

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P622

[5315] - 101

S.Y.B.Sc.

MATHEMATICS

MT-211: Multivariable Calculus - I

(2013 Pattern) (Semester - I) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Five of the following:

[10]

- a) State second derivative test for extremum of a function of two variables.
- b) Find the tangent plane to the surface $f(x, y, z) = x^2 + y^2 + z - 9$ at the point $(1, 2, 4)$.
- c) Find the slope of the tangent to the parabola at $(1, 2, 5)$ if the plane $x = 1$ intersects the paraboloid $z = x^2 + y^2$ in a parabola.
- d) Find an equation for the level curve of the function $f(x, y) = \sqrt{x^2 - 1}$ that passes through the point $(1, 0)$.
- e) State Clairaut's theorem for function of two variables.
- f) Give an example of a continuous function $f(x, y)$ which does not have partial derivatives of first order.
- g) Evaluate $\int_0^1 \int_0^\pi \int_0^\pi y \sin z \, dx \, dy \, dz$.

P.T.O.

Q2) Attempt any two of the following: **[10]**

- a) If $f(x, y)$ is continuous at (x_0, y_0) then prove that the function $f(x, y_0)$ is continuous at $x = x_0$ and the function $f(x_0, y)$ is continuous at $y = y_0$, where $f(x, y_0)$ and $f(x_0, y)$ being function of one variable. Is the converse hold? Justify.
- b) State and prove Taylor's theorem for the function of two variables.
- c) Show that $f(x, y) = \sqrt{|xy|}$ is continuous at $(0, 0)$ but not differentiable at $(0, 0)$

Q3) Attempt any two of the following: **[10]**

- a) If $w = f(u, v)$ is a differentiable function of u , and v and $u = \phi(x, y)$ & $v = \psi(x, y)$ are differentiable function of x and y then prove that the composite function $w = f[\phi(x, y), \psi(x, y)] = F(x, y)$ is differentiable function of x & y .
- b) Find the directional derivative of $f(x, y) = \tan^{-1}\left(\frac{y}{x}\right) + \sqrt{3} \sin^{-1}\left(\frac{xy}{2}\right)$ at the point $(1, 1)$ in the direction of $3\vec{i} - 2\vec{j}$.
- c) Discuss the maxima and minima of the function

$$f(x, y) = x^3 + y^3 - 12x - 3y + 5.$$

Q4) Attempt any one of the following: **[10]**

- a)
 - i) Evaluate the integral $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$ by changing the order of integration.
 - ii) Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = L$ by using the spherical polar co-ordinates.

b) i) Evaluate $\iint_R \sqrt{4x^2 - y^2} dx dy$, where R is the triangle bounded by the lines $y = 0$, $y = x$ and $x = 1$.

ii) Evaluate $\int_0^4 \int_{\frac{y}{2}}^{\frac{y}{2}+1} \frac{2x-y}{2} dx dy$ by applying the transformation

$$x = u + v, y = 2v.$$

EEE

Total No. of Questions : 4]

SEAT No. :

P623

[Total No. of Pages : 4

[5315] - 102

S.Y.B.Sc.

MATHEMATICS

MT-212(A): Discrete Mathematics

(2013 Pattern) (Semester - I) (Paper - II (A))

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator is not allowed.*

Q1) Attempt any Five of the following:

[10]

- a) Write inverse of 'If $2 + 7 = 9$ then logic is easy'.
- b) Find the truth value of $P(2, 3)$ if $P(x, y): x^2 + y^2 = 5$.
- c) Find the number of three letter words which begin with vowels if repetitions are allowed.
- d) Write Inclusion -Exclusion principle for four sets.
- e) Define tautology and compound statement.
- f) A class consists of seven boys and five girls. Find the number of committees of five that can be selected from the class.
- g) Find the number of permutations that can be formed from all the letters of word ELEVEN.

Q2) Attempt any TWO of the following:

[10]

- a) Prove that $\sim (p \wedge q) \equiv \sim p \vee \sim q$.
- b) Suppose repetitions are not permitted.
 - i) How many three-digit numbers can be formed from six digits 2, 3, 4, 5, 7 and 9.
 - ii) How many of these are less than 400.
- c) How many ways are there to select 8 balls from 50 red, 25 blue and 30 green balls? How many selections include at least 3 green balls.

P.T.O.

Q3) Attempt any TWO of the following:

[10]

- a) Explain valid argument and universal quantifier.
- b) Test the validity of following argument.

If I study then I will not fail in Mathematics.

If I do not play basket ball then I will study.

I failed in Mathematics. Hence I must have played basket ball.

- c) How many four letter words
 - i) begin and end with A
 - ii) begin with A and then no more A.

Q4) Attempt any ONE of the following:

[10]

- a) How many permutations of the 10 digits either begin with the three digits 9, 8, 7 contain digits 4, 5 in the 5th and 6th position or end with three digits 1, 2, 3.
- b)
 - i) Determine truth value of $\forall x, |x| = x$ and $\exists x, x^2 = x$ for $x \in \mathbb{R}$. Also write negation of both.
 - ii) Test the validity of $p \rightarrow \sim q, r \rightarrow q, r \vdash \sim p$ using truth table.

EEE

Total No. of Questions : 4]

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S.Y.B.Sc.

MATHEMATICS

MT-212 (B): Laplace Transform and Fourier Series

(2013 Pattern) (Semester - I) (Paper - II (B))

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Five of the following:

[10]

- a) Find $L\{3t^4 - 2\cos 3t + 2e^{-2t}\}$.
- b) By using $\sqrt{n+1} = n\sqrt{n}$ for all n , find $\sqrt{-\frac{3}{2}}$.
- c) Define Fourier series expansion of function $f(x)$ on the interval $[0, 2\pi]$.
- d) Find $L^{-1}\left\{\frac{1}{(s+1)(s-2)}\right\}$.
- e) State whether $f(t) = e^{t^2}$ is of exponential order or not.
- f) Find $L^{-1}\left\{\frac{s+2}{s^2+4s+8}\right\}$.
- g) Solve: $\frac{dy}{dt} = 1$, with initial condition $y(0) = 0$.

Q2) Attempt any TWO of the following:

[10]

- a) State and prove first shifting property for Laplace transform.

b) If $L^{-1}\{\phi(s)\} = f(t)$ then prove that $L^{-1}\{\phi(as)\} = \frac{1}{a} f\left(\frac{t}{a}\right)$.

c) Evaluate: $\int_0^{\infty} e^{-3t} \cos^3 t \, dt$.

Q3) Attempt any TWO of the following: **[10]**

a) Using power series expansion of $\sin t$, find $L\left\{\frac{\sin \sqrt{t}}{\sqrt{t}}\right\}$.

b) Find $L^{-1}\left\{\log\left(\frac{s^2+1}{s^2}\right)\right\}$.

c) Solve the differential equation $y'' + 2y' + y = t e^{-t}$, given that $y(0) = 1$ and $y'(0) = -2$ by using Laplace transforms.

Q4) Attempt any ONE of the following: **[10]**

a) State and prove convolution theorem. Use it to find $L^{-1}\left\{\frac{1}{s(s-3)}\right\}$.

b) Find the Fourier series expansion of $f(x) = \pi^2 - x^2$ in the interval $[-\pi, \pi]$. Hence obtain following identities.

i) $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$

ii) $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots$

EEE

Total No. of Questions : 4]

SEAT No. :

P624

[Total No. of Pages : 2

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S.Y.B.Sc.

PHYSICS

**PH-211 : Mathematical Methods in Physics - I
(2013 Pattern) (Semester - I) (Paper - I) (Regular)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of log tables and calculators is allowed.*

Q1) Attempt all of the following.

[10]

- a) If $z=x^3+xy+y^3$ find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.
- b) Find the value of 'P' which makes vector $\vec{A}=P\vec{i}+2\vec{j}-2\vec{k}$ and $\vec{B}=\vec{i}+3\vec{j}+P\vec{k}$ perpendicular.
- c) Prove that $\vec{V}=5z^4y\vec{i}+7x^7z\vec{j}+2xy\vec{k}$ is a Solenoidal vector.
- d) Write the order and degree of equation $y\frac{d^2x}{dt^2}+4\left[\frac{dx}{dt}\right]^2+xy=0$.
- e) What is an Argand diagram?
- f) What do you mean by explicit function?
- g) If $a-ib=\sqrt{x+iy}$, determine x and y .
- h) What is Partial differential equation?
- i) Using hyperbolic functions, prove that $\sinh(i\theta)=i\sin\theta$.
- j) Find the modulus of $\frac{1+3i}{1-2i}$.

P.T.O.

Q2) Attempt any two of the following. **[10]**

- a) Using the exponential form of complex numbers, determine the value of $(1+i)^8 + (1-i)^8$.
- b) Using total differential equation, find the approximate value of $\sqrt{(2.99)^2 + (3.99)^2}$.
- c) Show that $\vec{\nabla} \times (\vec{A} + \vec{B}) = \vec{\nabla} \times (\vec{A}) + \vec{\nabla} \times (\vec{B})$.

Q3) Attempt any two of the following. **[10]**

- a) The flow of viscous liquid through a capillary tube is given by Poiseuille's formula $V = \frac{\pi Pr^4}{8\eta l}$. If the errors in the measurement of P, r and l are 2%, 1.5% and 1% respectively. Find the minimum possible relative and percentage error in the measurement of V, where symbols have their usual meaning.
- b) Show that the vector field represented by $\vec{F} = (z^2 + 2x + 3y)\vec{i} + (3x + 2y + z)\vec{j} + (y + 2zx)\vec{k}$ is irrotational.
- c) Show that the point $x = 0$, is regular singular point of Bessel differential equation $x^2 \cdot \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (x^2 - n^2)y = 0$.

Q4) A) Attempt (a) or (b) of the following: **[8]**

- a) i) Find the sum, difference, product and quotient of $(2-3i)$ and $(5+2i)$.
- ii) Prove that, $\vec{\nabla} \cdot \left[\frac{\vec{r}}{r^3} \right] = 0$.

OR

- b) i) Find the equation of the tangent line to $x^3 - 3y^3 + xy + 21 = 0$, at point (1,2).
- ii) Prove that the vectors $\vec{A} = \vec{i} + 3\vec{j} + \vec{k}$ and $\vec{B} = 2\vec{i} + 6\vec{j} + 2\vec{k}$ are parallel to each other.

B) Attempt any one of the following: **[2]**

- a) State De-Moivre's theorem.
- b) If $\phi = 3x^2y - y^3z^2$, find grad ϕ at point (1, -2, -1).

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Total No. of Questions :4]

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S.Y.B.Sc.

PHYSICS

PH - 212 : Electronics - I

(2013 Pattern) (Semester - I) (Paper - II)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of log table and calculator is allowed.*
- 4) Neat circuit diagrams must be drawn wherever necessary.*

Q1) Attempt All of the following.

[10]

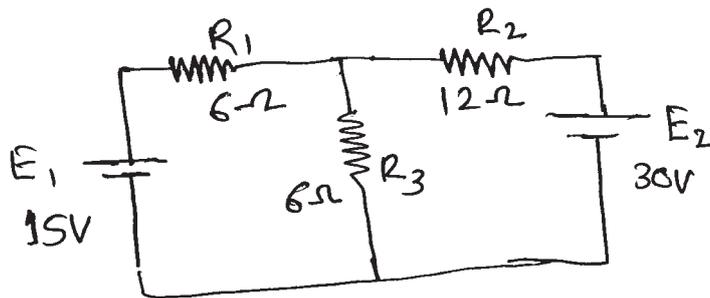
- a) Draw the symbol of constant current source and state it's ideal impedance.
- b) Find the value of α , if transistor has $\beta = 100$.
- c) Define Q point of transistor in CE configuration.
- d) A sine wave of 1V peak voltage is applied to non-inverting amplifier using $R_1 = 2k\Omega$ and $R_f = 20k\Omega$. Find the peak output voltage.
- e) What is the decimal equivalent of $(10111)_2$.
- f) Draw the block diagram of regulated power supply.
- g) What do you mean by positive feedback?
- h) Define the term input offset voltage of an op - amp.
- i) Give any two advantages of transistor or transistor switch over mechanical switch.
- j) State the maximum power transfer theorem.

Q2) Attempt any Two of the following:

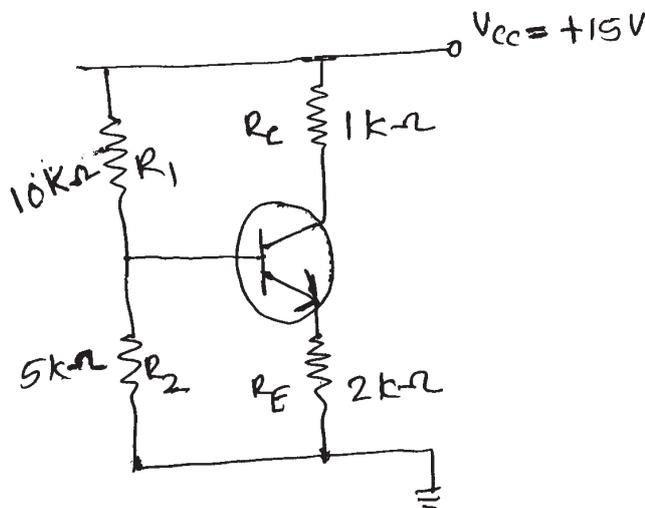
- a) Draw input and output characteristics curves for transistor in CE configuration. Hence explain the terms. [5]
 - i) input resistance
 - ii) Active region and
 - iii) cutoff region
- b) Explain the working of op-amp as a subtractor. Derive necessary formula. [5]
- c) Explain the operation of full wave rectifier and draw input and output wave forms. Give it's advantages. [5]

Q3) Answer any two of the following.

- a) Using superposition theorem, determine current flowing through R_3 for the given network. [5]



- b) Find the I_E and V_{CE} for the given transistor circuit if $V_{BE} = 0.6V$. [5]



c) Draw the logic diagram for Boolean expression [5]

$$Y = (\overline{AB} + \overline{A + B}) \cdot C \text{ and}$$

Evaluate it when i) $A = 0, B = 1, C = 1$ and

ii) $A = 1, B = 1, C = 1$

Q4) A) Attempt (a) or (b) of the following.

a) i) Derive the equation for gain of amplifier with feed back. [4]

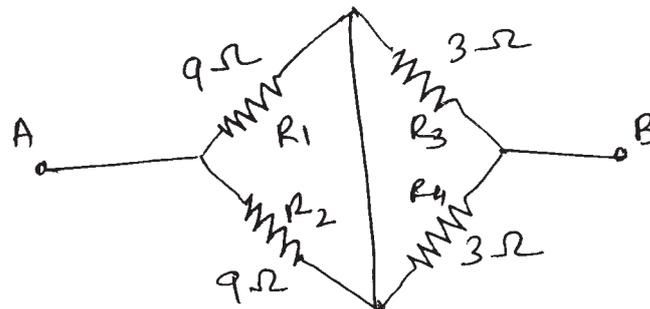
ii) Draw and explain the circuit of UJT as a relaxation oscillator. [4]

b) i) Explain the working of the op-amp as inverting amplifier. [4]

ii) State and prove the Demorgan's theorems. [4]

B) Attempt any One of the following:

i) Determine the equivalent resistance between terminals A and B. [2]



ii) What do you mean by PIV of diode? State the PIV of diode for Half wave rectifier. [2]



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S.Y.B.Sc.

PHYSICS

PH - 212 (B) : Instrumentation

(2013 Pattern) (Semester - I) (Paper - II)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of logtables and calculator is allowed.*

Q1) Attempt ALL of the following.

[10]

- a) Define accuracy of a measuring system.
- b) State the relation between celsius and Fahrenheit scale.
- c) State the principle used in Inductive transducer.
- d) What is a piezoelectric transducer?
- e) Define input bias current of OPAMP.
- f) Define slew rate.
- g) State the types of graphic recorder.
- h) What is the sensitivity of measuring instrument?
- i) Define load cell.
- j) Calculate the gain of non-inverting amplifier when input resistance at inverting terminal is $10\text{ k}\Omega$ and feed back resistance is $150\text{ k}\Omega$.

Q2) Attempt any Two of the following.

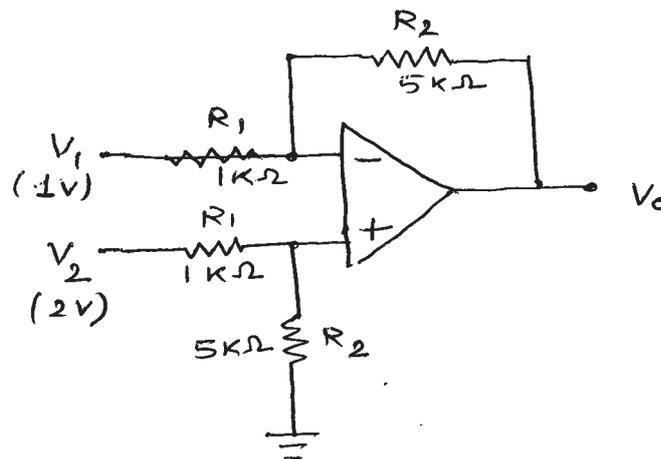
[10]

- Write a short note on thermal element as a first order system of measurement.
- What do you mean by cantilever beam? Explain how it is used for measurement of force.
- Explain with circuit diagram, Logarithmic amplifier using OPAMP.

Q3) Attempt any TWO of the following.

[10]

- What will be output for following circuit? Also mention the configuration of the circuit.



- A capacitive transducer uses two diaphragms of area 750 mm^2 separated by a distance 3 mm . A pressure of 900 KN/m^2 when applied to top diaphragm produces a deflection of 0.5 mm . The capacitance is 300 pf when no pressure is applied to diaphragm. Find the value of capacitance after application of pressure of 900 KN/m^2 .
- The resistance of platinum wire at 0°C is $5.5\ \Omega$ and at $t^\circ\text{C}$ it is $7.5\ \Omega$. Find the temperature of wire

(Given-temperature coefficient of platinum = $0.0039/^\circ\text{C}$)

Q4) A) Attempt (a) or (b) of the following.

- a) i) Explain in detail oscillographic recorder. [4]
- ii) Explain variable Resistance devices. [4]
- b) i) Explain with circuit diagram Active Half wave rectifier [4]
- ii) Write a note on resistive transducer as a first order system. [4]

B) Attempt any ONE of the following.

- a) The dead zone in certain thermometer is 0.125 percent of span. The calibration is 500 °c to 1300°c. What temperature change might occur before it is detected. [2]
- b) Draw the circuit diagram of an instrumentation amplifier. [2]



Total No. of Questions : 6]

SEAT No. :

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S.Y.B.Sc.

CHEMISTRY

CH-211: Physical and Analytical Chemistry

(2013 Pattern) (Semester - I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Answer to both sections should be written in same answer book.*

SECTION-I

(Physical Chemistry)

Q1) Answer the following:

[5]

- a) Define order of reaction.
- b) What is rate of reaction?
- c) State Grotthus-Draper's law.
- d) Define photosynthesis.
- e) When process of extraction is more economical and efficient?

Q2) a) Answer Any Two of the following:

[6]

- i) Deduce the equation for velocity constant for second order reaction with unequal initial concentration.
- ii) Draw the schematic diagram of the apparatus used for the determination of quantum yield.
- iii) Give the characteristics of first order reaction.

P.T.O.

- b) Attempt Any Two of the following: [4]
- Explain the term chemiluminescence.
 - Give difference between the first and second order reaction with respect to rate constant and half life period.
 - What is difference between thermal and photochemical reaction?

Q3) Solve Any Two of the following: [5]

- The rate constant of first order reaction is $6.4 \times 10^{-3} \text{ sec}^{-1}$ at 25°C . Find the time required to complete 75% of the reaction.
- The absorbance of $1.5 \times 10^{-3} \text{ m}$ solution of a sample was found to be 0.183 at a wavelength 440 nm in a cell of 1 cm path length. Find
 - transmitted
 - Molar extinction coefficient.
- Calculate the amount of acid extracted from two litre of aqueous solution containing 50 gm of an acid on extracting with 500 cm^3 of ether every time in 3 lots. If partition coefficient of acid in water to ether is 5.6.

SECTION-II

(Analytical Chemistry)

Q4) Answer the following: [5]

- Define sampling.
- What is Error?
- Which is group reagent for V group?
- Write chemical reaction for detection of phenol.
- Define common Ion Effect.

Q5) a) Answer any two of the following: [6]

- i) What is solubility product? Explain the role of this concept in separation of basic radicals.
- ii) Explain sodium fusion test for detection of Nitrogen and Oxygen.
- iii) What is empirical formula? Explain carius method for estimation of sulphur.

b) Attempt any two of the following: [4]

- i) How are sample of gas obtained?
- ii) Explain different methods used to minimise the error.
- iii) Explain the method of removal of phosphate in qualitative analysis.

Q6) Solve any two of the following: [5]

- a) The percentage of component M in compound MN were found to be 30.32, 30.33, 30.20, 30.10 and 30.58%. Calculate mean deviation and relative deviation.
- b) An organic compound on elemental analysis was found to contain carbon = 77.42% Hydrogen = 7.53 and nitrogen = 15.05% . Calculate its molecular formula.
If its molecular weight is 93.
- c) The concentration of Cu^{+2} metal ion in solution is 0.25M. What should be the concentration of sulphide ion required to just cause the precipitation of CuS. (K_{sp} of CuS = 8.5×10^{-45}).

EEE

Total No. of Questions : 6]

SEAT No. :

P627

[Total No. of Pages : 3

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S.Y.B.Sc.

CHEMISTRY

**CH-212 : Organic and Inorganic Chemistry
(2013 Pattern) (Semester-I) (Paper - II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Answers to the two sections should be written on same answer book.*
- 2) *All questions are compulsory.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*

SECTION - I

(Organic Chemistry)

Q1) Attempt the following.

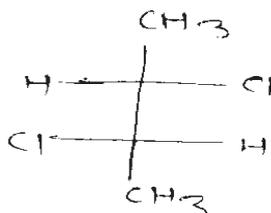
[5]

- a) What is optical isomerism?
- b) Draw the geometrical isomers of cis and trans 1,4 - dimethyl cyclohexane.
- c) What are electrophiles?
- d) What is Meso compound?
- e) Define carbocation with suitable example.

Q2) A) Attempt any two of the following.

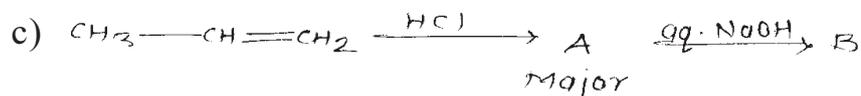
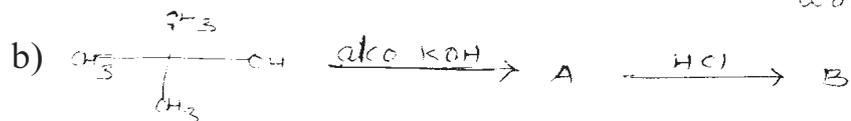
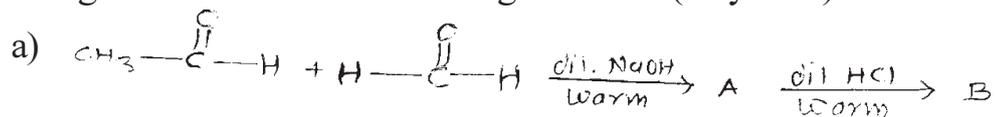
[6]

- a) Draw the chair conformation of cyclohexane indicating axial and equatorial bonds. Why chair form is more stable than boat form?
- b) Discuss the mechanism of addition of HBr to propylene in presence of peroxide.
- c) Define erythro isomer. Assign 'R' & 'S' configuration to the following molecule



P.T.O.

B) Assign 'A' & 'B' of the following reactions (Any Two): [4]



Q3) Attempt any two of the following. [5]

- What is angle strain? Why Baeyer's strain theory failed to explain stability of higher cycloalkanes.
- What is elimination reaction? Explain β -elimination with two examples.
- Draw the conformations of t-Butyl cyclohexane. Explain. Why t-butyl group in t-butyl cyclohexane locked at equatorial position?

SECTION - II

(Inorganic Chemistry)

Q4) Answer in one sentence. [5]

- Define the term 'Roasting'.
- Define 'Ore'.
- What is passivity?
- Name any two important ores of aluminium.
- Give two composition of cast iron.

Q5) A) Attempt any two of the following. [6]

- Explain the manufacture of steel by L.D. Process. What are the advantages of this process?
- What is corrosion? What are the factors which affect the process of corrosion?
- Discuss the electrolysis process to get aluminium from alumina with suitable diagram.

- B) Attempt any two of the following: [4]
- a) Write a note on commercial forms of iron.
 - b) Write a note on Electroplating.
 - c) Explain the term Anode effect and Cryolite.

- Q6)** Attempt any two of the following: [5]
- a) How wrought iron is manufactured by Puddling process?
 - b) What is galvanizing of metal? Write its applications.
 - c) What is flux? Write the different types of fluxes which are used in removal of various impurities.

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Total No. of Questions : 4]

SEAT No. :

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S.Y. B.Sc.

BOTANY

BO-211 : Taxonomy of Angiosperms & Plant Community

(2013 Pattern) (Semester-I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) What is natural system of classification?
- b) What are hydrophytes?
- c) Define synecology.
- d) Give botanical names of any two economically important plant from family myraceae.
- e) Define monograph.
- f) Write the type of fruit of solanaceae
- g) Define systematics.
- h) What is binomial nomenclature?
- i) Define Herbarium.
- j) What is food web?

Q2) Attempt any two of the following:

[10]

- a) Give the objectives of taxonomy.
- b) Explain anatomy as a source of data for systematics.
- c) Explain the concept of effective and valid publication.

P.T.O.

Q3) Write notes on Any two of the following: **[10]**

- a) Flora
- b) Merits and limitations of Linnaeu's system of classification.
- c) Pyramid of energy.

Q4) Give distinguishing characters, floral formula, floral diagram and economic importance of family Annonaceae. **[10]**

OR

What are xerophytes? Give external and internal adaptations in stem and leaf. **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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S.Y. B.Sc.

BOTANY

BO-212 : Plant Physiology

(2013 Pattern) (Semester-I) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) Define plasmolysis.
- b) Enlist any two factors affecting rate of water absorption.
- c) What is guttation?
- d) Write importance of plant physiology in agriculture.
- e) What is passive absorption of water?
- f) Define physiological seed dormancy.
- g) What is nonsymbiotic nitrogen fixation?
- h) Name any two instruments used for measurement of plant growth.
- i) Enlist any two physical force theories for ascent of sap.
- j) What is SDP?

Q2) Answer any two of the following:

[10]

- a) Describe practical applications of cytokinins.
- b) Write physico-chemical properties of water.
- c) Describe various methods to break seed dormancy.

P.T.O.

Q3) Write notes on (Any two of the following): **[10]**

- a) Imbibition.
- b) Factors affecting ascent of sap.
- c) Nitrification.

Q4) What is vernalization? write mechanism and applications of it. **[10]**

OR

Define transpiration. Describe various factors affecting rate of transpiration.



Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages : 2

[5315]-109

S.Y.B.Sc.

ZOOLOGY

**ZY-211: Animal Systematics and Diversity-III
(2013 Pattern) (Semester-I) (Paper - I) (Revised)**

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following:

[10]

- a) What is holometabolous development?
- b) Write any two foot modifications in Mollusca.
- c) Define torsion.
- d) Define mimicry in insects.
- e) Write any two types of pedicellariae.
- f) Give any two examples of class Insecta.
- g) Write any two Characters of class Holothuroidea.
- h) Write the function of Stone canal of Starfish.
- i) What type of fertilization is found in Starfish?
- j) Write any two characters of class Arachnida.

Q2) Write short notes on (any two):

[10]

- a) Useful insects.
- b) Nauplius larva.
- c) Autotomy and regeneration.

P.T.O.

Q3) Attempt the following (any two): **[10]**

- a) Describe the physiology of digestion in Starfish.
- b) Sketch and label chewing and lapping type of mouthparts in honeybee.
- c) Write distinguishing characters of class Crustacea.

Q4) Describe the habits, habitat and external characters of starfish. **[10]**

OR

Give general characters of phylum Mollusca and distinguishing characters of Class Cephalopoda.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 110

S.Y. B.Sc.

ZOOLOGY (Regular)

ZY-212 : Applied Zoology - I

(Fisheries and Agricultur Pests and Their Control)

(2013 Pattern) (Semester-I) (Revised) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following:

[10]

- a) What is Inland fishery?
- b) Mention any two stored grain pests.
- c) What is fish flour?
- d) What is cultural control?
- e) What is rearing pond?
- f) Write any two damages caused by Jowar stem borer.
- g) Write the name of equipment used for Harpodon harvesting.
- h) What is salting?
- i) What is antidotes?
- j) Write the names of any two pest control appliances.

Q2) Write short notes (Any Two).

[10]

- a) Chilling and canning techniques in fish preservation.
- b) Describe the harvesting method of Lobster.
- c) Snails and crabs as non-insect pest.

P.T.O.

Q3) Attempt the following (Any Two).

[10]

- a) Sketch and label purse net.
- b) Describe in brief catamaran.
- c) Describe in brief mechanical control of pest.

Q4) Describe marks of identification, Nature of damage and control measures of Rice weevil and mango stem borer.

[10]

OR

Describe Habit, Habitat and culture methods of Labeo rohita and Cirrihinus Mrigala.



Total No. of Questions :4]

P632

SEAT No. :

[Total No. of Pages : 2

[5315]-111
S.Y.B.Sc.
GEOLOGY
GL-211: Mineralogy
(2013 Pattern) (Semester-I) (Paper-I)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw Neat diagrams wherever necessary.*

Q1) Answer the following:

[10]

- a) What is Foreign overgrowth?
- b) State the hemihedral form of octahedron.
- c) Name any 2 minerals of feldspathoid group.
- d) Define asterism.
- e) Define dichroism.
- f) Define anisotropism.
- g) Define twin axis.
- h) Explain sorosilicate structure.
- i) Name the 2 end members of the olivine group of minerals.
- j) Name the varieties of garnet.

Q2) Write notes (any 2):

[10]

- a) Inosilicate structure with examples.
- b) Three basic attributes of gemstones.
- c) Extinction position in minerals.

P.T.O.

Q3) Answer the following (any 2): **[10]**

- a) Compare the Elements of symmetry of hexagonal system. Type calcite, type Quartz and type tourmalinae.
- b) External imperfections in crystal.
- c) Classification of turins.

Q4) Describe the structure, mineral composition, physical and optical properties and paragenesis of olivine group of minerals. **[10]**

OR

Describe the structure, Chemical composition physical and optical properties and paragenesis of silica group of minerals.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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S.Y. B.Sc.

GEOLOGY

GL-212 : Structural Geology

(2013 Pattern) (Semester-I) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following in 2 / 3 lines:

[10]

- a) outlier.
- b) Two uses of Brunton Compass
- c) Box folds.
- d) Normal faults.
- e) Bedding joints.
- f) Unconformity.
- g) Non - tectonic structures.
- h) Plunge and Rake of a linear feature.
- i) Disharmonic fold.
- j) Exfoliation dome.

Q2) Write notes on (Any two):

[10]

- a) Stages of development of an unconformity. Add a note on Disconformity.
- b) Genetic classifications of faults.
- c) Plunging and Non-plunging folds.

P.T.O.

Q3) Answer the following (Any Two): **[10]**

- a) Evidences of faulting.
- b) Seales of tectonic structures.
- c) Types of absolute movements along faults.

Q4) Describe the parts of a fold. Explain the following folds: **[10]**

- a) Symmetrical and asymmetrical folds.
- b) Refolding.
- c) Diapir fold.

OR

Q4) Define joints. Explain geometrical classification of joints. Add a note on the importance of joints in geological investigations. **[10]**



Total No. of Questions :4]

SEAT No. :

P634

[Total No. of Pages : 3

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S.Y.B.Sc.

STATISTICS

**ST-211: Discrete Probability Distributions, Time Series and R-Software
(2013 Pattern) (Semester-I) (Paper-I)**

Time :2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:

- A) Choose the correct alternative in each of the following. **[1 each]**
- a) If $X \rightarrow NB(k,p)$ then $E(X)$ is:
- | | |
|-----------|--------------|
| i) kpq | ii) kq/p |
| iii) kp | iv) kq/p^2 |
- b) If $(X_1, X_2, X_3) \rightarrow MD(n, p_1, p_2, p_3)$ then multiple correlation coefficient $R_{1,23}$ is
- | | |
|-----------|------------|
| i) $+1$ | ii) -0.5 |
| iii) -1 | iv) $+0.5$ |
- c) Moving averages of period k_1 remove cyclical variations of uniform period k_2 if
- | | |
|---------------------|---|
| i) k_1 is even | ii) k_1 is odd |
| iii) $k_1 \neq k_2$ | iv) $k_1 = k_2$ or k_1 is multiple of k_2 |
- B) State whether each of the following is True or False: **[1 each]**
- a) If $X_T \rightarrow B(n,p)$, truncated to the left at zero then $E(X_T) = 0$.
- b) Cyclical fluctuations represent long term movement in time series.
- c) R - command `rep ()` is used to generate vector with repetition of elements.

P.T.O.

- C) State the moment generating function (m.g.f.) of negative binomial distribution. [1]
- D) State autoregressive model of order one (AR(I)) for the time series (t, y_t) . [1]
- E) Give the real life situation where multinomial distribution is applicable. [1]
- F) If $(X_1, X_2, X_3) \rightarrow MD (n, p_1, p_2, p_3)$ then state $\text{corr} (X_1, X_2)$. [1]

Q2) Attempt any two of the following. [5 each]

- a) If $(X_1, X_2, X_3) \rightarrow MD (n, p_1, p_2, p_3)$, obtain marginal distribution of X_1 . Hence find mean and variance of X_1 .
- b) Describe Holt - Winter method for exponential smoothing.
- c) Suppose X_T is Poisson random variable, truncated to the left at zero. If $P(X_T = 2) = P(X_T = 1)$ find
 i) $E(X_T)$ and ii) $P(X_T \leq 2)$

Q3) Attempt any two of the following. [5 each]

- a) The probability that family prefers tea of certain brand A is 0.25. Find the probability that seventh family in a survey is found to be the fourth family which prefers the tea of brand A. Also find the expected size of survey to get four families which prefer tea of brand A.
- b) Describe the method of moving averages for the estimation of trend.
- c) Give the outputs of the following R-commands:
- i) `> x = c(11, 13, 10)`
`> y = c(0, 1, 2)`
`> data.frame (x, y)`
- ii) `> x = 1 : 8`
`> y = 8 : 1`
`> x * y`
- iii) `> x = 5`
`> x * x + 2 * 3 * x + 8`
- iv) `> x = seq (1, 3, 0.5)`
`> x`
- v) `> x = 41 : 45`
`> x [-2]`

Q4) Attempt any one of the following.

- a) i) If $(X_1, X_2, \dots, X_k) \rightarrow \text{MD}(n, p_1, p_2, \dots, p_k)$, obtain probability distribution of $X_1 + X_2$. Hence find probability distribution of X_3 given $X_1 + X_2 = r$. [6]
- ii) Explain cyclical variations and seasonal variations in time series. [4]
- b) i) State one R - Command to find minimum, maximum and three quartiles of a vector X simultaneously. [2]
- ii) If $(X_1, X_2, X_3) \rightarrow \text{MD}(10, 0.25, 0.5, 0.25)$ then find $P(X_1 = 6, X_2 = 1)$. [2]
- iii) Compute the quarterly seasonal indices for the following data using method of simple averages. [6]

Year	Q1	Q2	Q3	Q4
2010	40	46	43	39
2011	42	45	42	38
2012	46	46	43	36
2013	45	49	50	43



Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages : 3

S.Y.B.Sc.

STATISTICS

ST-212 : Continuous Probability Distributions
(2013 Pattern) (Paper - II) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

a) Choose the correct alternative in each of the following: [1each]

i) The moment generating function of $G(1, \lambda)$ distribution is

- | | |
|-----------------------|----------------------|
| 1) $(1+t)^\lambda$ | 2) $(1-t)^\lambda$ |
| 3) $(1-t)^{-\lambda}$ | 4) $(1-t^2)^\lambda$ |

ii) If (X, Y) is continuous bivariate r.v. then $E(E(X|Y=Y))$ is

- | | |
|------------|-------------|
| 1) $E(X)$ | 2) $E(Y)$ |
| 3) $E(XY)$ | 4) $E(X^2)$ |

iii) The mean and variance of normal distribution

- | | |
|------------------------|--------------------|
| 1) are same | 2) can not be same |
| 3) are sometimes equal | 4) none of these |

b) State whether the given statement is true or false in each of the following: [1each]

i) If $M_x(t)$ is moment generating function of r.v. X then moment

generating function of $Y = \frac{1}{3}X + 1$ is $e^t M_x\left(\frac{t}{3}\right)$.

ii) If X and Y are uncorrelated then X and Y must be independent.

iii) Exponential distribution is particular case of gamma distribution.

c) A random variable X has exponential distribution with mean 2. Find $P[X > 5]$ [1]

P.T.O.

- d) Let X be a continuous r.v. with p.d.f. [1]
 $f(x) = k(x+1), -1 < x < 1$
 $= 0$, otherwise
 Find value of k.
- e) Define cumulant generating function of continuous random variable X. [1]
- f) State mean and variance of uniform distribution. [1]

Q2) Attempt any Two of the following: [5 each]

- a) The joint p.d.f of r.v. (X,Y) is

$$f(x, y) = \frac{8}{9} xy \quad ; 1 \leq x \leq y \leq 2$$

$$= 0 \quad ; \text{otherwise.}$$

- i) Find marginal p.d.f.'s of X and Y
 ii) Find conditional p.d.f. of Y given X=x
- b) A r.v X has p.d.f.,

$$f(x) = \frac{1}{4} \quad ; -2 < x < 2$$

$$= 0 \quad ; \text{otherwise.}$$

Obtain

- i) $P[X < 1]$
 ii) $P[|X| > 1]$
 iii) $E(X)$.
- c) State and prove additive property of gamma distribution.

Q3) Attempt any Two of the following: [5 each]

- a) The p.d.f. of a continuous r.v X is

$$f(x) = \frac{1}{\sqrt{2\pi} \cdot 2} e^{-\frac{1}{8}(x-2)^2} \quad -\infty < x < \infty.$$

Identify the distribution of X. Also find $P(1 < X < 3)$.

- b) If X is continuous r v with p.d.f.

$$f(x) = 6x(1-x) \quad ; 0 < x < 1$$

$$= 0 \quad ; \text{otherwise.}$$

- Find i) Harmonic mean
 ii) Mode of X

- c) State and prove lack of memory property of exponential distribution and interpret it.

Q4) Attempt any One of the following:

- a) i) State and prove central limit theorem for i.i.d. random variables with finite variance. [7]
ii) If $X \rightarrow U[a, b]$ then find median of X. [3]
- b) i) Check whether X and Y are independent random variables if the joint p.d.f. of (X,Y) is
$$f(x, y) = 12xy(1 - y) \quad ; 0 < x, y < 1$$
$$= 0 \quad ; \text{otherwise.} \quad [4]$$

ii) Define distribution function of bivariate continuous r.v (X,Y). State any two of its properties. [4]
iii) State moment generating function of normal distribution with parameters (μ, σ^2) . Hence find its mean. [2]

✓ ✓ ✓

Total No. of Questions :4]

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[5315]-115

S. Y. B. Sc.

GEOGRAPHY

**Gg - 211: Geography of Resources - I
(2013 Pattern) (Semester-I) (paper I)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Answer the following questions in two to three sentences each (Any Ten)

[10]

- a) What is meant by functionality of resources?
- b) What are the components of human resources?
- c) Classify the resources on the basis of origin.
- d) Give any two examples of biotic nonrenewable resources.
- e) Give any two indirect uses of forests.
- f) What is meant by jhum cultivation?
- g) State any two methods of conservation of forests.
- h) What are the advantages of water transportation?
- i) Write various uses of water in industries.
- j) Give any two examples of land degradation due to agricultural activity.
- k) Give any two methods of land conservation.
- l) Name any two inland waterways of India.
- m) Give any two uses of abiotic non renewable resources.

P.T.O.

Q2) Write short notes on the following (Any Two) **[10]**

- a) Natural components of resources
- b) Importance of non conventional energy resources.
- c) Effects of deforestation.
- d) land degradation due to agricultural activity.

Q3) Answer the following questions in 100 words each (Any Two) **[10]**

- a) Explain the components of human resources.
- b) What are the environmental significance of forests?
- c) Explain the importance of abiotic renewable resources.
- d) Explain the causes of land degradation due to mining activity.

Q4) Answer the following questions in 200 words (Any One) **[10]**

- a) Describe the various methods of conservation of forest resources.
- b) Describe the various uses of water resources in detail.



Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages : 2

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S.Y.B.Sc.

GEOGRAPHY

**Gg-212: Watershed Management-I
(2013 Pattern) (Semester-I) (Paper-II)**

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw Neat diagrams and shetches wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Answer the following questions in two to three sentences each:

[10]

- a) Write any two principles of watershed management.
- b) What is the meaning of watershed delineation?
- c) Define- Interception.
- d) What is universal soil loss equation?
- e) What is land capability classification?
- f) Define- Transpiration.
- g) Name any two processes of soil erosion due to Wind.
- h) What is meant by drainage basin?
- i) Name any two advantages of Watershed management.
- j) What is meant by stream order?
- k) Name two criteria for land capability classification.
- l) What is meant by stream length ratio?
- m) List any two benefits of watershed management.

P.T.O.

Q2) Write short notes on the following (any two) : **[10]**

- a) Objectives of Watershed management.
- b) Ecological Characteristics of river.
- c) Evapotranspiration.
- d) Universal soil loss Equation.

Q3) Answer the following questions in 100 words each (any two) **[10]**

- a) Describe aerial aspects of drainage basin .
- b) Explain the Hydrological cycle.
- c) Describe the classes in Land capability classification.
- d) Examine the problems in Watershed Management.

Q4) Answer the following question in 200 words (any one).

- a) Describe the geomorphological characteristics of Watershed. **[10]**
- b) Examine the need and describe methods of land Capability Classification.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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S.Y. B.Sc.

MICROBIOLOGY

MB-211 : Bacterial Systematics and Physiology

(2013 Pattern) (Semester-I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

Q1) Attempt the following:

[10]

- a) Define species.
- b) Define cofactor.
- c) HMP pathway is half efficient than EMP. T/F.
- d) Nitrate is a terminal electron acceptor in aerobic respiration. T/F.
- e) KDPG is an intermediate of _____ pathway.
- f) Draw structure of alphaketoglutarate.
- g) β - galactosidase belongs to _____ class of enzyme.
 - i) Oxidoreductase
 - ii) Lyase
 - iii) Ligases
 - iv) Hydrolase
- h) Enzyme catalysis enhance the rate of reaction by lowering activation energy. T/F
- i) Write formula for similarity coefficient.
- j) Enlist two methods of G+C determination.

P.T.O.

Q2) Attempt any two of the following. **[10]**

- a) Explain lock and key model of enzyme catalysis.
- b) Describe autoradiography technique in the study of metabolic pathways.
- c) Explain G + C content as a genetic basis of taxonomy.

Q3) Write short notes on (Any two). **[10]**

- a) High energy compounds.
- b) Effect of p^H on enzyme activity.
- c) DNA hybridization.

Q4) Attempt any one of the following. **[10]**

- a) Describe EMP pathway with structures.
- b) What is Numerical taxonomy? Describe its general procedure used in bacterial classification.



Total No. of Questions : 4]

SEAT No. :

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[Total No. of Pages : 2

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S.Y. B.Sc.

MICROBIOLOGY

MB-212 : Industrial & Soil Microbiology

(2013 Pattern) (Semester-I) (Regular) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

Q1) Attempt the following:

[10]

- a) Define.
 - i) Batch fermentation.
 - ii) Rhizosphere.
- b) Enlist two antifoam agents.
- c) Enlist types of soil with pore size of particles
- d) State true or false.
 - i) Crowded plate technique is used for the screening of industrially important microorganisms.
 - ii) Rhizosphere soil is rich in micro flora.
- e) The example of dual fermentation is _____ .
- f) _____ medium is used for the isolation of Rhizobium.
- g) The part of fermenter used for aeration is
 - i) Sparger
 - ii) Baffles
 - iii) Agitator
 - iv) probes
- h) Conversion of ammonia to nitrate is called as
 - i) Nitrogen fixation
 - ii) Ammonification
 - iii) Denitrification
 - iv) Nitrification

P.T.O.

Q2) Write short notes (Any two): **[10]**

- a) Master culture
- b) Composting
- c) Cellulose degradation.

Q3) Solve any two of the following: **[10]**

- a) Explain the methods for monitoring and control of temperature during industrial fermentation.
- b) Diagrammatically illustrate CSTR.
- c) Describe commensalism with two examples.

Q4) Attempt any one of the following: **[10]**

- a) Define Biofertilizers. Explain the production of Azotobacter biofertilizer.
- b) Define screening. Explain parameters for the secondary screening.



Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages : 1

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S.Y.B.Sc.

PSYCHOLOGY

**EP-211: Psychology of Adjustment
(2013 Pattern) (Semester-I) (Paper - I)**

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Attempt all questions.*
- 2) *Draw the figures and diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt in two or four sentences.

[16]

- a) State the any four areas of adjustment.
- b) What is a personality disorder?
- c) What are occupational hazards?
- d) What is a carrer?
- e) Define marriage.
- f) What is happiness?
- g) Define the Psychology of adjustment.
- h) What is Cohabition?

Q2) Attempt any two of the following in eight or ten sentences.

[8]

- a) Explain the any two tests used for career decisions.
- b) Explain the Criteria of abnormal behaviour.
- c) Explain the stages of family life cycle.

Q3) Write short notes on any two of the following.

[8]

- a) Job stress.
- b) Paranoid disorder.
- c) Psychoanalytical approach.

Q4) a) What is career? Discuss the career. Choice?

[8]

OR

- b) What is happiness? Explain the roots of happiness.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 1

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[5315]-120

S.Y.B.Sc.

PSYCHOLOGY

Experimental Psychology and Research Methodology

(2013 Pattern) (Semester-I) (Paper - II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Attempt all questions.*
- 2) *Neat figures and diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in one to four sentences.

[16]

- a) What is Instrumental training?
- b) What is Creative thinking?
- c) What is scientific research?
- d) Define interview.
- e) What is perception?
- f) Define abstraction.
- g) What is negative reinforcement?
- h) What is hypothesis?

Q2) Attempt any two of the following in 8/10 sentences.

[8]

- a) Explain the characteristics of a good scientific research.
- b) Explain the characteristics of a good questionnaire.
- c) Explain the determinants of thinking.

Q3) Write short notes on any two of the following.

[8]

- a) Conditioning.
- b) Validity in research.
- c) Observation.

Q4) What is thinking? Describe the conceptual process in thinking.?

[8]

OR

Explain the steps and types of scientific research.



Total No. of Questions :4]

SEAT No. :

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S.Y.B.Sc.

ELECTRONIC SCIENCE

EL-211: Analog Circuit Design

(2013 Pattern) (Semester-I) (Paper - I)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable calculator is allowed.*

Q1) Attempt all of the following:

- a) Define the efficiency of power amplifier. [1]
- b) What is an amplifier? [1]
- c) What is feedback in case of amplifier? [1]
- d) State any two parameters on the basis of which amplifier are classified.[1]
- e) Voltage gain of first amplifier is 20 and that of second stage is 30, Find the overall voltage gain. [2]
- f) “Transformer coupling with same transistor gives larger gain than RC coupled amplifier” comment. [2]
- g) Find the output of current to voltage converter if $I_{in}=1.2 \text{ MA}$ and $R_F=5k\Omega$. [2]
- h) The turns ratio of transformer is 10:1, If the loud of 8Ω loudspeaker is connected across the secondary. Calculate the effective resistance seen into primary. [2]

Q2) Attempt any two of the following:

- a) Why there is a need of multistage amplifier? Explain gain bandwidth relation for it. [4]
- b) Draw circuit diagram of Colpitt’s oscillator and explain it’s working.[4]
- c) Write a short note on heat sink. [4]

P.T.O.

Q3) Attempt any two of the following:

- a) What is CE amplifier? Draw the output characteristics of CE amplifier and explain it. [4]
- b) Explain with circuit diagram precision rectifier using OPAMP. [4]
- c) Draw block diagram of current series and current shunt feedback. [4]

Q4) Attempt the following:

- a) Explain the working of push-pull amplifier with the help of circuit diagram. [6]
- b) Draw the circuit diagram of OPAMP as a differentiator circuit. With input output waveforms Derive the expression for output voltage. [6]

OR

- a) A power amplifier supply 32 W power to a loudspeaker of $8\ \Omega$. Find the ac output voltage and ac output current. [4]
- b) In an amplifier with gain 40, a positive feedback is applied through β network 0.005. Calculate the gain of amplifier. [4]
- c) Calculate the value of bypass capacitor for designing single stage RC coupled amplifier. If lower cutoff frequency is 300Hz. Assume $R_E = 180\ \Omega$. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P643

[5315] - 124

S.Y. B.Sc.

ELECTRONIC SCIENCE

EL-212 : Digital Circuit Design

(2013 Pattern) (Paper - II) (Semester-I)

Time : 2 Hour]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer All of the following:

- a) Write excitation table for J-K flipflop. [1]
- b) What is steady state accuracy test for digital to analog converter? [1]
- c) What do you mean by octet in K-map? [1]
- d) State the nature of input and output in case of thumb wheel switch. [1]
- e) Draw K-map for following equation
$$Y = \overline{A}BC + \overline{A}\overline{B}C + \overline{A}BC + A\overline{B}\overline{C} + A\overline{B}C.$$
 [2]
- f) “Non multiplexed display system draws large current from the power supply”. Comment. [2]
- g) “Flash type ADC is fastest ADC”. Comment. [2]
- h) State various methods for sequence generator. [2]

Q2) Attempt any Two of the following:

- a) Using K- map design 3-bit odd parity generator. [4]
- b) With the help of diagram explain the working of counter type ADC. [4]
- c) Draw a logic diagram and timing diagram of asynchronous decade counter using J-K flipflop. [4]

P.T.O.

Q3) Attempt any Two of the following:

- a) What are limitations of binary weighted resistive DAC? How is it overcome in R-2R ladder network? [4]
- b) Design a full adder circuit using K-map. [4]
- c) Draw block diagram of digital clock and explain second counter in detail. [4]

Q4) Attempt All of the following:

- a) With the help of block diagram explain in detail auto parking system. [6]
- b) Draw state table and state diagram of a sequential circuit described algebraically by following state equations. [6]

$$\text{Output } Z = X(t) \cdot Q_1(t)$$

$$Q_1(t+1) = X(t) + Q_1(t)$$

$$Q_2(t+1) = X(t) \cdot \overline{Q_2(t)} + \overline{X(t)} \cdot \overline{Q_1(t)}$$

OR

- a) Find the output voltage from a 5-bit R-2R ladder network for digital input 11010, given input voltage levels are $0=0\text{V}$ & $1=10\text{V}$. [4]
- b) Design a one-bit magnitude comparator using K-map. [4]
- c) Design a counter using J-K flipflop for the sequence 1, 2, 3, 1, 2-----.[4]



Total No. of Questions :4]

SEAT No. :

P644

[5315]-125

[Total No. of Pages : 2

S.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-101; Study of Conflict and Peace

(2013 Pattern) (Paper - I) (Semester-I)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

Q1) Answer in two to four sentences.

[8×2=16]

- a) Define conflict management.
- b) Define war studies.
- c) Define social integration.
- d) Define ethnicity.
- e) Define self determination.
- f) Define power politics.
- g) Define nationalism.
- h) State the meaning of politics power.

Q2) Answer in 8 to 10 sentences.

[2×4=8]

- a) Describe historical background of war studies.
- b) Discuss nature and scope of peace studies.
- c) Describe methods of peaceful settlement of disputes.

P.T.O.

Q3) Write short notes on (any two).

[2×4=8]

- a) Difficulties in peace studies.
- b) Nationalism and world politics.
- c) Problems of disarmament.

Q4) Answer in 18 to 20 sentences (any one)

[1×8=8]

- a) Examine how war is an instrument of national policy.
- b) Discuss approaches to the study of conflict and peace.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P645

[5315] - 126

S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-102 : Military Geography

(2013 Pattern) (Semester-I) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in 2 or 4 sentences each:

[16]

- a) Define "Ground strategy".
- b) State any one example of Tactics.
- c) State the ideas period for High Altitude warfare.
- d) What do you mean by "Resources of logistics"?
- e) What do you understand by "Nuclear warfare"?
- f) State any two characteristics of jungle warfare.
- g) Define "Civil Defence".
- h) State the types of Disaster.

Q2) Answer in 8 to 10 sentences (Any Two):

[8]

- a) Highlight on "Relations between war & Environment".
- b) Discuss the role of local field commander for "Tactics".
- c) Explain in brief any one resume of logistics.

P.T.O.

Q3) Write short notes on (Any Two): **[8]**

- a) Significance of logistics.
- b) Tactical problems of desert warfare.
- c) Concept of Military Geography.

Q4) Answer in 16 to 20 sentences (Any one): **[8]**

- a) Explain in detail characteristics and logistics problems of High Altitude warfare.
- b) Highlight on “Use of environmental factor during war with historical examples”.



Total No. of Questions : 4]

SEAT No. :

P646

[Total No. of Pages : 2

[5315] - 127

S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DSSY-103 : Contemporary Strategy

(2013 Pattern) (Semester-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in 2 or 4 sentences each:

[16]

- a) What do you understand by P.N.E. of 1974 in Indian context.
- b) State the meaning of C.B.M.
- c) State the duration of world war-I
- d) Write the names of member countries of Nuclear club.
- e) What do you mean by C.T.B.T?
- f) Define "Strategy".
- g) What do you understand by National Security?
- h) What do you mean by "Nuclear strategy"?

Q2) Answer in 8 to 10 sentences (Any Two):

[8]

- a) Explain any one example of Nuclear Deterrence.
- b) Write in brief C.B.M. in Indo-Pak relations.
- c) Explain the concept of "Strategic thinking".

P.T.O.

Q3) Write short notes on (Any Two): **[8]**

- a) Nuclear strategy of Pakistan.
- b) Causes of P.N.E. of India -1974.
- c) Political power as a component of National security strategy.

Q4) Answer in 16 to 20 sentences (Any one): **[8]**

- a) Discuss the “Military power” as a component of National security strategy.
- b) Explain the “Nuclear strategy of India”.



Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages : 2

[5315]-128

S.Y.B.Sc.

ENVIRONMENTAL SCIENCE

EVS-201: Ecology & Ecosystem

(2013 Pattern) (Semester-I) (Paper - I) (New course)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat and labeled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following in 1-2 lines each.

[10]

- a) Define: Biome and give one example.
- b) State the difference between photosynthesis and Respiration.
- c) Write examples of Gaseous cycle.
- d) What is Ecological succession?
- e) Define :Environmental Resistance.
- f) Enlist any two Quantitative analytical community characters.
- g) What is meant by carrying capacity of environment?
- h) Define : Food chain and write one example.
- i) What does Ecological pyramid of Biomass depict?
- j) What is Synecology?

Q2) Answer any two of the following:

[10]

- a) Explain Ecological classification based on taxonomic affinity.
- b) Describe any two energy flow models with flowchart.
- c) Explain any five Population characteristics.

P.T.O.

Q3) Write short notes on (any two). **[10]**

- a) Hydrosere with diagram.
- b) Ecological ríche.
- c) Productivity of an ecosystem.

Q4) Attempt any one of the following. **[10]**

- a) Describe in detail community composition and characteristics.
- b) Discuss interdisciplinary nature of ecology. Add an account on its historical overview.

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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P648

[5315] - 129

S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS-202 : Natural Resources, Energy & Their Management

(2013 Pattern) (Semester-I) (Paper-II) (New Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following in 1-2 lines.

[10]

- a) Define 'EDP'
- b) What is 'Resource'.
- c) What is 'Rain water Harvesting'.
- d) Explain the 'protect Areas' with example.
- e) Define 'Genetic Diversity'.
- f) What are 'Non-conventional Energy Resource'.
- g) What is 'In-sim conservation'.
- h) Explain the term 'waterlogging'.
- i) Define 'JFM'.
- j) What is Bioenergy.

Q2) Write short note on any two of the following:

[10]

- a) Hydro- electric energy.
- b) Water conservation.
- c) Effect of Modern Agriculture.

P.T.O.

Q3) Answer any two of the following:

[10]

- a) Write note on 'significance of top most layer of land'.
- b) Give detail account of 'world food problem'.
- c) Explain Man's interaction with natural Resource.

Q4) Answer any one of the following:

[10]

- a) What is Energy crisis? Give the classification of Energy Resources.
- b) What is wildlife Resource ? Give its significance, and conservation methods.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P649

[5315] - 130

S.Y.B.Sc.

ENGLISH (Optional)

TEXT BOOK : LITERARY VISTAS

(2013 Pattern Revised) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) Attempt any one of the following in about 100 words **[5]**
- i) What basic facts does C. Jones describe about our planetary system in 'The Sun, the planets and the stars'?
 - ii) What is Jerzy Kosinski's attitude towards television?
- b) Attempt any one of the following in about 100 words **[5]**
- i) What interesting information about the stars do we get from the lesson 'The Sun, the planets and the stars'?
 - ii) What are the important causes which help civilized humans to live longer than uncivilized ones?
- Q2)** a) Attempt any one of the following in about 100 words **[5]**
- i) Do you agree 'Purdah' is an oppressive practice that shuts out women from life itself?
 - ii) What advice does the poem 'A Psalm of Life' conclude with?
- b) Attempt any one of the following in about 100 words **[5]**
- i) 'Life changes for a girl, once she starts wearing the purdah': How does the poem Purdah build this idea?
 - ii) Is television a good babysitter? Support your answer with examples.

P.T.O.

Q3) Attempt any five of the following.

[10]

- a) Complete the following sentences with an appropriate word chosen from those in brackets.
- i) The satellite is (stationary, stationery)
 - ii) The handwriting was not (legible, eligible)
- b) Match the words 'A' with their antonyms in 'B'.
- | A | B |
|------------------|--------------|
| i) Fair | 1) brilliant |
| ii) Beautiful | 2) impartial |
| iii) Intelligent | 3) large |
| iv) Big | 4) pretty |
- c) Choose the right combinations of words.
- i) Press an icon/Click on an icon.
 - ii) Renew a contract/resign a contract.
- d) Differentiate between the following pairs of words and make sentences.
- i) Principal, Principle
 - ii) Discovery, Invention
- e) Pick out the word that is closest antonym of the underlined words.
- i) Refuse: praise, negate, accept.
 - ii) Consent: forbid, resent, permit.
- f) Add suffixes or prefixes to the words in the bracket to form meaningful sentence.
- i) No, that answer is (correct).
 - ii) The pain has become (tolerable).

Q4) Attempt any ten of the following:

[10]

- a) Yesterday, the Chief Minister of Maharashtra a new computer training center. (inaugurate)
- (Use correct form of the verb given in the bracket)
- b) We can never forget such a character.
- (Change into interrogative sentence)

- c) Although we searched everywhere for the key, we could not find it.
(Change into the compound sentence)
- d) The farmer finished his work in the field and went home.
(Change into simple sentence)
- e) Work hard or you will fail.
(Change into complex sentence)
- f) It is very stupid of me to say such things.
(Change into exclamatory sentence)
- g) Shame on you for saying so!
(Change into assertive sentence)
- h) The office is giving us a housing loan.
(Change into passive voice)
- i) Could you water the plants please?
(Change into imperative sentence)
- j) Rajesh said, "My mother will leave tomorrow".
(Change into reported speech)
- k) You are sometimes unwise.
(Change into a negative sentence)
- l) He is too weak to walk fast. (remove 'too').

ζ ζ ζ

Total No. of Questions : 3]

SEAT No. :

P 650

[Total No. of Pages : 2

[5315]-131

S.Y. B.Sc. (Theory) (Semester - I)

मराठी (MARATHI)

पाठ्यपुस्तक “विज्ञान सृष्टी” (मराठी विज्ञान साहित्य)
(2013 पॅटर्न)

वेळ : 2 तास]

[एकूण गुण : 40

- सूचना : 1) सर्व प्रश्न सोडविणे आवश्यक आहे.
2) उजवीकडील अंक पूर्ण गुण दर्शवितात.

प्रश्न 1) खालीलपैकी कोणत्याही एका विषयावर 400 शब्दात निबंध लिहा. [10]

- अ) बेभरवशाचा पाऊस व आजचा शेतकरी
ब) मतदार जनजागृती : काळाची गरज
क) आणि पुस्तके बोलू लागली ... (ललित)

प्रश्न 2) खालीलपैकी एका प्रश्नाचे उत्तर 300 शब्दांपर्यंत लिहा. [15]

‘पहाड’ या कथेचे परीक्षण करा.

किंवा

‘पर्यावरण आणि मानवी जीवन’ या लेखातून राजेंद्र शेंडे यांनी पर्यावरणाचे महत्व व वाढते प्रदूषण यावर कसा प्रकाश टाकला आहे? ते लिहा.

प्रश्न 3) टिपा लिहा. (कोणत्याही तीन) [15]

- अ) विज्ञान साहित्याची लक्षणे.
ब) ‘खेळ आणि गारूडी’ कथेतील संग्रामसिंहाचे व्यक्तिचित्र.
क) नॅनो तंत्रज्ञान : अर्थ व स्वरूप.

P.T.O.

- ड) कान शिवण्याच्या उपचार पध्दती.
- इ) सुशिक्षितांची अंधश्रध्दा.
- फ) भारतरत्न सी.एन. आर. राव. यांना मिळालेले सन्मान.



Total No. of Questions : 3]

SEAT No. :

P 651

[Total No. of Pages : 3

[5315]-132

S.Y. B.Sc. (Semester - I)

हिंदी (HINDI) (General)

नयापाठ्यक्रम

(2013 Pattern)

- पाठ्यपुस्तकें : 1) भारती गद्य-संग्रह सं: डॉ. मधु धवन
2) कवितायन सं. डॉ. भोलानाथ तिवारी.

समय : 2 घंटे]

[पूर्णांक : 40

- सूचनाएँ : 1) सभी प्रश्न अनिवार्य हैं।
2) दाहिनी ओर लिखे अंक प्रश्न के पूर्णांक हैं

प्रश्न 1)अ) निम्नलिखित में से किन्हीं छह वाक्यों को शुद्ध करके फिर से लिखिए। [6]

- i) आप शनिवार के दिन चले जाएं।
- ii) मुझे आदेश दी।
- iii) वे संतान को लेकर दुखी थे।
- iv) मेरी आयु बीस की है।
- v) मेरे पिता सजन है।
- vi) तुम तुम्हारे रास्ते लगो।
- vii) हमारी नाक में दम है।
- viii) मुझे छिलके वाला धान चाहिए।

आ) निम्नलिखित अंग्रेजी अनुच्छेद का हिंदी में अनुवाद कीजिए। [6]

"Lata mangeshkar received the first Asha Bhosale Award for musical excellence instituted by the Akhil Bharati ya marathi natya parishad at a grand function attended by a 5,000 plus audience in Akurdi on sunday evening.

Accepting the Award Lata said, it was indeed a special moment for her. She frankly declared that Asha was the most versatile singer she had ever heard. To top it all. Lata admitted that even she herself could not parallel her younger sister.

P.T.O.

प्रश्न 2) अ) निम्नलिखित गद्य अवतरण की संसंदर्भ व्याख्या कीजिए। [4]

क) “आप लोगों में से जो दब्लु, कायर, परिश्रमी और चरिहीन छात्र हैं, वे आगे चलकर राजपत्रित अधिकारी, वकील, डॉक्टर या शिक्षक बनेंगे।”

अथवा

“हृदय को ऊर्जा पहुँचाने वाली किसी एक धमनी में एका एक रूकावट आ जाने से ही दिल का दौरा पड़ता है।”

आ) निम्नलिखित पद्य अवतरण की संसंदर्भ व्याख्या कीजिए। [4]

ख) “मैं नहीं चाहता चिर – सुख,

चाहता नहीं अविरत दुख।

सुख – दुख की आँख – मिचौनी

बोले जीवन अपना मुख।।

अथवा

“कह लेना यह कथा, अगर अपनी विषाक्त डाढ़ों से

काल छोड़ दे तुझे और भवितव्य अगर कहने दे।

दर्शन की लहरें मत अधिक उछाल,

विचारों के विवर्त में पड़ा आदमी बहुत विवश होता है।”

प्रश्न 3) अ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए। [10]

i) संस्कृति की पहचान कैसे होती है – स्पष्ट कीजिए।

ii) दिल का दौरा और एनजाइना किसे कहते हैं?

iii) शोर क्या है? समझाइए।

आ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए।

[10]

- i) 'सखि, वे मुझसे कहकर जाते' कविता में व्यक्त विवशता को स्पष्ट कीजिए।
- ii) 'तोड़ती पत्थर' कविता की संवेदना को विश्लेषित कीजिए।
- iii) 'बीते दिन कब आनेवाले!' कविता के आशय को समझाइए।



Total No. of Questions : 4]

SEAT No. :

P1718

[5315]-133

[Total No. of Pages : 2

S.Y. B.Sc. (Semester - I)

SANSKRIT

Geervānabhārtee (गीर्वाणभारती)

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instruction to the candidates:

- सूचना : 1) All questions are compulsory.
सर्व प्रश्न अनिवार्य आहेत.
2) Figures to the right indicate full marks.
उजविकडील अंक प्रश्नांचे पूर्ण गुण दर्शवितात.

Q1) Write short answers in 2-4 lines on the following questions: [16]

पुढील प्रश्नांची 2-4 ओळीत उत्तरे लिहा.

- i) State the any two names of उपनिषद्.
कोणत्याही दोन उपनिषदांची नावे लिहा.
- ii) Which are the types of भक्ती?
भक्तीचे प्रकार कोणते?
- iii) Which are the चतुष्कला in अनन्तवान्?
अनन्तवान् या पादाच्या चतुष्कला कोणत्या?
- iv) From which उपनिषद् the lesson 'सत्यकामजाबालकथा' is taken and write a other name of उपनिषद्.
'सत्यकामजाबालकथा' हा पाठ कोणत्या उपनिषदातून घेतला आहे? उपनिषद् या शब्दाचे अन्य नाम लिहा.
- v) How many types of वेद संहिता & state the any two names of वेद संहिता?
वेदाचे एकूण प्रकार लिहून कोणत्याही दोन वेद संहितांची नावे लिहा?
- vi) कृत्वा तु मानसीं पूजां ततः पूजां समाचरेत्॥ Explain the meaning.
कृत्वा तु मानसीं पूजां ततः पूजां समाचरेत्॥ वाक्याचा अर्थ स्पष्ट करा.
- vii) What is the reason of king parikshit's death.
कोणत्या कारणाने परिक्षितराजा मरण पावला.
- viii) Which is the part of छायाग्राहिसत्त्वम् & who is the author of the book?
छायाग्राहिसत्त्वम् हा कोणत्याग्रंथाचा भाग आहे व त्या ग्रंथाचा कर्ता कोण?

P.T.O.

Q2) Write short notes on any two of the following in 8-10 lines. [8]

पुढीलपैकी कोणत्याही दोहोंवर 8 ते 10 ओळीत संक्षिप्त टीपा लिहा.

- i) उपनिषद्
- ii) शकुन्तला
- iii) ब्रह्मविद्या

Q3) Write short notes on any two of the following in 8 - 10 lines. [8]

पुढीलपैकी कोणत्याही दोहोंवर 8 ते 10 ओळीत संक्षिप्त टीपा लिहा.

- i) शिवमानसपूजा
- ii) रामायणम्
- iii) हनुमान्

Q4) Answer any one of the following in 16-20 lines. [8]

पुढीलपैकी कोणत्याही एका प्रश्नाचे 16-20 ओळीत उत्तर लिहा.

- i) Write a story of च्यवनभार्गव.
च्यवनभार्गव कथा लिहा.
- ii) Fully explain. उपदेशप्रबन्ध:
उपदेशप्रबन्ध: सविस्तर स्पष्ट करा.



Total No. of Questions : 4]

SEAT No.

P-652

[Total No. of Pages : 2

[5315]-134

**S.Y. B.Sc (Semester - I)
ARABIC FUNCTIONAL
(2013 Pattern)**

Maximum Marks : 40]

[Time : 2 Hours

Instructions to candidates :

- 1) *Attempt all questions.*
- 2) *Figures to the right indicate full marks.*

1. Define with examples any two of the following grammar: [10]

(١) الْحُرُوفُ الْقَمَرِيَّةُ.

(٢) الْأَعْرَابُ.

(٣) الْمَبْتَدَاءُ وَالْخَبَرُ.

(٤) أَسْمَاءُ لَا شَارَةَ.

2. Translate into English any five of the following Sentences: [10]

(١) هُوَ ذَاهِبٌ إِلَى بَيْتِ صَدِيقِهِ.

(٢) الْبِنْتُ جَالِسَةٌ عَلَى الْكُرْسِيِّ.

(٣) هَلْ مَدْرَسَتُكَ مُغْلَقَةٌ.

(٤) هِيَ مَشْغُولَةٌ فِي مَكْتَبِهَا.

(٥) مَكْتَبُهُ بَعِيدٌ مِنْ بَيْتِهِ.

P.T.O.

وَالِدِي عَامِلٌ فِي عُرْفَتِهِ. (٦)

هَذِهِ الْمَدْرَسَةُ جَيِّدَةٌ. (٧)

عَلَيَّ رَاجِعٌ مَعَ فَاطِمَةَ مِنَ السُّوقِ. (٨)

3. Translate into Arabic any five of the following Sentence: [10]

1. He is going to his house.
2. In the fridge there is an apple.
3. On the window there is a curtain.
4. Ho, his College is closed.
5. The chair is comfortable.
6. This bus is coming from the College.
7. The new teacher is a tall man.
8. My brother is going to the School.

4. Write in Arabic any ten terminology of the following: [10]

- | | | | |
|-------------|---------------|---------------|-----------|
| (1) Planet | (2) Voltage | (3) Gas. | (4) Soft |
| (5) Degree | (6) Axis | (7) Heat | (8) pole |
| (9) Motion | (10) Orbit | (11) Science | (12) Atom |
| (13) Liquid | (14) Physics. | (15) Computer | (16) Zone |



Total No. of Questions : 4]

SEAT No.

P-653

[Total No. of Pages : 2

[5315]-135

S.Y. B.Sc (Semester - I)
URDU (General Paper-II)
(2013 Pattern)

Maximum Marks : 40]

[Time : 2 Hours

Instructions to candidates :

- 1) Attempt all questions.
- 2) Figures to the left indicate full marks.

نوٹ:- تمام سوالات کے جوابات لازمی ہیں۔

ہر سوال کی بائیں جانب نشانات درج ہیں۔

[10]

سوال نمبر ۱:- ڈاکٹر علامہ اقبال کی شخصیت اور ان کے فن پر روشنی ڈالیں۔

یا

علامہ اقبال کی نظموں پر اپنے خیالات کا اظہار کیجئے۔

[10]

سوال نمبر ۲:- اُردو نظم کے آغاز و ارتقا کا سرسری جائزہ لیجئے۔

یا

اقبال کا مجموعہ کلام ”بانگِ درا“ کی نظموں کا جائزہ لیجئے۔

[10]

سوال نمبر ۳:- ذیل میں سے کوئی ایک نظم پر مختصر نوٹ لکھیں۔

(۱) صبح کا ستارہ (۲) نیا سوال (۳) چاند

P.T.O.

[10]

سوال نمبر ۴:- درج ذیل کے اشعار میں سے کوئی پانچ اشعار کی بحوالہ متن تشریح کیجئے۔

- (۱) نہ یہ، خدمت، نہ یہ عزت، نہ یہ رفعت اچھی۔ اس گھڑی بھر کے چمکنے سے تو ظلمت اچھی
- (۲) اے ہمالہ! ارے فیصل کشور ہندوستان۔ چومتا ہے تیری پیشانی کو جھک کر آسماں
- (۳) میرے ویرانے سے کوسوں دور ہے تیرا وطن۔ ہے مگر دریائے دل تیری کشش سے موجزت
- (۴) سونی پڑی ہوئی ہے مدت سے دل کی بستی۔ ایک نیا سوالہ اس دلیں میں بنا دیں
- (۵) آزادیاں کہاں وہ اپنے گھونسلے کی۔ وہ باغ کی بہاریں وہ سب کا چہچہانا
- (۶) چوٹیاں تیری ثریا سے ہیں کسر گرم سخن۔ درمق موج ہوا جس کے لئے رومال
- (۷) خاک میں مل کے حیاتِ ربدی پا جاؤں۔ عشق کا سوز مانے کو دکھاتا جاؤں



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 136

S.Y. B.Sc.

INDUSTRIAL CHEMISTRY (Vocational)

211 : Utilities, Unit Operations & Process Instrumentation

(2013 Pattern) (Semester-I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams should be drawn wherever necessary.*

Q1) Answer the following:

[16]

- a) Convert 52°C into °F.
- b) Define temporary hardness.
- c) Convert 10kg m⁻² into torr.
- d) Write two disadvantages of hard water.
- e) What is drying?
- f) State Peltier effect.
- g) Write the expression for Reynold number.
- h) Explain primary nucleation.

Q2) Attempt any two of the following:

[8]

- a) Describe the working of thermopile.
- b) Write the difference between evaporation. and distillation.
- c) Describe the methods used to remove the hardners of water.

P.T.O.

Q3) Write short notes on any two of the following: **[8]**

- a) Nutries filters.
- b) Thermionic ionization gauge.
- c) Magnetic flow meter.

Q4) Sketch and explain the various types of vaccum pressure devices. **[8]**

OR

State and explain the principle of fractional distillation. Explain with suitable examples.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P655

[5315] - 137

S.Y. B.Sc.

BIOTECHNOLOGY - I (Vocational)

VOC-Biotech-211 : cell & Molecular Biology and Microbial Genetics

(2013 Pattern) (Semester-I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

Q1) Answer each of the following in 1-2 lines:

[10]

- a) Define: Endocrine signaling.
- b) What is active transport?
- c) State the role of gap junction.
- d) What is fibronectin protein?
- e) Define nucleotide excision repair.
- f) What is transduction?
- g) How F⁻ strain is formed during conjugation?
- h) What are nucleosomes.
- i) Comment on transformation.
- j) Enlist two examples of cell signalling.

Q2) Write short notes on any two of the following:

[10]

- a) Griffith experiment.
- b) Protein targetting.
- c) Subcellular fractionation of cells.

P.T.O.

Q3) Attempt any two of the following: **[10]**

- a) Describe insertional sequences with suitable example.
- b) Explain structure and function of nucleus.
- c) Compare gene structure in prokaryotes and eukaryotes.

Q4) Explain the process of transcription in prokaryotes in detail. **[10]**

OR

Explain the process of replication in prokaryotes in detail.



Total No. of Questions : 4]

SEAT No. :

P1729

[Total No. of Pages : 2

[5315]-138

S.Y.B.Sc. (Semester - I)

**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION
(VOCATIONAL)**

Still Photography, Processing & Printing (Paper - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Draw neat and labeled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following in short.

[16]

- a) How is a subject important in photography?
- b) State the law of transmission and absorption of light.
- c) Explain the significance of the back elements of a camera lens.
- d) How would you push the far limit of depth of field to infinity?
- e) Discuss the importance of the 'histogram' in digital photography.
- f) Calculate the angle of view of a lens with a focal length of 100 mm on a full frame DSLR camera.
- g) The guide number of a flash light is 56, what does it mean?
- h) Wide angle lenses are generally slower. Explain.

Q2) Attempt Any Two of the following .

[8]

- a) Discuss why artificial light is necessary in photography.
- b) Discuss how filters are useful in photography. Give suitable examples.
- c) Discuss the features of a zoom lens.

P.T.O.

Q3) Write notes on Any Two of the following. **[8]**

- a) Metering patterns of a TTL exposure meter.
- b) Use of skylight filter in photography.
- c) Architectural photography.

Q4) Answer Any One of the following. **[8]**

- a) Give suitable examples and discuss how colours are important in photography.
- b) Draw a suitable diagram and discuss the standard three point lighting set-up used for studio portrait. Explain the importance of each light used in this set-up.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P656

[5315] - 139

S.Y. B.Sc.

ELECTRONIC EQUIPMENT AND MAINTENANCE (Vocational)

VOC-EEM-211 : Trouble Shooting Electronic Equipment

(2013 Pattern) (Semester-I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Neat diagrams should be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

Q1) Answer all of following:

- a) List the instruments used for testing LDR. [1]
- b) State different types of thyristors. [1]
- c) List the most common faults in transistor. [1]
- d) What do you mean by block diagram? [1]
- e) What is the use of edge connectors ? [2]
- f) State the purpose of testing the inductance.at 1kHz frequency. [2]
- g) Give the names of test and measuring instruments used for trouble shooting. [2]
- h) What are the possible causes faults in paper capacitor. [2]

Q2) Answer any two:

- a) Discuss the various causes of equipment failure. [4]
- b) When does the approaching component method used in trouble shooting? [4]
- c) Discuss the situation when the expairs should not be done. [4]

P.T.O.

Q3) Answer any two:

- a) Write a note on testing of fixed Resistors. [4]
- b) Explain the possible causes of failure in capacitors. [4]
- c) Discuss in detail test and measuring of inductors. [4]

- Q4)** a) What are the types of failures and their possible causes in semiconductor devices. [6]
- b) Discuss in detail fault diagnosis in OPAMP. [6]

OR

- Q4)** a) Explain in brief the contents of serine/instruction manual. [4]
- b) State and explain the types of failure in potentiometer. [4]
- c) Write a note on special diodes & their testing. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P657

[5315] - 140

S.Y. B.Sc.

COMPUTER HARDWARE & NETWORK

ADMINISTRATION (Vocational)

Microprocessor & Interfacing Techniques

(2014-15 Pattern) (Semester-I) (Paper-I) (New)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Attempt the following: [4×1=4]

- i) Define term transducer.
- ii) What do you mean by Dual Core processor?
- iii) State different type of ports available in a computer.
- iv) What is cache memory?

b) Attempt the following: [4×2=8]

- i) What is data bus? State the size of data bus used for Pentium processor.
- ii) Define resolution.
- iii) What is DAC? State types of DAC.
- iv) State any two features of 8086 processor.

Q2) Attempt any two of the following: [2×4=8]

- a) What are the main features of core i3 processors?
- b) What is ADC? Explain working of any one type of ADC?
- c) Write a note on PCI bus architecture.

P.T.O.

Q3) Attempt any two of the following:

[2×4=8]

- a) Write a short note on Pentium processor.
- b) With a neat diagram explain keyboard interface with microprocessor.
- c) Write a note on modes of 8086?

Q4) Attempt any two of the following:

[2×6=12]

- a) What is function of processor? List non Intel processor and explain features of any one non Intel processor.
- b) What is interrupt? Write a note on DOS and BIOS interrupts.
- c) What is function of DMA? Explain DMA controller operation with a neat diagram.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P658

[5315] - 141

S.Y. B.Sc.

SEED TECHNOLOGY - I (Vocational)

VOC-ST-211 : Hybrid Seed Production

(2013 Pattern) (Semester-I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) Give the types of Apomixis.
- b) Define Genetic male sterility.
- c) What is self Incompatibility.
- d) Define Roughing.
- e) Enlist types of placentations.
- f) Define variety.
- g) What is the isolation distance required for jower hybrids?
- h) Define emasculation.
- i) What is stigma receptivity?
- j) Define variety.

Q2) Answer any two of the following.

[10]

- a) Give the commercial utilization of heterosis.
- b) Explain cytoplasmic male sterility.
- c) Comment on structure of stamen

P.T.O.

Q3) Write notes on (any two): **[10]**

- a) Gametocides.
- b) significance of Apomixes.
- c) Compact area approach.

Q4) Give detail procedure for hybrid seed production in cotton. **[10]**

OR

Give detail procedure for hybrid seed production in Arachis hypogea.



Total No. of Questions : 4]

SEAT No. :

P659

[Total No. of Pages : 2

[5315] - 142

S.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY (Vocational)

VOC-IND-MIC-211 : Bioreactors-Designs and Operation

(2013 Pattern) (Semester-I) (Theory) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[10]**

a) State whether the following statement are True or False.

The American Iron and Steel Institute (AISI) states that steels containing less than 4% chromium are classified as stainless steels and those containing more than 4% are classified as steel alloys.

b) Foam is formed when high protein containing media are used during fermentation.

c) Enlist five major groups of commercially important fermentations.

d) Name any two methods used for measurement of microbial biomass in fermenter.

e) _____ is used for measurement of gas flow.

f) Define - Immobilization of cells.

g) How many baffles are to be used for fermenter vessels over 3dm³ diameter?

h) Write any two modes of feed addition in fed - batch fermentation.

i) How amino acid solutions are sterilized to use as fermentation media.

j) Define 'off-line' monitoring of a process variable.

P.T.O.

Q2) Answer any two of the following. **[10]**

- a) Explain mechanism of Tubular bioreactor.
- b) Draw CSTR. State the advantages of running a fed batch process of fermentation over batch process.
- c) What is sparger? Explain different types of sparger?

Q3) Answer any two of the following. **[10]**

- a) Explain continuous sterilization process.
- b) Enlist different fermenters used in fermentation with immobilized cells. Explain an air -lift fermenter with neat labelled diagram.
- c) Describe various factors considered while designing fermenter.

Q4) Answer any one of the following. **[10]**

- a) Enlist different critical parameters affecting productivity of the metabolite. Explain measurement and control of any two parameters in detail.
- b) Explain continuous fermentation process with respect to
 - i) Chemostat.
 - ii) Turbidostat.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P660

[5315]-143

S.Y.B.Sc. (Vocational)

INDUSTRIAL CHEMISTRY

212: Inorganic Process Industries

(2013 Pattern) (Semester-I) (Paper-II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams should be Drawn wherever necessary.*

Q1) Answer the following.

[16]

- a) State two uses of bronze alloys.
- b) Define whiskers.
- c) Describe cullet.
- d) Write two characteristics of glass?
- e) What is Microbiological corrosion?
- f) Write the constituents of cement.
- g) What is a fibre glass?
- h) Write uses of ceramics?

Q2) Attempt any two of the following:

[8]

- a) What are carbon refractories? Where they are used?
- b) What is glazing? Discuss the role of glazing.
- c) Describe various types of portland cement.

P.T.O.

Q3) Write short notes on any two of the following. **[8]**

- a) Quick setting cement.
- b) Special type of refractories.
- c) Mechanism of wet corrosion.

Q4) What is corrosion? Describe different methods for prevention of corrosion. **[8]**

OR

What are enamels? Write the raw materials required for preparation of enamels. Describe the applications. of enamels.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P661

[5315]-144

S.Y.B.Sc. (Vocational)

BIOTECHNOLOGY-II

VOC-Biotech-212: Recombinant DNA Technology

(2013 Pattern) (Semester-I) (Paper-II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) Answer each of the following in 1-2 lines:

[10]

- a) What are cosmids?
- b) Name the two methods for DNA Sequencing.
- c) Mention any one NIH guideline in RDT.
- d) Define site directed mutagenesis
- e) Enlist the two types of λ -phage vectors.
- f) What is gene cloning?
- g) Name any one restriction endonuclease with its recognition sequence.
- h) What is southern blotting?
- i) Define proteomics.
- j) Give two examples of vectors used in r-DNA technology.

Q2) Write short notes on any two of the following:

[10]

- a) YAC vector .
- b) DNA Modifying enzymes.
- c) Northern blotting.

P.T.O.

Q3) Answer any two of the following. **[10]**

- a) Describe non- radioactive detection procedures for screening of transformants.
- b) Explain genomics in detail.
- c) What is r-DNA? Describe any 4 tools used in r-DNA technology.

Q4) What is PCR? Explain the steps involved in PCR. Enlist the types of PCR and give its applications.

OR

Describe different applications of r-DNA Technology. **[10]**



Total No. of Questions : 4]

SEAT No. :

P1730

[Total No. of Pages : 2

[5315]-145

S.Y. B.Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Fundamentals of Acoustics and Sound for Media

(Semester - I) (Paper - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat and labeled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt ALL of the following.

- i) Mention four basic requirements of an auditorium. [2]
- ii) What is audio delayer? [2]
- iii) Define: Reverberation time. [2]
- iv) Explain the necessity of crossover network. [2]
- v) What is a microphone? Mention any two types of special microphones. [2]

Q2) Attempt ANY TWO of the following.

- i) Design a crossover network to give 12 dB per octave attenuation for tweeter and woofer for critical frequency of 1 kHz. Loudspeaker resistance is 8Ω . [5]
- ii) State five characteristics of loudspeakers and explain them in brief. [5]
- iii) Explain the concept of resistance, inductance and capacitance in acoustical system with the help of suitable examples. [5]

P.T.O.

Q3) Attempt ANY TWO of the following.

- i) Sound intensity at 1 meter from a loudspeaker is 400 mW/m^2 . The audio power fed to the loudspeaker is 10 W. Calculate the efficiency of the loudspeaker. [5]
- ii) With the help of a neat labelled block diagram, explain the construction and working of a PA system. [5]
- iii) Draw a neat labelled block diagram to explain the construction and working of a magnetic sound recording system. [5]

Q4) Attempt ANY TWO of the following.

- i) Draw a neat labeled block diagram to explain the construction and working of a magnetic sound recording system. [5]
- ii) With the help of a neat sketch, explain the construction and functioning of electrodynamic type loudspeaker. What are its advantages and disadvantages relative to permanent magnet type speaker? [5]
- iii) Sound intensity at 1 meter from a loudspeaker is 200 mW/m^2 . The audio power fed to the loudspeaker is 50 W. Calculate the efficiency of the loudspeaker. [5]



Total No. of Questions :4]

SEAT No. :

P662

[Total No. of Pages : 2

[5315]-146

S.Y.B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE-II

Voc- EEM-212: Audio, Video and Office Equipment-A

(2013 Pattern) (Semester-I) (Paper-II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw Neat diagram wherever necessary.*

Q1) Attempt the following.

- a) What is the function of preamplifier in receiver? [1]
- b) State the type of antenna used in satellite receiver. [1]
- c) Write the principle of recording electric signal on magnetic tape. [1]
- d) Give any one advantage of FM transmission over AM transmission. [1]
- e) List at least two characteristics of radio receiver. [2]
- f) Write the frequency range of FM radio receiver. [2]
- g) State the application of Vestigial sideband transmission. [2]
- h) What is digital TV? [2]

Q2) Attempt any TWO.

- a) Explain the function of modulator in AM radio receiver . State the range of frequencies in AM band radio. [4]
- b) Draw a typical block diagram of PA system. Explain the function of any block in brief. [4]
- c) Describe the working principle of CD player system. [4]

P.T.O.

Q3) Attempt any TWO.

- a) Elaborate the structure of composite video signal. [4]
- b) Explain the HDTV Standard in brief. [4]
- c) Write a short note on BLU- ray disc. [4]

- Q4)**
- a) What is MP3? Explain MP3 Compression in brief. [6]
 - b) Describe typical automotive infotainment system in brief. [6]

OR

- a) What is CCTV? Explain the basic CCTV system with the help neat block diagram. [6]
- b) Explain the LCD/ Plasma in brief. Compare the features of the CRT Vs LCD TV. [6]



Total No. of Questions :4]

SEAT No. :

P663

[5315]-147

[Total No. of Pages : 2

S.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Computer System Management

(2013 Pattern)(Semester-I) (Paper-II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Attempt the following: [4×1=4]

- i) What is Corrosion?
- ii) What do you mean by Booting?
- iii) Write two ways in which beeps can be used to identify problem.
- iv) List various diagnostic utilities used in computer system.

b) Attempt the following: [4×2=8]

- i) What are ill effects of high power magnetic field near PC?
- ii) List various startup problems with modern PC.
- iii) State any two mouse related problems.
- iv) What is importance of fan in your PC?

Q2) Attempt any two of the following: [2×4=8]

- a) Explain the effect of cold and dust as contributors to system failures?
- b) Describe the safety precautions you would take while troubleshooting and repairing a PC.
- c) Write a short note on common troubles with modern PC.

P.T.O.

Q3) Attempt any two of the following: **[2×4=8]**

- a) Explain the precaution that should be taken while handling hard disk drive and CDROM.
- b) State various display adaptors used in modern PC and explain problems related to them.
- c) Explain backup and recovery procedures in brief.

Q4) Attempt any two of the following: **[2×6=12]**

- a) What is SMPS? Explain in brief the preventive maintenance of UPS and Power supply of a PC.
- b) What are different types of printers? Explain in brief the preventive measures for printer failure.
- c) What do you mean by preventive Maintenance? What are software preventive methods?



Total No. of Questions :4]

SEAT No. :

P664

[Total No. of Pages : 2

[5315]-148

S.Y.B.Sc.(Vocational)

SEED TECHNOLOGY-II

VOC-ST-212: Seed Testing

(2013 Pattern) (Semester-I) (Paper -II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) Define seed sampling.
- b) What is seed testing?
- c) Define seed vigour.
- d) Give any one role of ISTA.
- e) Define pure seed component of physical purity analysis.
- f) What are guard samples?
- g) Define service sample.
- h) Write the minimum moisture content required for cereals.
- i) What is seed germination?
- j) Define Abnormal seeling.

Q2) Answer any two of the following:

[10]

- a) Give working of moisture meter.
- b) Comment on ODY test.
- c) Give the role of central seed testing laboratory

Q3) Write notes on (any two):

[10]

- a) Heterogeneity test
- b) Layout and furnishing in seed testing laboratory.
- c) General principles of sampling

P.T.O.

Q4) What is seed germination? Give objectives of germination testing. **[10]**

OR

Explain in detail different types of seed samples and procedure of registration.



Total No. of Questions :4]

SEAT No. :

P665

[Total No. of Pages : 2

[5315]-149

S.Y.B.Sc.

INDUSTRIAL MICROBIOLOGY -II (Vocational)
VOC-IND-MIC-212: Screening & Process optimization
(2013 Pattern) (Semester-I) (Paper-II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw Neat Labeled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[10]**

- a) Define: Metagenome.
- b) The end products of a pathway that show feedback control can be lost from the cell by increasing _____.
- c) What is response surface methodology?
- d) Define : Feedback repression.
- e) What is lyophilization?
- f) The relationship between Del factor, temperature and time is give by _____ equation.
- g) What is an antifoam agent? Write any two examples?
- h) What is genotype based targeted screening?
- i) Define: Secondary screening.
- j) Explain the method for preservation of bacterial or fungal spores.

P.T.O.

Q2) Answer any two of the following: **[10]**

- a) Explain gradient plate technique and its application?
- b) How does secondary screening help in providing information required for setting up a new fermentation?
- c) Write uses of recombinant DNA technology with reference to industrial strain improvement program.

Q3) Answer any two of the following. **[10]**

- a) Explain the objectives of scale up with respect to different parameters.
- b) Write a note on function based targeted screening.
- c) What is the importance of preservation and maintenance of industrially important microorganisms? Explain cryopreservation in detail.

Q4) Answer any one of the following. **[10]**

- a) What is auxotrophic mutant? Explain following methods used for detection of an auxotrophic mutant.
 - i) Replica plate technique.
 - ii) Enrichment culture technique using inhibitory agents.
- b) Elaborate on media optimization using plackett Burman design.



Total No. of Questions : 4]

SEAT No. :

P666

[Total No. of Pages : 2

[5315] - 201

S.Y. B.Sc.

MATHEMATICS

MT-221: Linear Algebra

(2013 Pattern) (Semester-II) (Paper-I) (81112)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any FIVE of the following. **[10]**

- a) Define subspace of a vector space.
- b) By inspection, explain why the set of vectors $S = \{(-1, 2, 4), (5, -10, -20)\}$ is linearly dependent in \mathbb{R}^3 ?
- c) Define basis of a vector space.
- d) Determine $(T_2 \circ T_1)(x, y, z)$ if $T_1(x, y, z) = (y, z)$ and $T_2(x, y) = x$.
- e) Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be the linear operator given by $T(x, y) = (2x - y, -8x + 4y)$. Is $(5, 10)$ belongs to $\ker(T)$? Justify.
- f) Let P_2 be the vector space with inner product $\langle p, q \rangle = \int_{-1}^1 p(x) q(x) dx$.
show that $p(x) = 1$ and $q(x) = x$ are orthogonal in P_2 .
- g) If \bar{u} and \bar{v} are orthonormal vectors in an inner product space V , then find $\|\bar{u} + \bar{v}\|$.

Q2) Attempt any TWO of the following. **[10]**

- a) Let $B = \{\bar{v}_1, \bar{v}_2, \bar{v}_3, \dots, \bar{v}_n\}$ be a basis for a vector space V . Then prove that every vector $\bar{v} \in V$ is uniquely expressed as a linear combination of the vectors of B .

P.T.O.

b) Are the vectors $(1,1,2,4)$, $(2,-1,-5,2)$, $(-1,-1,-4,0)$, $(2,1,1,6)$ linearly independent in \mathbb{R}^4 ?

c) Determine the basis and dimension for the solution space of,

$$x_1 + 2x_2 + 2x_3 - x_4 + 3x_5 = 0$$

$$3x_1 + 6x_2 + 8x_3 + x_4 + 5x_5 = 0$$

$$x_1 + 2x_2 + 3x_3 + x_4 + 5x_5 = 0$$

Q3) Attempt any TWO of the following. **[10]**

a) State and prove Cauchy-Schwartz inequality.

b) Show that for vectors $\bar{u} = (u_1, u_2)$ and $\bar{v} = (v_1, v_2)$ in \mathbb{R}^2 ,

$$\langle \bar{u}, \bar{v} \rangle = 5u_1v_1 - u_1v_2 - u_2v_1 + 10u_2v_2$$

defines an inner product on \mathbb{R}^2 .

c) Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be defined by

$$T(x, y, z) = (4x + 3y + 2z, 2x + y - z, -x + y)$$

Find a basis and dimension of kernel of T .

Q4) Attempt any ONE of the following. **[10]**

a) i) In an inner product space V and for \bar{u}, \bar{v} in V , prove that

$$\|\bar{u} + \bar{v}\|^2 + \|\bar{u} - \bar{v}\|^2 = 2\|\bar{u}\|^2 + 2\|\bar{v}\|^2$$

ii) Let \mathbb{R}^2 have Euclidean inner product. Use Gram-Schmidt process to transform the basis vectors $\bar{u}_1 = (1, 3)$ and $\bar{u}_2 = (2, -2)$ into an orthonormal basis.

b) i) Prove that a linear transformation $T: V \rightarrow W$ has an inverse if it is bijective.

ii) Resolve the vector $\bar{v} = (1, 2, 1)$ into two perpendicular components along $\bar{u} = (2, 1, 2)$.



Total No. of Questions :4]

SEAT No. :

P667

[5315]-202

[Total No. of Pages : 3

S.Y.B.Sc.

MATHEMATICS

MT - 222 (A) : Multivariable Calculus-II

(2013 Pattern) (Semester - II) (Paper - II(A)) (811A2)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following:

[10]

a) If $\vec{u} = (a \sin t)\vec{i} - (a \cos t)\vec{j} + bt\vec{k}$, find $\left| \frac{d\vec{u}}{dt} \times \frac{d^2\vec{u}}{dt^2} \right|$ at $t=0$.

b) Define Curvature.

c) Show that the vector field $\vec{F} = xy\vec{i} + zx\vec{j} - yz\vec{k}$ is solenoidal.

d) Evaluate $\int_C x^2 dx + xy dy + dz$ where C is given by

$$\vec{r}(t) = t\vec{i} + t^2\vec{j} + \vec{k}, 0 \leq t \leq 1.$$

e) State Stoke's theorem.

f) Prove that $\vec{F} = (y^2 \cos x + z^3)\vec{i} + (2y \sin x - 4)\vec{j} + (3xz^2 + 2)\vec{k}$ is a conservative force field.

g) Using divergence theorem, show that

$$\iiint_S (x + 5z) dydz + (2y - z) dzdx + (2x - y) dxdy = 3V$$

where V is the volume enclosed by the surface S.

P.T.O.

Q2) Attempt any Two of the following: **[10]**

- a) If $\vec{r}(t)$ is a differentiable function at t_0 , then show that it is continuous at t_0 . Is the converse true? Illustrate by an example.
- b) A particle moves along the curve $x = 2t^3$, $y = t^2 - 4t$, $z = 3t - 5$, where 't' is the time. Find the component of velocity and acceleration at time $t=1$ in the direction of $\vec{i} - 3\vec{j} + 2\vec{k}$.
- c) Find the acute angle between the tangents to the curve $\vec{r} = t^2\vec{i} + 2t\vec{j} - \frac{1}{2}t^2\vec{k}$ at the points $t=1$ and $t=-3$.

Q3) Attempt any two of the following: **[10]**

- a) If \vec{u} is a vector function which possesses continuous second order partial derivatives then prove that $\nabla \cdot (\nabla \times \vec{u}) = 0$
- b) Evaluate $\int_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = yz\vec{i} + 2y\vec{j} - x^2\vec{k}$ along the path C consisting of line segments from (0,0,0) to (0,0,1) then to (0,-3,1) and then to (2,-3,1).
- c) If \vec{w} is a constant vector and $\vec{v} = \vec{w} \times \vec{r}$ then show that $\vec{w} = \frac{1}{2} \text{curl } \vec{v}$

Q4) Attempt any One of the following: **[10]**

- a) i) State Green's theorem. Using Green's theorem evaluate

$$\int_C (xy + y^2) dx + x^2 dy, \text{ where } C \text{ is the closed curve of the region}$$

bounded by $y = x$ and $y = x^2$.

- ii) Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$, where $\vec{F} = 18z\vec{i} - 12\vec{j} + 3y\vec{k}$ and S is that part of the plane $2x + 3y + 6z = 12$ which is located in $x \geq 0$, $y \geq 0$, $z \geq 0$.

b) i) Prove by using Stoke's theorem that

$$\int_C (\sin z \, dx - \cos x \, dy + \sin y \, dz) = 2, \text{ where}$$

C is the boundary of the rectangle $0 \leq x \leq \pi$, $0 \leq y \leq 1$, $z = 3$

ii) Show that $\vec{F} = (2xy + z^3)\vec{i} + x^2\vec{j} + 3xz^2\vec{k}$ is a conservative field.
Find the scalar potential $\phi(x, y, z)$ such that $\vec{F} = \text{grad } \phi$.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

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[5315] - 203

S.Y. B.Sc.

PHYSICS - I

**PH-221: Oscillations, Waves and Sound
(2013 Pattern) (Semester-II) (Paper-I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of logtable and calculator is allowed.*

Q1) Attempt all of the Following:

[10]

- a) State different types of equilibria.
- b) Define energy density of wave. Give its unit.
- c) Define Quality Factor (Q) of damped harmonic oscillator.
- d) Give two applications of Lissajous Figures.
- e) State the conditions for critically damped oscillations in LCR circuit.
- f) In list the resonance phenomena occurs widely used in natural and in technology applications.
- g) What is red Shift?
- h) What are the Factors which affects quality of sound?
- i) Determine the bulk modulus of water. It the velocity of sound in water is 1500 m/s.
(Give density of water = 1000 kg/m³)
- j) Calculate the velocity of light, if a spectral line of wavelength 5890 Å° in spectrum of a star to be displayed towards red end by 1Å°.

P.T.O.

Q2) Attempt any two of the Following: **[10]**

- a) Discuss the phenomenon of sharpness of resonance and show how it depends on the damping Factor.
- b) Show that the energy density of a plane progressive wave propagating through medium is directly proportional to square of the amplitude of particle.
- c) Explain the following characteristic of musical sound
 - i) Loudness
 - ii) Pitch

Q3) Attempt any Two of the following: **[10]**

- a) A particle performing S.H.M has velocity 8cm/sec and 10 cm/sec, when it is at distance 5cm and 4cm respectively from mean position. what is it's amplitude.
- b) The equation of forced oscillation is given by

$$2\left(\frac{d^2x}{dt^2}\right) + 3\left(\frac{dx}{dt}\right) + 16x = 30\sin 2t$$

All quantities are expressed in CGS units.

Find velocity, amplitude (V_0) and maximum kinetic Energy.

- c) The equation of damped harmonic motion is given by

$$2\left(\frac{d^2x}{dt^2}\right) + 12\left(\frac{dx}{dt}\right) + 50x = 0$$

Find frequency on damped oscillations.

Q4) A) Attempt any ONE: **[8]**

- a)
 - i) Obtain the equation of motion of simple harmonic progressive transverse wave.
 - ii) Show that Doppler effect of sound is asymmetric in nature.

b) i) Show that total energy of undamped simple harmonic oscillator is constant at any instant of motion and proportional to the square of amplitude of oscillation.

ii) Expression for it.

(B) Attempt any ONE: [2]

i) A fixed source emits sound of frequency 1000 Hz .

What is the Frequency as heard by observer moving away from source at the rate. 20 m/s . [Given velocity of sound in air $c = 340 \text{ m/s}$]

ii) The intensity of two sound waves are $2 \times 10^{-9} \text{ w/m}^2$ and $4 \times 10^{-10} \text{ w/m}^2$ respectively. Determine their relatively loudness in decibels.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P669

[5315] - 204

S.Y. B.Sc.

PHYSICS

PH-222: Optics

(2013 Pattern) (Semester-II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use of logtable and calculator is allowed.*

Q1) Attempt all of the following: (one mark each)

[10]

- a) Define the term power of the lens.
- b) Define the term radius of curvature of the lens.
- c) What is an aplantic lens?
- d) Define plane polarized light.
- e) Calculate grating element of plane Transmission grating with 5000 lines per centimeter.
- f) Find the angle of polarization for the glass plate. (Given $\mu = 1.54$ for the glass)
- g) What do you mean by aberration?
- h) What is meant by Negative crystal?
- i) Define term linear magnification.
- j) Why Ramsden eye-piece is called positive eyepiece?

P.T.O.

Q2) Attempt any two of the following: (five marks each) **[10]**

- a) Explain the phenomenon of interference in thin parallel sided film. Obtain the expression for minima and maxima for the reflected rays.
- b) Prove that for a combination of two thin coaxial lenses of focal lengths F_1 and F_2 , separated by distance x , the focal length of combination is given by equation $\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{x}{f_1 f_2}$.
- c) Define the Magnifying power of simple microscope. Draw neat ray diagram and show that maximum magnifying power of simple microscope is $\left(1 + \frac{D}{f}\right)$.

Q3) Attempt any two of the following: (Five marks each) **[10]**

- a) The focal length of an achromatic combination of two lenses in contact is 90 cm. the dispersive powers of the lenses are 0.025 and 0.035. calculate focal length of each lens of the combination.
- b) Two optically plane glass plates, each 6cm long are placed one over the other. At one end a mica strip is introduced between them. Seen in the reflected light of wavelength 5.89×10^{-5} cm, we find 100 fringes in 3 cm length. calculate the thickness of mica strip. (Given: $\mu=1$)
- c) Unpolarized light falls on two polarizing sheets placed one on top of other. what must be angle between the characteristic directions of the sheets, if intensity of the transmitted light is one third of the incident beam.

Q4) a) Attempt the following:

- i) Show that refraction at single curved surface obeys an equation

$$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}. \quad [4]$$

- ii) Show that the condition of minimum spherical aberration for coaxial system of two planoconvex lenses separated by distance x is given as $x = f_1 - f_2$. **[4]**

OR

- i) State and explain Rayleigh criterion for Resolution. [4]
- ii) Draw the ray diagram of Huygens eye-piece and obtain the principal points of Huygen's eyepiece. [4]
- b) Attempt any one of the following:
- i) In Newton's rings experiment, the diameter of 10th dark ring is found to be 4 mm. Assuming the air film and radius of curvature of plano convex lens 100 cm, calculate the wavelength of light. [2]
- ii) Explain term principle focus using convex lens and concave lens. [2]



Total No. of Questions : 6]

SEAT No. :

[Total No. of Pages : 3

P670

[5315] - 205

S.Y. B.Sc.

CHEMISTRY

CH-221: Physical and Analytical chemistry

(2013 Pattern) (Semester II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Answer to both sections should be written on same answer book.*

SECTION - I

[Physical Chemistry]

Q1) Answer the following:

[5]

- a) Define standard free energy of formation.
- b) What is relation between k_p and k_c ?
- c) Define molality.
- d) What are Azeotropes?
- e) What are conjugate solutions?

Q2) a) Attempt any two of the following:

[6]

- i) Derive an expression for free energy change of a chemical reaction.
- ii) State Henry's law and give its applications.
- iii) Write note on fractionating column.

P.T.O.

b) Attempt any two of the following: [4]

i) Derive $\left[\frac{\partial G}{\partial T} \right]_P = -S$

ii) What is chemical equilibrium? Give its types.

iii) Define ideal and non-ideal solutions.

Q3) Solve any two of the following: [5]

a) For a reaction $\Delta G = -91630$ Joule at 25°C and 1 pascal pressure. Find out the temperature coefficient at 25°C , if the heat of reaction is -105060 Joule/deg.

b) The vapour pressure of water is 2.5×10^5 pascal at 27°C and 7.5×10^5 pascal at 37°C . calculate molar heat of vapourization of water.

[$R = 8.314$ J/K/mole].

c) The mixture of immiscible liquid and water boils at 98°C at 755 mm Hg. The vapour pressure of water at this temperature is 712 mm Hg. Find the weight composition of the distillate.

[Given : Mol. wt. of immiscible liquid = 204]

SECTION - II

[Analytical Chemistry]

Q4) Answer the following: [5]

a) Give any two examples of primary standard substance.

b) What is parts per thousand?

c) Define Reducing agent.

d) What is universal indicator?

e) Define Equivalence point.

Q5) a) Answer any two of the following. **[6]**

- i) What is calibration? How will you calibrate volumetric flask?
- ii) What is Titration? Explain the titration curve for a strong acid and a weak base.
- iii) What is Redox indicator? How will you prepare 0.1M. potassium dichromate.

(Mol.wt.of potassium dichromate =294.19 gm).

b) Answer any two of the following: **[4]**

- i) Discuss titration curve between Fe^{+2} and Ce^{+4} .
- ii) Give the pH transition range and colour in acid form and base form for.
 - a) Cresol red
 - b) phenolphthalein
- iii) What is principle of conductometry? what are types of conductometric titrations?

Q6) Solve any two of the following: **[5]**

- a) How many ml of 0.1N HCl are required to neutralise 100 ml of 0.5N NaOH?
- b) What is the normality of solution, when 1000 ml 0.25 N NaOH mixed with 50 ml of 0.1N NaOH?
- c) What is the pH of the solution which contains 5% millimoles of sodium formate and 5.8 millimoles of formic acid in 100ml solution. [$K_a=1.7 \times 10^{-4}$].



Total No. of Questions :6]

SEAT No. :

P671

[5315]-206

[Total No. of Pages : 3

S.Y.B.Sc.

CHEMISTRY

CH-222 : Organic and Inorganic Chemistry
(2013 Pattern) (Semester - II) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Answer of the two sections should be written in the same answer book.
- 2) All questions are compulsory.
- 3) Neat diagrams must be drawn wherever necessary.

SECTION-I

(Organic Chemistry)

Q1) Attempt the following.

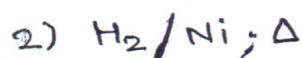
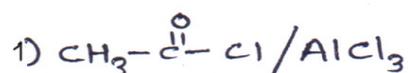
[5]

- a) What is Lindlar's catalyst? Give its important use.
- b) Why furan is aromatic?
- c) Define Biochemistry.
- d) Give any two applications of KMnO_4 .
- e) Explain the term 'Zwitter ion'.

Q2) a) Attempt any Two of the following:

[6]

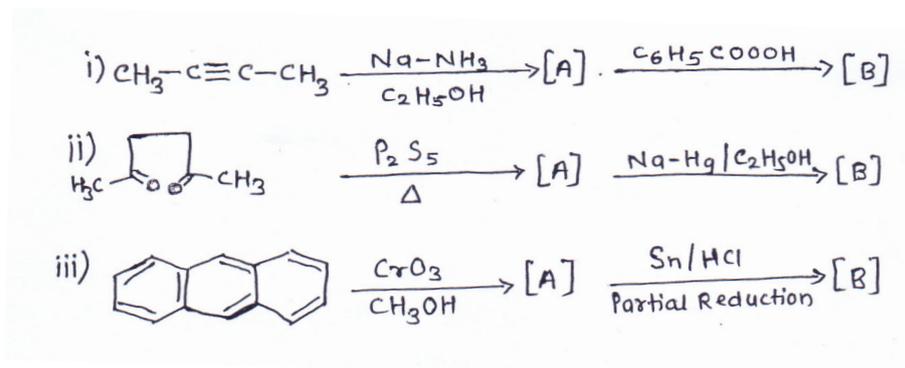
- i) What is reduction ? Give two important applications of LiAlH_4 .
- ii) Give the synthesis of pyrrole. What is the action of following on pyrrole?



- iii) What are carbohydrates? Discuss the classification of carbohydrates with suitable examples.

P.T.O.

b) Assign [A] and [B] of the following reaction (Any Two) [4]



Q3) Attempt any Two of the following: [5]

- What are α -amino acids? Discuss the classification of α -amino acids.
- What is Jone's reagent? Give any two important applications of Jone's reagent.
- Define peptide linkage. Draw the structure of following amino acids.
 - Phenylalanine
 - Serine

SECTION-II

(Inorganic Chemistry)

Q4) Answer the following: [5]

- Write the electronic configuration of copper (Atomic number, Cu=29).
- How many bridging carbonyls are present in $[\text{Co}_2(\text{CO})_8]$
- Define acids and bases according to Lewis theory.
- Define 'chemical toxicology'.
- What are amphoteric solvents?

Q5) a) Answer any Two of the following: [6]

- What are d-block elements? Explain the following properties of d-block elements.
 - Atomic size
 - Catalytic activity
- Define EAN rule. Find out the valence electrons in the following metal carbonyls.
 - $\text{Cr}(\text{CO})_6$
 - $\text{Fe}(\text{CO})_5$(Atomic number of Cr=24 and Fe=26)
- Explain the Lowry-Bronsted concept of acids and bases. Give its merits and demerits.

- b)** Attempt any Two of the following: **[4]**
- i) Explain 'Biochemical methylation'.
 - ii) Why Transition metals have ability to form co-ordination compounds?
 - iii) Why "BF₃ is stronger lewis acid than BH₃"?

Q6) Answer any Two of the following: **[5]**

- a) Write a note on Biochemical effects of lead.
- b) What is spin only formula? Calculate magnetic moment of Co²⁺ and Ni²⁺ ion by using spin-only formula.
(Atomic number of Co=27 and Ni=28)
- c) Define back bonding. Draw the structure of
 - i) M₀ (Co)₆
 - ii) Ir₄ (Co)₁₂

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 207

S.Y. B.Sc.

BOTANY

BO-221 : Plant Anatomy and Embryology

(2013 Pattern) (Semester-II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) Define secondary growth.
- b) What are trichomes?
- c) What are tyloses?
- d) Give the type of vascular bundle in dicot root.
- e) What is incompressibility?
- f) Define entomophily.
- g) What is double Fertilization?
- h) Define syngamy.
- i) What is bitegmic ovule?
- j) What is porogamy?

Q2) Answer any two of the following:

[10]

- a) Describe the distribution of mechanical tissues in monocot stem.
- b) Describe the anomalous secondary growth in Bignonia stem.
- c) Explain the process of development of nuclear endosperm.

P.T.O.

Q3) Write notes on (any two):

[10]

- a) Principle of incompressibility.
- b) Significance of double fertilization.
- c) Structure of female gametophyte.

Q4) What is embryo sac? Explain the development of tetrasporic embryo sac. **[10]**

OR

What is normal secondary growth? Describe the process of normal secondary growth in Helianthus annuus stem in detail.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 208

S.Y. B.Sc.

BOTANY

BO-222 : Plant Biotechnology

(2013 Pattern) (Semester-II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams should be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) What are plasmids?
- b) Name any two microorganisms used in fermentation.
- c) Enlist any two physical methods of enzyme immobilization.
- d) What is phytoremediation?
- e) Enlist any two methods of direct gene transfer.
- f) Write any two sources of SCP.
- g) What is nanobiotechnology?
- h) Enlist any two transgenic plants developed for pest resistance.
- i) What is gene cloning?
- j) Give importance of biotechnology in medicines.

Q2) Answer any two of the following:

[10]

- a) Give classification of enzymes.
- b) Write the process of phytoextraction.
- c) Describe economic implications of SCP.

P.T.O.

Q3) Write notes on (any two): **[10]**

- a) Restriction enzymes.
- b) Applications of plant genetic engineering in abiotic stress tolerance.
- c) Industrial applications of enzymes.

Q4) Define genetic engineering. Describe the process of Agrobacterium mediated gene transfer in plants. **[10]**

OR

What is bioreactor? Describe in detail tubular tower bioreactor. **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 209

S.Y. B.Sc.

ZOOLOGY

ZY-221 : Animal Systematics and Diversity-IV

(Revised 2013 Pattern) (Semester-II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams should be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following:

[10]

- a) What is hetero cercal tail?
- b) Give any two desert adaptations in Reptiles.
- c) What is mesovarium?
- d) Enlist any two examples of poisonous snakes.
- e) Write names of any two eye ball muscles at Scoliodon.
- f) What is hemibranch?
- g) Write any two examples of Theria.
- h) Enlist any two examples of Anapsida.
- i) Mention the names of paired fins in Scoliodon.
- j) Write any two disadvantages of bird migration.

Q2) Write short notes on (any two):

[10]

- a) Altitudinal migration.
- b) Any five modifications of original mammalian structure in Aquatic mammals.
- c) Ampullae of Lorenzini.

P.T.O.

Q3) Attempt the following (any two): **[10]**

- a) Cursorial and Raptorial feet.
- b) Distinguishing characters of Archaeornithes.
- c) Sketch and label v.s. of eye of scoliodon.

Q4) Describe the structure and working of heart in scoliodon. **[10]**

OR

Describe in detail aerial adaptations in birds.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 210

S.Y. B.Sc.

ZOOLOGY

ZY-222 : Applied Zoology - II (Apiculture and Sericulture)

(Revised 2013 Pattern) (Semester-II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams should be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Attempt the following:

[10]

- a) Write the biological name of western bee.
- b) What is swarming?
- c) Write any two bacterial diseases of honey bees.
- d) Write any two uses of honey.
- e) Mention the use of bee veil.
- f) Write biological name of Eri Silkworm.
- g) What is pruning?
- h) Write the Fungal disease of silkworm larvae.
- i) Write use of feather.
- j) What is hibernating egg?

Q2) Write short notes on (any two):

[10]

- a) Composition and uses of bee wax.
- b) Duties of worker bees.
- c) Branch cutting method.

P.T.O.

Q3) Attempt the following (any two): **[10]**

- a) Sketch and label pupa of Bombyx mori.
- b) Uzi fly.
- c) Describe Round dance.

Q4) Describe colony organization and division of labour in honey bees ? **[10]**

OR

Describe morphology and Lifecycle of Bombyx mori.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 211

S.Y. B.Sc.

GEOLOGY

GL-221 : Petrology

(2013 Pattern) (Semester-II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt the following questions.

[10]

- a) Define Eutectic.
- b) Give genesis of spherulitic structure.
- c) Give any one point difference between metamorphism and diagenesis.
- d) Define the term crush conglomerate.
- e) Define Expansion crack structure.
- f) Give the temperature of the magma.
- g) Define reaction rim/corona structure.
- h) Give the names of the product of thermal. Metamorphism of pure and impure limestone.
- i) Define Poikilitic texture.
- j) Define Idioblastic crystals.

Q2) Write notes on (Any Two):

[10]

- a) Describe the concept of matrix and cement and its effects on porosity and permeability.
- b) Describe the modes of transportation including phases of traction.
- c) Describe sandstone rock deposits with respect to its definition, texture/ structure mineral composition and name its varieties.

P.T.O.

Q3) Answer the following questions on (any two): **[10]**

- a) Describe the classification of igneous rocks based on its colour index, and feldspar content.
- b) Describe the Bauxite rock with respect to its texture / structure & mineral composition.
- c) Describe the following structures with respect to their origin and environmental significance.
 - i) Ripple mark &
 - ii) Lamination.

Q4) Describe the crystallisation of a bi-component magma with the help of solid-solution series. **[10]**

OR

Define metamorphism. Describe the regional metamorphism of argillaceous and basic igneous rocks.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 212

S.Y. B.Sc.

GEOLOGY

GL-222 : Stratigraphy and Palaeontology

(2013 Pattern) (Semester-II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw the diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following questions:

[10]

- a) Define correlation.
- b) Define index fossil.
- c) What is the definition of stratigraphy given by a palaeo - geographer?
- d) Define magnetostratigraphy.
- e) Define bedding.
- f) Give importance of stratigraphy.
- g) Define a chronozone.
- h) Enumerate the chemical deposits resulting in stratification.
- i) Define biostratigraphy.
- j) Enumerate the biological factors associated with the development of stratification.

Q2) Write notes on (Any Two):

[10]

- a) Types of Microfossils.
- b) Systematic position and palaeo-ecological significance of foraminifera.
- c) Morphology of hard parts of Ostracods.

P.T.O.

Q3) Explain the following (any two): **[10]**

- a) Evolutionary trends in Glabella and Eyes of Trilobites.
- b) Uses of Microfossils.
- c) Field techniques for collection of microfossils.

Q4) Define chronostratigraphy and a chronostratigraphic unit. Describe chronostratigraphic units in detail. **[10]**

OR

What is meant by vertical succession in stratigraphy? Describe the characters by which vertical successions are identified.



Total No. of Questions : 4]

SEAT No. :

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S.Y. B.Sc.

STATISTICS

ST-221: Statistical Methods and Use of R- Software

(2013 Pattern) (Semester II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:

- a) Choose the correct alternative for each of the following: **(1 each)**
 - i) If $3Y - 12X_1 - 9X_2 = 90$ is the equation of the regression plane of Y on X_1 and X_2 then by X_2 , X_1 is equal to
 - A) -3
 - B) 3
 - C) 30
 - D) -10
 - ii) Rejecting H_0 when H_1 is true leads to
 - A) type I error
 - B) type II error
 - C) correct decision
 - D) either type I or type II error
 - iii) When N.R.R. = 1 then we interpret that:
 - A) population remains constant.
 - B) female population will exactly replace it self.
 - C) there is no mortality in female.
 - D) all the above.

P.T.O.

- b) State whether the given statement is true or false in each of the following: **(1 each)**
- If $R_{Y.X_1 X_2} = 0$ then both $r_{y x_1}$ and $r_{y x_2}$ must be equals to zero.
(i.e if $R_{1.23} = 0$ then $r_{12} = r_{13} = 0$)
 - Critical region is the region of acceptance of null hypothesis H_0 .
 - NRR is greater than GRR.
- c) Define total fertility rate (T.F.R.) **[1]**
- d) Write a command in R- software to draw a random sample of size 5 out of 50 units by SRSWOR and store it in a vector **[1]**
- e) Define term ‘traffic density’ in queuing theory. **[1]**
- f) Define Level of significance (.l.o.s.) **[1]**

Q2) Attempt any two of the following: **(5 each)**

- Derive the formula for the partial correlation coefficient $r_{y.x_1.x_2}$ (i.e $r_{12.3}$) in terms of total correlation coefficients.
- A company manufacturing electric bulbs claims that the average life of bulbs is 1200 hours. A random sample of 100 bulbs shows the average life is 1180 hours. The standard deviation of the life of bulbs is known to be 150 hours. Test the company’s claim at 5% l.o.s.
- Tests in communication skills were taken for 6 persons before and after they were given a training. The scores are as follows:

Scores (before):	48	60	45	70	65	55
Scores (after) :	54	72	50	78	68	62

Write commands in R-software to carry out a paired t-test to check whether there is any effect on the average score of the training or not.

Q3) Attempt any two of the following: **(5 each)**

- Explain a large sample test to test $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2$, where μ_1 and μ_2 are population means of two populations. TWO independent random samples of large sizes n_1 and n_2 are taken from these populations. The population variances are known.

- b) One customer arrives at a counter in a bank after every 15 minutes. Staff on the counter take 10 minutes on an average for serving a customer. Under the assumptions for applying M/M/1 : ∞ /FC FS model, find
- Average queue length
 - A second counter will be started if waiting time of customer in the queue is atleast 15 minutes. Can you justify a need of second counter?
- c) Compute (i) C.B.R. (ii) G.F.R. and (iii) Age - S.F.R. for the following data.

Age - group	No. of Women	No. of Births
20-24	24,000	800
25-29	20,000	2,400
30-34	15,000	2,000
35-39	12,000	600
40-44	6,000	120
45-49	4,000	10

The total population is 1,86,300

Q4) Attempt any one of the following:

- Derive the equation of least square regression plane of Y on X_1 and X_2 . [7]
 - Explain the terms: P-value, confidence-interval. [3]
- Explain how to construct a $100(1-\alpha)$ % Confidence interval for population mean (μ) of normal distribution when standard deviation σ is known, while testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$. [5]
 - A quality control manager of an electronic plant thinks that, handicaped people do better work than the normal people. A sample of 400 items produced by the handicaped found to have 20 defectives. On the other hand a sample of 500 items producedl by the normal people found to have 32 defectives.
Do the above data supports managers claim? Use 1% l.o.s., Justify the answer. [5]



Total No. of Questions : 4]

SEAT No. :

P679

[Total No. of Pages : 4

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S.Y. B.Sc.

STATISTICS

ST-222: Sampling Distributions and Inference

(2013 Pattern) (Semester- II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:

- a) Choose the correct alternative in each of the following: **[1 each]**
- i) If X_1 and X_2 are independent random variables (r.v.s) having $N(0,1)$ and $N(0,16)$ distribution respectively then probability distribution of $X_1^2 + \frac{1}{4}X_2^2$ is
- A) $N(0,17)$ B) χ_2^2
C) t_2 D) $F_{1,1}$
- ii) If a r.v. has chi-square distribution with variance equal to 8 then its moment generating function (m.g.f.) is given by
- A) $(1-2t)^{-2}$ B) $(1-t)^{-2}$
C) $(1-2t)^2$ D) $(1-t)^2$
- iii) Suppose e_1, e_2, e_3 and e_4 are expected frequencies such that $e_1, e_2 > 5$ and $e_3 + e_4 = 8$ are obtained after fitting a probability distribution in which one parameter is estimated. Then under H_0 : fitting of probability distribution is good, the test statistic used
- A) χ^2 with 1 degrees of freedom (d.f.)
B) χ^2 with 2 d.f.
C) χ^2 with 4 d.f.
D) χ^2 with 3 d.f.

P.T.O.

b) State whether each of the following statement is true or false: **[1 each]**

i) If r.v. F follows $F_{2,2}$ distribution with $Q_1 = 5$ then $Q_3 = \frac{1}{5}$.

ii) Let X be a r.v. having t- distribution with 5 d.f. Then the value of μ_4 is equal to $\frac{25}{2}$.

iii) Let X_1, X_2, \dots, X_n be a random sample (r.s.) from $N(\mu, \sigma^2)$, μ is unknown. To test $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 > \sigma_0^2$ the rejection region is $\chi_{n-1}^2 \leq \chi_{n-1, 1-\alpha}^2$ at α level of significance (l.o.s.).

c) State limiting behaviour of χ_n^2 as $n \rightarrow \infty$ according to Fisher's approximation. **[1]**

d) State the standard error of the statistic $\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n}$ **[1]**

e) Give one real life situation where chi-square test of independence can be used. **[1]**

f) Distinguish between two sample t-test and paired t-test. **[1]**

Q2) Attempt ANY TWO of the following: [5 each]

a) Find the mode of a chi-square distribution with n d.f. Also if $X \sim \chi_n^2$ and mode of the distribution is 5 find $P(X > 2.167)$.

b) If a r.v. $U \sim N(0,1)$, $V \sim \chi_n^2$ and are independent then find the distribution

of $\frac{U}{\sqrt{\frac{V}{n}}}$.

- c) If $X \sim \chi_{10}^2, Y \sim \chi_9^2$ and are independent r.v.s then find
- $P [12.242 < Y < 21.666]$
 - Median of Y
 - $P[X+Y \geq 21.689]$.

Q3) Attempt ANY TWO of the following:

[5 each]

- If a r.v. $X \sim F_{n_1, n_2}$ then find the distribution of $\frac{1}{X}$.
- Derive a test statistic to test $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 \neq \sigma_2^2$. Also state the assumptions if any.
- If \bar{X} and S^2 are the mean and the variance of a r.s. of size 10 from $N(4, 16)$ then find $P(-1 < X < 4, 6.6688 < S^2 < 17.0496)$.

Q4) Attempt ANY ONE of the following:

- If X_1, \dots, X_n is a r.s. from $N(\mu, \sigma^2)$ distribution then show that sample mean (\bar{X}) and sample variance (S^2) are independently distributed. **[6]**
 - For two independent normal populations we have the following information :

Sample means	$\bar{X}=10$	$\bar{Y}=12$
Sample variances	$S_1^2=46$	$S_2^2=50$
Sample sizes	$n_1=15$	$n_2=15$

To test $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2$, calculate the 95% confidence interval for $(\mu_1 - \mu_2)$. Also give the conclusion. (Use $\alpha=5\%$) **[4]**

b) i) If $X \sim F_{n_1, n_2}$ and $Y \sim F_{n_2, n_1}$ then show that $P(X \geq a) + P\left(Y \geq \frac{1}{a}\right) = 1$ [2]

ii) A certain stimulus is administered to each of 12 patients resulted in the following increase in blood pressure:

5, 2, 8, -1, 3, 0, 4, 6, -2, 1, 5, 0

Can it be concluded that the administration of the stimulus in general will be accompanied by increase in the b.p.? Use appropriate test to give the answer. (Use l.o.s. = 0.05) [4]

iii) Write a short note on McNemar's test. [4]



Total No. of Questions :4]

SEAT No. :

P680

[5315]-215

[Total No. of Pages :2

S. Y. B. Sc.

GEOGRAPHY

**Gg - 221: Geography of Resources -II
(2013 Pattern) (Semester-II) (paper -I)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams and sketches wherever necessary.*
- 4) Use of map stencils is allowed.*

Q1) Answer the following questions in two or three sentences each (Any Ten):

[10]

- a) Name the types of coal with carbon content.
- b) Name any four iron ore producing countries in the world.
- c) Name four leading bauxite producing countries in the world.
- d) Write any four nuclear power generating countries in the world.
- e) What is meant by optimum population?
- f) Name any four sparsely populated regions of the world.
- g) Write any two densely populated states in India.
- h) What are the components of natural gas?
- i) Write any two uses of land resources.
- j) State any two significances of solar energy.
- k) Write any two uses of water resource.
- l) Define resource planning.
- m) Write any two needs of resource planning in India.

P.T.O.

Q2) Write short notes on the following (Any Two): **[10]**

- a) Production of bauxite in India.
- b) Advantages and disadvantages of nuclear energy.
- c) Population as a resource.
- d) Resource Planning in India.

Q3) Answer the following questions in 100 words each (Any Two): **[10]**

- a) What are the advantages and disadvantages of wind energy.
- b) Give an account of distribution of population in India.
- c) Explain the role of energy resources in economic development.
- d) Explain the concept resource planning.

Q4) Answer the following questions in 200 words (Any One): **[10]**

- a) Give an account of distribution and production of iron ore in world.
- b) Explain the role of mineral resources in economic development.



Total No. of Questions :4]

SEAT No. :

P681

[5315]-216

[Total No. of Pages :2

S. Y. B. Sc.

GEOGRAPHY

**Gg - 222: Watershed Management -II
(2013 Pattern) (Semester-II) (paper -II)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Answer the following questions in two or three sentences each (Any Ten):**[10]**

- a) What is watershed?
- b) What is drainage map?
- c) Define watershed survey.
- d) What is hydrologic data?
- e) Write any two advantages of participatory planning.
- f) What is capacity building?
- g) Write any two components of livelihood security.
- h) What is cost sharing?
- i) What is check dam?
- j) Give any two traditional methods of storage of harvested water.
- k) Define contour bunding.
- l) Write any two benefits of soil conservation.
- m) What is dryland farming?

P.T.O.

Q2) Write short notes on the following (Any Two): **[10]**

- a) Benefits of survey methods.
- b) Food security.
- c) Gully plugging.
- d) Resource Mapping.

Q3) Answer the following questions in 100 words (Any Two): **[10]**

- a) Explain database generation method in resource appraisal.
- b) Explain livelihood security.
- c) Explain traditional methods of soil conservation.
- d) Explain crop production techniques

Q4) Answer the following questions in 200 words (Any One): **[10]**

- a) Explain the need of planning for small rainfed catchments.
- b) Explain the watershed based farming system.



Total No. of Questions :4]

SEAT No. :

P682

[5315]-217

[Total No. of Pages :2

S. Y. B. Sc.

MICROBIOLOGY

MB - 221: Bacterial Genetics

(2013 Pattern) (Semester-II) (Paper -I) (Regular)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt the following:

[10]

- a) Define Spontaneous mutations.
- b) Define Base Analogues.
- c) Define Relaxed plasmids.
- d) Write 2 example of Alkylating agents.
- e) Structure of Thymine.
- f) Plasmid DNA replicates by _____ mechanism
- g) Fluctuation test was devised by _____.
- h) Purine replaced by a Pyrimidine in DNA is referred to as _____.
- i) State True or False: A form of DNA erusts under dehydrated conditions.
- j) State True or False: Bacterial genome is positively supercoiled.

Q2) Attempt any two of the following.

[10]

- a) Define mutations. Explain using conditional lethal mutants.
- b) Define plasmids Explain the phenomenon of plasmid Incompatibility with suitable example.
- c) Define mutagens. Give role of biological mutagen with a suitable example.

P.T.O.

Q3) Diagrammatically represent any two of the following: **[10]**

- a) Leading and Lagging strand synthesis.
- b) Hershey and chase experiment.
- c) Q model of Semi- discontinuous replication

Q4) Attempt any one of the following. **[10]**

- a) What is central dog ma. Explain in detail the mechanism of Translation in bacteria.
- b) Define Induced mutations Enlist the various mutagenic agents. Explain in detail the mechanism of action of U.V and X rays on DNA.



Total No. of Questions :4]

SEAT No. :

P683

[5315]-218

[Total No. of Pages :2

S. Y. B. Sc.

MICROBIOLOGY

**MB - 222: Air and Water Microbiology
(2013 Pattern) (Semester-II) (paper -II)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

Q1) Answer the following.

[10]

- a) Define : Droplet.
- b) Air flora is transient in nature.T/F.
- c) Causative agent of Tuberculosis is
- d) Ground water is relatively free from bacteria.T/F.
- e) Write the use of "Eijkman test".
- f) 'MPCB' stands for.
- g) Define: Demineralized water.
- h) PPM is the permissible limit of BOD of any waste water body to be disposed off in any fresh water body.
- i) What is activated sludge.
- j) Write the effect of Arsenics on human health.

Q2) Attempt any two of the following.

[10]

- a) Diagrammatically explain Anderson's air Sampler.
- b) Describe E.coli & Streptococcus faecalis are used as a indicators of faecal pollution.
- c) Explain; toxicity testing by fish bioassay.

P.T.O.

Q3) Attempt any two of the following. **[10]**

- a) What is air Sanitation, Describe physical methods of it.
- b) Describe the presumptive test to check potability of water.
- c) Write the applications of biogas.

Q4) Describe solid waste management with respect to Raw materials, organisms involved & their activity. **[10]**

OR

Q4) Describe waste water treatment by.

- a) Oxidation ponds / Lagoons.
- b) Trickling filters.



Total No. of Questions : 4]

SEAT No. :

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S.Y. B.Sc.

PSYCHOLOGY

EP-221 : Health Psychology

(2013 Pattern) (Semester-II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw the figures and diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer in two or four sentences.

[16]

- a) Define illness.
- b) Define self imposed.
- c) Define pressure.
- d) Define coping.
- e) Define overeating.
- f) Define poor nutrition.
- g) Define pressure a stress.
- h) Define Burnout.

Q2) Attempt any two of the following in eight or ten sentences.

[8]

- a) Explain the post Traumatic stress disorders.
- b) Explain the Bio-Medical model of illness.
- c) Describe effect of smoking on health.

P.T.O.

Q3) Write short notes on any two of the following. **[8]**

- a) Behaviour and AIDS.
- b) Problem focused constructive coping.
- c) Frustration.

Q4) What is stress? Describe the major types of stress. **[8]**

OR

Explain in details the effect of the life style of Health.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 220

S.Y. B.Sc.

PSYCHOLOGY

**Psychological Testing and Assessment
(2013 Course) (Semester-II) (Paper-II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw the diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in two or four sentences.

[16]

- a) Define Neuro psychology.
- b) State full form of SVIB.
- c) Define psychological test.
- d) What is achivement ?
- e) Define clinical psychology.
- f) Define intellectual ability.
- g) What is job satisfaction.
- h) Define attitude.

Q2) Attempt any two of the following in eight or ten sentences.

[8]

- a) Explain the general Aptitude test Battery.
- b) Describe Interview method for perschool Assessment.
- c) Describe the any two tests of general Intlectual ability.

P.T.O.

Q3) Write short notes on any two of the following.

[8]

- a) Controlled word association test.
- b) Assessment center.
- c) Observational method.

Q4) a) Define Aptitude. Explain the any two types of Aptitude Test. In educational assessment. **[8]**

- b) Define Neuropsychological Assessment ? Explain any two tests of Neuropsychological Assessment.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 223

S.Y. B.Sc.

ELECTRONIC SCIENCE

**EL-221: Electronic Instrumentation
(2013 Pattern) (Semester-II) (Paper-I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of non-programmable calculator is allowed.*

Q1) Answer All of the following:

- a) What is resolution in instrumentation? [1]
- b) List any two electrical temperature sensors. [1]
- c) Define sweep generator. [1]
- d) Give any two specification of SMPS. [1]
- e) “Initial zero setting for pH measurement is at pH=7”. comment [2]
- f) “On line Ups is also called True Ups”. Comment. [2]
- g) Determine Static error if digital voltmeter read 4.65 voltage and the true of the voltage is 4.52 volts. [2]
- h) In tachometer if number of pulses per seconds are 200 and number of teeth on rotar 20. Find speed of tachometer in rpm. [2]

Q2) Answer any Two of following:

- a) Explain various types of errors in measurement system. [4]
- b) What is digital storage oscilloscope? Draw it's block diagram. [4]
- c) With suitable example, explain voltage and current setting of CVCC Power supply. [4]

P.T.O.

Q3) Answer Any Two of the following:

- a) Draw the neat diagram of Dc Voltmeter and explain its working in detail. [4]
- b) What is signal generator? state its specifications. [4]
- c) Explain with block diagram DC to DC converter. [4]

Q4) Answer All of the following:

- a) Draw and explain block diagram ofDFM and give its modes of operation.[6]
- b) Explain working of function generator with block diagram. [6]

OR

- a) Calculate the percentage load regulation for power supply if $V_{ML} = 5\text{v}$ and $V_{FL} = 4.95\text{v}$ and state ideal values for load regulation. [4]
- b) Design multirange voltmeter for range $v = 0$ to 10 volt and $v = 0$ to 50 volt. when internal resistance $R_m = 50 \Omega$ full scale deflection current 1mA . [4]
- c) Caluculate percentage duty cycle of square wave having [4]
 - i) T_{ON} time 0.5 m sec and T_{OFF} time 0.7 m sec.
 - ii) $T_{ON} = T_{OFF}$ time.



Total No. of Questions : 4]

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S.Y. B.Sc.

ELECTRONIC SCIENCE

EL-222 : Communication Electronics

(2013 Pattern) (Semester-II) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer all of the following:

- a) Define baud rate. [1]
- b) State the role of pre-emphasis in F.M. [1]
- c) Define sensitivity of a radio receiver. [1]
- d) What is the role of hybrid in basic telephone hand set. [1]
- e) "In FM, band width is relatively larger than an equivalent AM signal". Comment. [2]
- f) "Walky-talky is half duplex two way communication". Comment. [2]
- g) Compute the noise temperature if the noise factor is 1.5. [2]
- h) If a superheterodyne receiver uses IF of 455 KHz for receiving frequency of 2000 KHz. What is the frequency of local oscillator? [2]

Q2) Attempt any two of the following.

- a) Distinguish between pulsed and DTMF dialing. [4]
- b) Describe the working of single tuned discriminator. What are its drawbacks. [4]
- c) Explain the principle of heterodyne and draw a block diagram of super heterodyne AM receiver. [4]

P.T.O.

Q3) Attempt any two of the following:

- a) Explain with block diagram basic communication system. [4]
- b) Compare serial and parallel communication system. [4]
- c) Explain the concept of TDM and FDM. [4]

Q4) Attempt all of the following:

- a) Show that in AM
 - i) Two side bands are generated and draw frequency spectrum of AM.
 - ii) $P_C = \frac{2}{3} P_T$ [6]
- b) Explain the concept of ASK, FSK and PSK. [6]

OR

- a) A 50Ω resistor operates at 29°C . How much noise voltage it provides to a matched load over the bandwidth of 6MHz. [4]
- b) Determine the percentage modulation of an FM wave with a frequency deviation of 15kHz for
 - i) FM broadcast.
 - ii) For TV broadcast. [4]
- c) Calculate the power in each sideband if carrier power is 500 W and modulation index is 70%. [4]



Total No. of Questions : 4]

SEAT No. :

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S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-201:Conflicts Management and Resolution

(2013 Pattern) (Semester-II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in two to four sentences.

[8×2=16]

- a) What do you mean by world organization.
- b) State the meaning of ADR.
- c) Define ethnic conflict.
- d) Define Disarmament.
- e) Define International law.
- f) Write any two relationships between conflict and communication.
- g) Write any two sources of International law.
- h) Write the meaning of conflict resolution.

Q2) Answer in 8 to 10 sentences.(any two)

[2×4=8]

- a) Describe historical background of war studies.
- b) Write the causes of clash of civilization.
- c) Discuss pacific methods of conflict settlement.

P.T.O.

Q3) Write short notes on (any two):

[2×4=8]

- a) Arms control and world order.
- b) Problems of peace research.
- c) World order and peace keeping force (IPKF).

Q4) Answer in 18 to 20 sentences (any one).

[1×8=8]

- a) Write a note on the role of U.N in maintaining world peace.
- b) Discuss nature and scope of peace studies.



Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages :2

S. Y. B. Sc.

DEFENCE AND STRATEGIC STUDIES

DSSY - 202: Geopolitics

(2013Pattern) (Semester-II)(Paper -II)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

Q1) Answer in 2 or 1 sentences each.

[16]

- a) Define "Territorial sea".
- b) State the meaning of geopolitics.
- c) Define "state".
- d) Write any two names of land locked state.
- e) Whose the Andaman & Nicobar Islands situated?
- f) State the meaning of Buffer state.
- g) Write the location of Diego Garcia Islands.
- h) State any two factor of geopolitics.

Q2) Answer in 8 To 10 sentences (Any Two).

[8]

- a) Explain the concept of strategic Minerals.
- b) Highlight on various uses of Exclusive Economic Zone.
- c) Write in brief geostrategic importance of Siachen Glacier.

P.T.O.

Q3) Write short notes on (Any Two). **[8]**

- a) Concept of State.
- b) Geostrategic importance of Andoman & Nicobar Islands for India.
- c) Organizing capacity as a factor of geopolitics.

Q4) Answer in 16 To 20 sentences (Any One). **[8]**

- a) Evaluate the problems & solution on Land Locked State.
- b) Explain the concept of Line of Actual control with special reference to LOC between India & Pakistan in Jammu & Kashmir.



Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages :2

S. Y. B. Sc.

DEFENCE AND STRATEGIC STUDIES
DS - 203: Contemporary World and Security
(2013 Pattern) (Semester-II)(Paper - III)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in two to four sentences.

[2×8=16]

- a) What do you mean by national values?
- b) State any two aims of national security.
- c) What do you mean by dynamics of Geopolitics?
- d) State the meaning of Non- state actors.
- e) Define Insurgency.
- f) Write the meaning of world order.
- g) Define nationalism.
- h) Define conflict management.

Q2) Answer any two in 8 to10 sentences.

[2×4=8]

- a) Describe issues of human rights.
- b) Explain problems of energy security.
- c) Discuss comprehensive security.

P.T.O.

Q3) Write short notes on (any two).

[2×4=8]

- a) India and South Asia.
- b) Sources of conflict in West Asia.
- c) India's relations with Russia.

Q4) Answer in 18 to 20 sentences (any one).

[1×8=8]

- a) Write a note on the issues of India's security concern.
- b) Discuss role of Geopolitics in world politics.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS-201 : Biological Diversity & its Conservation

(2013 Pattern) (Semester-II) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following in one to two lines:

[10]

- a) Define the term: Biological Diversity.
- b) What is Endemism?
- c) Write the full form of IUCN.
- d) What are sacred groves?
- e) Write the names of Biodiversity hotspots of India.
- f) What are Transgenic organisms?
- g) State the difference between Insitu & Ex- Situ conservation techniques.
- h) Enlist any two Mega diversity countries of world.
- i) What are GMO's ? Name any two examples.
- j) Define: Environmental pollution.

Q2) Write short notes on Any Two of the following:

[10]

- a) Udvardy's classification of Ecosystem diversity.
- b) Western Ghat as a hotspot.
- c) Measurement of Genetic Diversity.

P.T.O.

Q3) Answer any two of the following: **[10]**

- a) Describe any two traditional methods of Biodiversity conservation.
- b) Write in detail - Environment (Protection) Act 1986.
- c) Evolution and significance of Agrobiodiversity.

Q4) Answer Any One of the following in 10-15 lines. **[10]**

- a) Explain any five threats to Biodiversity.
- b) Discuss the community Participation in Biodiversity conservation.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

**EVS-202 : Pollution Control and Environmental Technology
(2013 Pattern) (Semester-II) (Paper-II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory and carry equal marks.*
- 2) Neat and labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following in 1 to 2 lines each:

[10]

- a) Define gray water.
- b) Give two names of disinfection of water methods.
- c) Define reverse osmosis.
- d) Define adsorption.
- e) What is pyrolysis.
- f) Role of catalytic conversion in fuel combustion.
- g) Give any two methods of in - situ treatment - in solid waste.
- h) Define Biogasification.
- i) Give two examples of attach growth treatment in waste water.
- j) Define phytoremediation.

Q2) Write a short notes on Any Two of the following:

[10]

- a) Sanitary landfill.
- b) Volume reduction methods in solid waste.
- c) Sound insulation.

P.T.O.

Q3) Answer any two of the following:

[10]

- a) Briefly explain the working principle of wet scrubbing.
- b) What are the methods used for noise control.
- c) Explain the adsorption theory with suitable example.

Q4) Answer Any One of the following:

- a) Explain the methods of anaerobic waste water treatment add a note on UASB. **[10]**
- b) Explain the health hazards of nuclear waste and add note on its disposal methods.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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S.Y. B.Sc.

ENGLISH (Optional)

Text Book : Literary Vistas

(2013 Pattern) (Revised) (Semester-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Attempt any one of the following in about 100 words. **[5]**

- i) What is the significance of the little box that Rosemary Fell wanted to buy?
- ii) How did the narrator react to the changes made to his features in the photograph?

b) Attempt any one of the following in about 100 words. **[5]**

- i) Draw a character sketch of Rosemary Fell.
- ii) Do you think the narrator refers to the photographer's changes as his brutal work?

Q2) a) Attempt any one of the following in about 100 words. **[5]**

- i) How are the daffodils depicted by Wordsworth?
- ii) How does the poem 'Ozymandias' portray the idea that human life and power is temporary?

b) Attempt any one of the following in about 100 words. **[5]**

- i) What kind of advice does the poem 'If' convey for any good life?.
- ii) Describe the emotion that still remains on the face of the sculpture in the poem 'Ozymandias'.

P.T.O.

Q3) Attempt any two of the following:

[10]

- a) Write a short paragraph of about 100 words on ‘ My views on College life’.
- b) You have applied for a bank loan to study abroad and have been asked to attend an interview. Anticipate any five questions that you could be asked and write down your responses to them.
- c) Aniket, Archana, Rakesh and Amit are asked to have a group discussion on the topic ‘Are Indian films losing their charm’? Write a transcript of a group discussion using the following points:
don’t believe that, completely agree, see your point, it’s true, I’m afraid like to add, inclined to agree, make a point, to summarize, think that.
- d) Prepare five slides of 20 words each for a power point presentation on one of the topics from your textbook.

Q4) Attempt any two of the following:

[10]

- a) Write an essay on the impact of GST on Indian Economy.
- b) Write a review of your favorite television serial.
- c) Write a report of two short paragraphs on new superfast train from Ahamadabad to Mumbai.
- d) Summarize the following paragraph-

Science affects the average man and woman in two ways already. He or she benefits by its applications, driving a motor car or omnibus instead of a house drawn vehicle, being treated for disease by a doctor or surgeon rather than witch, and being killed with an automatic pistol or a shell in place of a dagger or a battle-axe. It also affects his or her opinions. Almost everyone believes that the earth is round, and the heavens nearly empty, instead of solid. And we are beginning to believe in our animal ancestry and the possibility or vast improvements in human nature by biological methods.



[5315]-231

S.Y. B.Sc. (Semester - II)

मराठी (MARATHI) (Theory)

मराठी विज्ञानसाहित्य आणि व्यावहारिक मराठी
(2013 पटर्न)

वेळ : 2 तास]

[एकूण गुण : 40

- सूचना :- 1) सर्व प्रश्न सोडविणे आवश्यक आहे.
2) उजवीकडील अंक पूर्ण गुण दर्शवितात.

प्रश्न 1) i) खालील इंग्लिश परिच्छेदाचे मराठीत भाषांतर करा.

[10]

Punyashlok Ahilyadevi was born at Chaundi in Maharashtra in 1725. She was a daughter of Manakoji Shinde Patil. He was a vatandar. She was very pretty and very impressive in her childhood. Everyone was impressed instantly by her personality. The story of her wedding is very interesting. She became the daughter-in-law of the Subhedar of Malawa, Malharrao Holkar. Malharrao was very brave and gallant. He had a son, Khanderao. Khanderao was good for nothing. He was addicted and loved a life of luxury. He was not interested in the administration of his kingdom. Malharrao was very sad and worried for his useless son. He worried for his kingdom. He wanted it to prosper. Apparently Khanderao was not to fulfill his wish, Malharrao felt. He thought if Khanderao gets a good wife she would take care of the kingdom. He was always thinking about it.

Once he was travelling to take account of his subjects (people). Bhanoji was with him. They were riding on horsebacks. They saw a temple by a river. Malharrao wanted to rest for a while in that temple. He went with his four Soldiers and Dhanoji to the temple. The atmosphere in the temple was very holy. The sound of Jay Shiv Shambhu filled the temple. It was Lord Shankar's temple. Malharrao sat on a bench out side the temple a very impressive girl came to the temple. Malharrao was struck with her personality. He thought, "one should have such a daughter-in-law". The girl entered the temple, Malharrao looked at her very carefully. Dhanoji understood his thoughts. He said, " Maharaj, the girl is very impressive". Malharrao said, " As if Goddess Gauri has come to the temple!" Dhanoji said, "Chote Sarkar should get such a bride". "You stole words from my lips, " said Malharrao.

P.T.O.

ii) खालील परिच्छेदाचा 1/3 सारांश करा.

[10]

नीती जेवढी धर्मनिरपेक्ष तेवढेच विज्ञानही धर्मनिरपेक्ष आहे. त्याहीपुढे जाऊन सगळे ज्ञानच धर्मनिरपेक्ष किंवा सेक्युलर आहे असे म्हणता येईल. धर्म, वंश, जात, भाषा किंवा आताच्या प्रादेशिक चौकटीत वाढलेल्या संस्कृती यांसारख्या जन्मदत्त निष्ठांपैकी कोणत्याही निष्ठेला ज्ञान-विज्ञानाचा आणि नीति-मूल्यांचा येत्या काळातील वेग आणि विजय रोखता येणार नाही. जन्मदत्त निष्ठांच्या चौकटी मजबूत असण्याच्या काळातही त्यांना तेंव्हाही जमले नाही. ज्या काळात या चौकटींच्या मागे समूहमन आणि त्या मनामागे श्रद्धांची बळकटी उभी होती त्या काळात जर त्या श्रद्धा नव्या जीवनमूल्यांना थोपवू शकल्या नसतील तर आताच्या स्वातंत्र्य, समता, बंधुता आणि सर्वस्वी व्यक्तिकेंद्री मानसिकतेच्या युगात त्यांना ते जमणे अशक्यही आहे. नव्या मन्वंतराला सामान्य माणसांनी घडविलेल्या कायद्यांचा, घटनांचा आणि लोकशाही व्यवस्थांचा भक्कम आधार आहे आणि तो जुन्या जन्मदत्त निष्ठांची मान्यता व बळकटी काढून घेणारा आहे.

आताचा मानवी मूल्यांच्या दिशेने होत असलेला प्रवास केवळ समूहगततेकडून व्यक्तिगततेकडे एवढाच मर्यादित नाही. तो धर्मश्रद्धेकडून धर्मनिरपेक्षतेकडे, वंशनिष्ठेकडून मानवी ऐक्याकडे आणि खऱ्या अर्थाने होणाऱ्या माणसांच्या मुक्तीच्या दिशेने होणार आहे. पूर्वीच्या संरक्षक चौकटींचे जाचकपण व्यक्तीएवढेच समूहांनाही जाणवू लागले आहे. या चौकटींचे अनैसर्गिक असणे आणि तरीही त्यांचे टिकून राहणे याच गोष्टींना आताच्या खऱ्या समस्यांचे स्वरूप आले आहे.

वयात आलेल्या स्त्रीपुरुषांवर कोणतेही बंधन, अगदी लैंगिक स्वातंत्र्या-विषयीचा निर्बंधही आता कोणाला घालता येणार नाही. तसे त्यांच्या आई-वडिलांएवढेच जातीधर्मानाही करता येणार नाही. जगभरातील प्रगत देश एके काळी निषिद्ध मानलेल्या समलिंगी विवाहांना मान्यता देऊ लागले आहेत. समूहाने दिलेले सतीसारखे, केशवपनासारखे किंवा आताच्या खाप पंचायतींनी दिलेल्या प्रतिगामी निवाड्यांसारखे निर्णय आताच्या व्यवस्थेला नुसते अमान्यच नाहीत तर तीत दंडनीय अपराधही ठरणारे आहेत.

विज्ञानाने जगाच्या उत्पत्तीचा शोध सुरू केला आहे. स्वित्झर्लंड आणि फ्रान्सच्या सीमेवर भूपृष्ठाखाली कित्येक मीटर खोल, अठरा मैल लांबीचे व तीन मीटर व्यासाचे प्रचंड गोलाकार रिंगण त्यासाठी तयार केले आहे. या रिंगणात दर सेकंदाला हजारो किलोमीटर वेगाने प्रवास करणारे इलेक्ट्रान आणि प्रोटॉनचे सूक्ष्म कण सोडून त्यांची टक्कर घडवून आणली जात आहे. अशा पहिल्याच टक्करीने घडविलेल्या महास्फोटात (बिग बॅंग) नवे जडद्रव्य (मॅटर) निर्माण झाल्याचे वैज्ञानिकांना आढळले आहे. जडद्रव्यापासून चेतन (याला त्यांनी सध्या दिलेले नाव आहे, अँटीमॅटर) वेगळे करण्याचा आणि जडचेतन विश्वाची निर्मितीप्रक्रिया समजून घेण्याचा हा प्रयत्न आहे. (390 शब्द)

- प्रश्न 2) खालीलपैकी कोणत्याही दोन प्रश्नांची उत्तरे लिहा. [15]
- अ) 'सुशिक्षितांची अंधश्रद्धा' या विषयावर वर्तमानपत्रासाठी दोनशे शब्दांत लेख लिहा.
- ब) 'वाढती महागाई' या विषयावर आकाशवाणीसाठी दोनशे शब्दांत भाषणसंहिता तयार करा.
- क) 'परीक्षा व ताण-तणाव' या विषयावर मानसोपचार तंत्रांची दूरदर्शनसाठी घेतलेली 5 मिनिटांची मुलाखत तयार करा.

प्रश्न 3) खालील पारिभाषिक संज्ञाना मराठीतील पर्यायी पारिभाषिक संज्ञा लिहा. (कोणतेही पाच)[5]

- i) Transport
- ii) Merit
- iii) Virus
- iv) Research
- v) Radiology
- vi) Square
- vii) Fungal
- viii) Solar energy
- ix) Director
- x) Laboratory



Total No. of Questions : 3]

SEAT No. :

P695

[Total No. of Pages : 2

[5315]-232

S.Y. B.Sc. (Semester - II)

हिंदी (HINDI)

(नया पाठ्यक्रम) (सामान्य) (General)

(2013 Pattern)

- पाठ्यपुस्तकें : 1) भारती गद्य संग्रह सं. - डॉ. मधु धवन
2) कवितायन सं. - डॉ. भोलानाथ तिवारी

समय : 2 घंटे]

[पूर्णांक : 40

सूचनाएँ :- 1) सभी प्रश्न अनिवार्य हैं।

2) दाहिनी ओर लिखे अंक प्रश्न के पूर्णांक हैं।

प्रश्न 1) अ) निम्नलिखित पारिभाषिक शब्दों में से किन्हीं आठ के हिंदी पर्याय लिखिए। [8]

- | | |
|-----------------|-----------------|
| i) Anemia | ii) Atom |
| iii) Catalyst | iv) Diagnosis |
| v) Energy | vi) Geology |
| vii) Operation | viii) Satellite |
| ix) Supersonics | x) Take off |

आ) निम्नलिखित परिच्छेद का एक-तिहाई शब्दों में सार लेखन कर उसे उचित शीर्षक दीजिए।[4]

स्वाधीनता प्राप्ति के बाद राष्ट्रपति ने उन्हें राज्यसभा का सदस्य मनोनीत किया था। आप कुछ समय तक भागलपुर विश्वविद्यालय के उपकुलपति तथा कुछ समय तक हिंदी सलाहकार समिति के सदस्य भी रहे। विश्वकवि सम्मेलन में भारत का प्रतिनिधित्व किया। साहित्यिक सेवाओं के प्रति सम्मान व्यक्त करने के लिए भारत सरकार ने 'पद्मभूषण' से विभूषित किया था। आपको 'साहित्य अकादमी' और 'ज्ञानपीठ' पुरस्कार से सम्मानित किया गया। आपकी गणना हिंदी की राष्ट्रीय सांस्कृतिक काव्य-धारा के ओजस्वी कवि के रूप में होती है। क्रांति, शौर्य और राष्ट्रीयता का स्वर आपके साहित्य में सुनाई देता है। अन्याय, दमन और शोषण के विरोध में आप लेखन करते रहे।

P.T.O.

- प्रश्न 2) अ) निम्नलिखित गद्य अवतरण की ससंदर्भ व्याख्या कीजिए। [4]
क) मैं तुम्हें अपने अनुभवों के अलावा विश्वसनीय स्रोत नाभिकीय, कृषि प्रभाग, भाभा परमाणु अनुसंधान केंद्र, ट्रांबे की एक रिपोर्ट मंगवाकर उत्तर दे रहा हूँ।

अथवा

अपनी असाधारण मेधा शक्ति के कारण गणित के क्षेत्र में आपने ऐसा चमत्कार किया कि दुनिया विस्मित हो देखती रह गई।

- आ) निम्नलिखित पद्य अवतरण की ससंदर्भ व्याख्या कीजिए। [4]

ख) पर - पीड़ा से पूर-पूर हो
अमर-धवल गिरि के शिखरों पर
प्रियवर! तुम कब तक सोए थे!
रोया यक्ष कि तुम रोए थे?

अथवा

चाहे इस प्रार्थना सभा में
तुम सब मुझ पर गोलियाँ चलाओ
मैं मर जाऊँगा
लेकिन मैं कल फिर जन्म लूँगा
कल फिर आऊँगा।

- प्रश्न 3) अ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए। [10]

- च) घर लौटते हुए लेखक के मन में कौन से विचार आ रहे थे?
छ) रेशम का निर्माण किस प्रकार होता है?
ज) सुरक्षा और किरणीयन का प्रयोग कैसे किया जाता है?

- आ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए। [10]

- ट) कवि अज्ञेय किन बातों को लेकर मुझे आज हँसना चाहिए कहते हैं?
ठ) दैनिक कविता का उद्देश्य लिखिए।
ड) कवि ने अर्जुन को सामान्य मनुष्य के साथ कैसे जोड़ा है?



Total No. of Questions : 4]

SEAT No. :

P696

[Total No. of Pages : 2

[5315]-233
S.Y. B.Sc. (Semester - II)
SANSKRIT
गीर्वाणभारती (Girwanabharati)
(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Q1) Write short answers of the following questions. (2 - 4 lines)

[16]

पुढील प्रश्नांची 2 - 4 ओळीत उत्तरे लिहा.

- i) Which are the Nāstika Darśanas?
नास्तिक दर्शने कोणती ?
- ii) What is meant by पुण्डरीक and what is the peculiarity of that?
पुण्डरीक म्हणजे काय ? त्याचे वैशिष्ट्य काय ?
- iii) State any two types of Natural Sciences.
नैसर्गिक शास्त्रांचे कोणतेही दोन प्रकार सांगा.
- iv) What is meant by ज्योतिषशास्त्रम् ?
ज्योतिषशास्त्र म्हणजे काय ?
- v) In which book the method of नगररचना is mentioned?
नगररचना पध्दती कोणत्या ग्रंथात सांगितली आहे ?
- vi) State the meaning of 'यन्त्र'.
'यन्त्र' शब्दाचा अर्थ लिहा.
- vii) Who is the author of 'वैनायकम्'.
'वैनायकम्' ग्रंथाचा रचयिता कोण ?
- viii) Explain the meaning of 'यत् सौहृदानि सुजने शिथिली भवन्ति'।
'यत् सौहृदानि सुजने शिथिलीभवन्ति' अर्थ स्पष्ट करा.

P.T.O.

प्रश्न 2) Write short notes on any two of the following in 8 - 10 lines. [8]

पुढीलपैकी कोणत्याही दोहोंवर 8 - 10 ओळीत संक्षिप्त टीपा लिहा.

- i) सद्धर्मपुण्डरीककथा।
- ii) चुम्बकप्रकाराः।
- iii) वास्तुशास्त्रम्।

प्रश्न 3) Write short notes on any two of the following in 8 - 10 lines. [8]

पुढीलपैकी कोणत्याही दोहोंवर 8 - 10 ओळीत संक्षिप्त टीपा लिहा.

- i) भास्कराचार्यः
- ii) Importance of 'वैराग्य'
वैराग्याचे महत्त्व
- iii) Importance of 'पत्नी' in Raghuvamasa.
रघुवंशातील 'पत्नीचे महत्त्व'.

प्रश्न 4) Answer in 16 - 20 lines (any one) [8]

16 - 20 शब्दात उत्तर लिहा. (कोणत्याही एकाचे)

- i) Define सुभाषित and explain any two सुभाषित's from the lesson 'सुभाषितानि'
'सुभाषितानि' या पाठातील कोणतीही दोन सुभाषिते 'सुभाषिते म्हणजे काय?' हे सांगून स्पष्ट करा.
- ii) Write a summary of 'प्राचीनशास्त्रपरिचयः द्वितीयो भाग'
'प्राचीनशास्त्रपरिचयः द्वितीयो भागः' या पाठाचा सारांश लिहा.



Total No. of Questions : 4]

SEAT No.

P-697

[Total No. of Pages : 2

[5315]-234

S.Y. B.Sc (Semester - II)
ARABIC FUNCTIONAL
(2013 Pattern)

Maximum Marks : 40]

[Time : 2 Hours

Instructions to candidates :

- 1) *Attempt all questions.*
- 2) *Figures to the right indicate full marks.*

1. Translate into English Urdu Marathi any two of the following [10]

Passages پ;

(الف) الْحَمْدُ ثَابِتٌ لِلَّهِ . الْعَمَلُ ضَرُورِيٌّ لِلْعَالَمِ . أَلَا سِتَادُ جَالِسٌ
عَلَى الْكُرْسِيِّ . الْعِلْمُ نِعْمَةٌ لِّإِنْسَانٍ . أَنَا مَشْغُولٌ بِالْقِرَاءَةِ .
وَهُوَ مَشْغُولٌ فِي اللَّعِبِ . هُوَ وَاقِفٌ عَلَى الْاَرْضِ أَنَا مُسْلِمٌ
وَهُوَ الْيَضَا مُسْلِمٌ .

(ب) مَا فِي الرَّسْمِ يَا عَزِيزُ؟ فِي الرَّسْمِ قَفْصٌ وَفِي
القَفْصِ طَائِرٌ . هُوَ جَمِيلٌ . ذَلِكَ القِطُّ كَبِيرٌ .
ذَلِكَ الطَّائِرُ غَرَابٌ . وَهُوَ أَسْوَدٌ . الْعِلْمُ
مُفِيدٌ . ذَلِكَ الْكِتَابُ عَرَبِيٌّ . أَنَا مَشْغُولٌ
بِالْقِرَاءَةِ . وَهُوَ مَشْغُولٌ بِاللَّعِبِ .

(ج) قى هز الرسم أصيص وفي ذالك الأ صيص غرض.
على ذالك الغرس ورق. الأ دب واجب. هزا
جيد بالقراءة وذالك جيد في اللعاب. القرآن
كتاب. العلم مفيد. ذالك الكتاب عربي. هذا
الفار صغير. ذالك القط كبير.

2. Translate and Explain any five of the following verses : [10]

- | | | | |
|-------------------------------|-------|-----------------------------|-----|
| دُنْيَاكُمْ حَبِيبَةٌ | _____ | بِحُسْنِهَا وَالطَّيْبَةِ | (١) |
| لَا كِنَّهَا غَدَارَةٌ | _____ | خَدَاعَةٌ. غَرَارَةٌ | (٢) |
| عَزِيزُهَا دَلِيلٌ | _____ | كَثِيرُهَا قَلِيلٌ | (٣) |
| يَشْتَقِي الْبَهَا الْكَبِيبُ | _____ | وَيَتَعَبُ الْأَدِيبُ | (٤) |
| شَرُّ الْمَقَالِ الْكَذِبُ | _____ | خَيْرُ الْخِصَالِ الْأَدَبُ | (٥) |
| الْبُحْلُ عَيْبٌ فَاضِحٌ | _____ | وَالْجُودُ سِتْرٌ صَالِحٌ | (٦) |
| الْعَقْلُ قَاضٍ عَادِلٌ | _____ | وَالْعُجْبُ دَاءٌ قَاتِلٌ | (٧) |

3. Answer in Arabic any five of the following : [10]

- (١) مَنْ أَنْتِ؟
- (٢) كَيْفَ الزَّهْرُ؟
- (٣) هَلْ أَنْتِ صَغِيرٌ؟
- (٤) أَيُّ حَيَوَانٍ طَوِيلٌ؟
- (٥) أَيْنَ السَّمَكُ؟
- (٦) كَيْفَ الْقَطُّ؟
- (٧) مَنْ أَنْتِ؟

4. Write the letter in Arabic to your mother; [10]

اُكْتُبِ الرِّسَالَةَ إِلَى أُمِّكَ



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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[5315]-235

S. Y. B. Sc. (Vocational)

BIOTECHNOLOGY

VOC. Biotech-221- Plant and Animal Tissue Culture

(2013 Pattern) (Semester-II) (paper I)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*

Q1) Answer each of the following in 1-2 lines

[10]

- a) What are growth hormones? state their role in PTC.
- b) Define: Callus culture.
- c) Enlist different macro nutrients in MS medium.
- d) State the role of 70% alcohol in PTC.
- e) What is embryo culture? Enlist important steps involved in embryo culture.
- f) Define: Primary cell culture.
- g) State the role of trypsin in ATC.
- h) Name any two important media used in ATC.
- i) What are stem cells?
- j) Give any two important methods of cell Separation.

Q2) Write short notes on any two of the following.

[10]

- a) Trypsinisation in ATC.
- b) Protoplast culture.
- c) Cell banks.

P.T.O.

Q3) Answer any two of the following. **[10]**

- a) What is cell line? Explain any two methods of cell line characterisation.
- b) Importance of Aseptic techniques in PTC.
- c) 'Applications of PTC in plant propagation: Explain the importance.

Q4) What is organ culture? Explain various methods of organ culture with suitable diagram. **[10]**

OR

Explain various stages of micropropagation in PTC.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P699

[5315]-236

S. Y. B. Sc.

INDUSTRIAL CHEMISTRY (Vocational)

221: Unit Processes in Organic Chemical Industries

(2013 - Pattern) (Semester - II) (paper I)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*

Q1) Write balanced chemical equations with necessary conditions for the following Synthesis. **[16]**

- a) Benzene - Dodecyl benzene.
- b) Cellulose - Cellulose acetate.
- c) Toluene - Benzoic acid.
- d) Benzene - Nitrobenzene.
- e) Acetic acid - Chloroacetic acid.
- f) Chlorobenzene - Aniline
- g) Ethyl benzene - Styrene.
- h) Benzene - Chlorobenzene.

Q2) Attempt any two of the following. **[8]**

- a) Explain friedel - crafts acylation.
- b) How is acetylene obtained from vinyl ester?
- c) Describe catalytic hydrogenation.

P.T.O.

Q3) Answer any two of the following. **[8]**

- a) Write a note on Ozonolysis.
- b) What is Oxidation? Describe the role of KMnO_4 as an oxidising agent.
- c) Discuss types of esterification processes.

Q4) What is reduction? Define reducing agent. Describe two example of reduction using a metal and acid. **[8]**

OR

What is sulphonation? How is sulphonation of benzene carried out? Explain with the mechanism involved.



Total No. of Questions :4]

SEAT No. :

P700

[5315]-237

[Total No. of Pages :2

S. Y. B. Sc. (Vocational - I)
PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION -I
Colour Photography and Digital Photography
(2013 Pattern) (Semester-II) (Paper - III)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Draw neat labeled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following in short.

[16]

- a) Why is white balance important in digital photography?
- b) Which tool in image processing software is used for selecting a specific area or colour?
- c) Explain two important features of a CCD sensor.
- d) What is dynamic range of a digital sensor?
- e) Draw a histogram of a properly exposed image. Discuss the diagram you have drawn.
- f) Explain the source of 'noise' in a digital sensor.
- g) What is 'crop factor?' How dose it affect the image qualities?
- h) How is '18% grey' important for a photographer?

Q2) Attempt any two of the following.

[8]

- a) Draw a suitable diagram and explain the 'luminosity curve' of a normal human eye.
- b) Explain how the black body radiation curve is useful in defining the colour temperature of a light source.
- c) Describe the world without colours.

P.T.O.

Q3) Write short notes on any two of the following. **[8]**

- a) Use of filters in photography.
- b) Psychological impact of colours.
- c) Use of layer mask in image processing.

Q4) Attempt any one of the following. **[8]**

- a) Draw a diagram and discuss the spectral response of a normal human eye. Hence explain how human beings see colours.
- b) Draw a suitable diagram and explain the construction of a typical sensor used in a digital camera. Explain the purpose of each 'layer' and component of the sensor. Discuss the sequence of events taking place when the sensor is exposed to a 'scene'.



Total No. of Questions :4]

SEAT No. :

P701

[5315]-238

[Total No. of Pages :2

S.Y.B. Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE

**VOC- EEM - 221: Troubleshooting Electronic Equipment - B
(2013 Pattern) (Semester-II) (Paper - I)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

Q1) Answer the following.

- a) Give name of any two SMD packages. [1]
- b) State the three states of tri - state logic IC. [1]
- c) State the precaution for handling digital ICS. [1]
- d) State the advantage of SMD over through hole type device. [1]
- e) State the type of regulators. [2]
- f) State the procedure for testing counter ICS. [2]
- g) State the advantages of fixed three pin regulator. [2]
- h) State the features of surface mount technology. [2]

Q2) Answer any two of the following.

- a) Explain the procedure of troubleshooting high voltage power supply. [4]
- b) Discuss the steps in repairing SMPS. [4]
- c) Write a note on 'Fault Diagnosis chart' of oscilloscope. [4]

Q3) Answer any two of the following.

- a) Explain with block diagram the working of cordless telephone. [4]
- b) Discuss the troubleshooting procedure of cordless telephone. [4]
- c) Discuss the typical faults and their troubleshooting in Digital still camera. [4]

P.T.O.

Q4) Answer the following.

- a) Write a short note on 'Mobile phone'. [6]
- b) Explain the faults and their remedies in Mobile phone. [6]

OR

Q4) Answer the following.

- a) Discuss the procedure of testing decoder. [4]
- b) Explain with neat diagram the operation of logic probe and pulser. [4]
- c) Explain with neat diagram the working of logic comparator. [4]



Total No. of Questions : 4]

SEAT No. :

P1731

[Total No. of Pages : 2

[5315]-239

S.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Microprocessor & Interfacing Techniques

(2013 Pattern) (Paper - I) (Semester - II)

Time : 2 hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Attempt the following: **[4 × 1 = 4]**

- i) What is a MIDI?
- ii) List various controllers that are located on the motherboard.
- iii) State any two features of Android.
- iv) List various input and output devices available for modern PC.

b) Attempt the following: **[4 × 2 = 8]**

- i) What is Multimedia PC? State minimum requirement for it?
- ii) What is function of display adapter?
- iii) What is OS? List various OS available.
- iv) What is wi-fi? State applications of wi-fi.

Q2) Attempt any two of the following: **[2 × 4 = 8]**

- a) What is BIOS? Explain the important functions of BIOS.
- b) Write a note on storage devices and their techniques.
- c) Explain the concept of speech recognition in brief

P.T.O.

Q3) Attempt any two of the following: **[2 × 4 = 8]**

- a) What is Green PC? Explain the concept of thick and thin configuration.
- b) What are the different types of Printers? Explain in brief the advantages and disadvantage of any one.
- c) What is Bluetooth? Explain features and application of Bluetooth.

Q4) Attempt any two of the following: **[2 × 6 = 12]**

- a) What is function of ADD ON cards? List various ADD ON cards available for interface. Explain in brief features of any one.
- b) State the advantages of serial communication system. Explain in brief asynchronous and synchronous communication protocol.
- c) What is Network? State advantages of Network. Explain features of LAN.



Total No. of Questions :4]

SEAT No. :

P702

[5315]-240

[Total No. of Pages :2

S. Y. B. Sc.

**SEED TECHNOLOGY (Vocational)
Vegetable Seed Production
(2013 Pattern) (Semester - II) (paper - I)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat labelled diagrams wherever necessary.*

Q1) Attempt the following:

[10]

- a) What is sexual reproduction?
- b) Define self incompatibility.
- c) Give the types of hybridization.
- d) Write any two applications of population improvement.
- e) Give the diagrammatic representation for classifying the vegetable crops based on growing season in vegetable crops.
- f) What is isolation distance for foundation seed production in OKra?
- g) Which type of nursery bed is required for growing onion seedlings?
- h) Define seed drying.
- i) What is CMS?
- j) Write any two objectives of vegetable seed production.

Q2) Attempt any two of the following:

[10]

- a) Explain any two vegetative methods of reproduction in vegetable crops.
- b) Discuss genetic male sterility in detail.
- c) Write the objectives of hybridization techniques in vegetable crops.

P.T.O.

Q3) Write notes on any two.

[10]

- a) Bulk method.
- b) Progeny selection.
- c) Classification of vegetable crops based on plant parts used for consumption.

Q4) Answer any one of the following.

[10]

- a) Give an account of seed production in okra with reference to kind requirement, isolation, nursery management, cultural practices, roughing, plant protection, harvesting, seed extraction, drying and storage.

OR

- b) Give an account of seed production in bitter gourd with reference to land requirement, isolation, nursery management cultural practices, roughing, plant protection, harvesting, seed extraction, drying and storage.



Total No. of Questions :4]

SEAT No. :

P703

[5315]-241

[Total No. of Pages :2

S.Y.B. Sc.

INDUSTRIAL MICROBIOLOGY (Vocational)

**VOC- IND-MIC- 221: Fermentation Processes and Downstream
Processing**

(2013 Pattern) (Semester-II) (Paper - I)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labeled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[10]**

- a) Define Downstream Processing.
- b) The cell disruption is important step in isolation of extracellular enzyme.(True/False).
- c) Distillation can be used to separate a soluble solid from a solution.(True/False).
- d) Write structure of citric acid.
- e) Name any two microbes used as bioinoculant with respect to their plant growth promoting feature.
- f) The Production of L-glutamic acid by *C. glutamicum* is maximal at a critical ___ concentration, which is suboptimal for growth.
- g) State any two primary metabolites produced by microbes and obtained by fermentation process.
- h) Name any two chemicals which are used in precipitation of fermentation product.
- i) What is rennet?
- j) Disadvantages of extraction process.

P.T.O.

Q2) Answer any two of the following. **[10]**

- a) Write flow chart for glutamate production.
- b) Explain Vitamin B12 production.
- c) How Chromatography is used in product recovery?

Q3) Write short notes on any two of the following. **[10]**

- a) Vinegar production.
- b) Precipitation method in fermentation.
- c) Product polishing.

Q4) Answer any one of the following. **[10]**

- a) Discuss a typical process of bioinoculant production using flow chart. How is quality control employed in bioinoculant production?
- b) Describe the filtration as product recovery process in fermentation.



Total No. of Questions :4]

P704

SEAT No. :

[Total No. of Pages : 2

[5315]-242

S.Y.B.Sc.(Vocational-II)

INDUSTRIAL CHEMISTRY

Voc-222 : Industrial Pollution

(2013 Pattern) (Semester-II) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

Q1) Answer the following.

[16]

- a) Define night soil.
- b) Describe the term 'atmosphere'.
- c) What are trickling filters?
- d) Describe lagooning.
- e) Explain the term 'Electrodialysis'.
- f) Name two green house gases.
- g) Name the chemical constituents of London smog.
- h) Write two ill effects of NO_x .

Q2) Attempt any two of the following.

[8]

- a) Write a note on "Dairy wastes".
- b) Discuss radiation pollution.
- c) Distinguish between BOD and COD.

P.T.O.

Q3) Write short notes on any two of the following. [8]

- a) Thermal precipitator.
- b) Reverse Osmosis
- c) Photochemical smog.

Q4) Explain aerobic and anaerobic digestion process in sludge treatment. [8]

OR

Explain the source, hazardous effects of co pollution on human health. [8]



Total No. of Questions :4]

SEAT No. :

P705

[Total No. of Pages :2

[5315]-243

S.Y.B.Sc.

BIOTECHNOLOGY (Vocational-II)

Voc. Biotech-222 : Immunology and Medical Microbiology

(2013 Pattern) (Semester-II) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*

Q1) Answer each of the following in 1-2 lines:

[10]

- a) What is immunity?
- b) What is the difference between immunogenicity and antigenicity?
- c) Name the primary lymphoid organs.
- d) What are haptens?
- e) Name the predominant antibody type produced in primary immune response.
- f) What are toxoids?
- g) Enlist any two autoimmune diseases.
- h) What is the role of mast cells in hypersensitivity?
- i) Give the etiological agent of syphilis?
- j) What is dermatomycosis?

Q2) Write short note on any two of the following.

[10]

- a) Ig A
- b) Meningitis
- c) Primary immune response.

P.T.O.

Q3) Attempt any two of the following. **[10]**

- a) Describe type I hypersensitivity.
- b) Explain any two types of vaccines in detail.
- c) Describe polio disease in detail.

Q4) Explain humoral immune response in detail. **[10]**

OR

Describe typhoid with respect to etiological agent, characterization, morphology, preventive measures and control.



Total No. of Questions :4]

SEAT No. :

P706

[Total No. of Pages :2

[5315]-244

S.Y.B.Sc.(Vocational-II)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION
Principles & Applications of Analog and Digital Communications
(Semester-II) (Paper - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat and labeled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following questions.

- a) State whether the following statements are TRUE or FALSE. Justify your answers. **[2]**
 - i) Examples of transceivers include televisions, fax machines, cellular telephones, and computer modems.
 - ii) Most of the signals and waveforms that we discuss and analyze are expressed in the time domain whereas in telecommunication we discuss and analyze signals in the frequency domain as well.
- b) Comment on the following statements. **[4]**
 - i) mQAM and mPSK are normally used in old days MODEMs for high data transfer rate, where m denotes number of symbols.
 - ii) According to fourier analysis, complex signals and distorted sine waves are made up of a fundamental sine wave and numerous harmonic signals.
- c) Attempt the following. **[6]**
 - i) For a PAM transmission of a voice signal with $f_m = 3$ kHz, calculate the transmission bandwidth B_T , if the width of each pulse, $\tau = 0.1T_s$ and the sampling frequency $f_s = 8$ kHz.
 - ii) Give range of frequency and bandwidth for
 - a) Voice signal for telephony.
 - b) Music signal.
 - c) TV signal (Picture).
 - d) Digital data using MODEM (old system).

P.T.O.

Total No. of Questions :4]

P707

SEAT No. :

[Total No. of Pages : 2

[5315]-245

S.Y.B.Sc.(Vocational-II)

ELECTRONIC EQUIPMENT MAINTENANCE

VOC-EEM-222: Audio, Video & Office Equipment-B

(2013 Pattern) (Semester-II) (Paper - II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw Neat diagrams wherever necessary.*

Q1) Answer the following.

- a) Keyboard of PC can be replaced by mouse today comment. [1]
- b) What is multimedia computer? [1]
- c) What is OHP? Where is it used? [1]
- d) Write at least two I/P device to multimedia computer. [1]
- e) What is EPBAX? Give its relevance today. [2]
- f) Compare Desktop with Laptop Computer. [2]
- g) What is light pen? Where it is used? [2]
- h) Explain the role of ROM in PC . [2]

Q2) Attempt any two of the following:

- a) With neat diagram explain the working principle of LCD projector. [4]
- b) Explain the working principle of large screen display. [4]
- c) How to rectify/correct the common faults in PC. [4]

P.T.O.

Q3) Answer any two of the following.

- a) What are the types of mouse? How it works? [4]
- b) What is bar code ? Give its application. How to read bar code? [4]
- c) Give the technical specifications of PG computer Laptop with Desktop. [4]

- Q4)** a) Explain in details the working principle of slide projector. [6]
- b) Explain with neat diagram Photocopying machine. [6]

OR

- a) What is motherboard? Draw its block diagram .Explain the functions of different blocks in it. [6]
- b) Explain in details the working principle & touch screen. Give its application. [6]



Total No. of Questions : 4]

SEAT No. :

P3996

[Total No. of Pages : 2

[5315]-246

S.Y. B.Sc. (Vocational) (Semester - II)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Computer System Management - II (Paper - II)

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Attempt the following: [4 × 1 = 4]

- i) What is Wi-Fi?
- ii) State advantages of flash memories.
- iii) What is tablet PC?
- iv) What is function of RAM?

b) Attempt the following: [4 × 2 = 8]

- i) What is device driver?
- ii) State any two advantages of upgrading PC.
- iii) State any two features of iPhone.
- iv) What is Mainframe?

Q2) Attempt any two of the following: [2 × 4 = 8]

- a) List various Network devices and explain their function in brief.
- b) Write a short note on PC assembly procedure
- c) Explain in brief installation procedure of printer.

P.T.O

Q3) Attempt any two of the following:

[2 × 4 = 8]

- a) Write a note on maintenance and disposal of storage media.
- b) Write a note on LAN.
- c) What is BlackBerry? Explain features available in BlackBerry.

Q4) Attempt any two of the following:

[2 × 6 = 12]

- a) List various hardware components of a desktop system. Explain the need of upgrading PC.
- b) What is client-server? List various network devices. Explain any two devices in brief.
- c) What is software? List various types of software. Explain installation procedure of any one in brief.



Total No. of Questions :4]
P708

SEAT No. :
[Total No. of Pages : 2

[5315]-247
S.Y.B.Sc.(Vocational)
SEED TECHNOLOGY
Seed Quality Control
(Semester-II) (Paper - II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw Neat and labeled diagrams wherever necessary.*

Q1) Attempt the following.

[10×1=10]

- a) Write any one concept of seed quality.
- b) Define foundation seed.
- c) Name any two seed certification agencies.
- d) Write any two objectives of field inspection.
- e) What are off type plants?
- f) Define control legislation.
- g) Write any two duties of seed inspector.
- h) Who is responsible for establishment of central seed committee?
- i) Draw any two walking patterns in field inspection.
- j) Define isolation distance.

Q2) Attempt any two of the following:

[2×5=10]

- a) Describe standards for seed certification.
- b) Comment on seed certification agencies and its organization.
- c) Explain the powers of seed inspector.

P.T.O.

Q3) Write notes on (Any two).

[2×5=10]

- a) Seed legislation in India.
- b) Central seed testing laboratory.
- c) Specific crop standards.

Q4) Give an account of Biofertilizers, Biopesticides and pheromones.

[10]

OR

Explain in detail the methods of field inspection with suitable example.

.



Total No. of Questions :4]

P709

SEAT No. :

[Total No. of Pages : 2

[5315]-248

S.Y.B.Sc.

INDUSTRIAL MICROBIOLOGY (Vocational)
VOC-IND-MIC-222:Quality Assurance for Industrial
Fermentation Products
(2013 Pattern) (Semester-II) (Paper - II)

Time :2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks*
- 4) *Draw Neat labeled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines.

[10]

- a) What is potency of drug?
- b) In membrane filtration use membrane filters having a nominal pore size not greater than _____.
- c) Define 'Quality Assurance' according to ISO 9000.
- d) List the QA tests recommended for Streptomycin.
- e) Test organism *Pseudomonas aeruginosa* is grown in _____ medium.
- f) Seventh edition of Indian pharmacopoeia is published by _____.
- g) Comment on 'Growth promotion test'.
- h) The neutralizing agent used against interfering iodine is _____.
- i) State the full form of FDA.
- j) List the constituents of Fluid A .

P.T.O.

Q2) Answer any two of the following: **[10]**

- a) Describe the concept of 'Monograph' using a suitable example.
- b) Why QA is considered a managerial tool?
- c) Justify 'determining undue toxicity of a product is important'.

Q3) Write a short notes on any two of the following. **[10]**

- a) Soyabean -casein digest medium.
- b) BP
- c) Quality control.

Q4) Answer any one of the following. **[10]**

- a) How to determine microbial load of Penicillin?
- b) Discuss the in vitro and in vivo tests for pyrogens.



Total No. of Questions :4]

SEAT No. :

P710

[5315]-249

[Total No. of Pages : 2

S.Y.B.Sc.

MATHEMATICS

**MT - 222(B) : Numerical Methods and It's Applications
(2013 Pattern) (Semester - II) (Paper - II) (811B2)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of non programmable scientific calculator is allowed.*

Q1) Attempt any five of the following:

[10]

- a) Three approximate values of the number $\frac{2}{3}$ are given as 0.3, 0.33 and 0.34. Which of these three is the best approximation?
- b) Round-off the following numbers to four significant figures.
3.3465827, 15.235387, 5.37582, 0.00457328
- c) Derive Newton-Raphson formula to find square root of a given number C.
- d) State newton's formula for general interpolation with divided difference.
- e) Prove that $\nabla \equiv 1 - E^{-1}$.
- f) Evaluate $\left(\frac{\Delta}{E}\right)^2 x^3$ where interval of differencing being 1.
- g) Given that $\frac{dy}{dx} = -2y$, $y(0)=1$. Find $y(0.2)$ by Euler's method. (Take $h=0.2$. Perform one iteration).

P.T.O.

Q2) Attempt any Two of the following: [10]

- a) Prove that the n^{th} forward difference of a polynomial of degree n in x is constant when the values of independent variable are at equal intervals.
- b) Find the root of the equation $x^2 - 2x - 1 = 0$ between $x = 1$ and $x = 3$ by using false position method.
(Perform 4 iterations)
- c) Find the number of students who obtained less than 45 marks from the following data.

Marks	30-40	40-50	50-60	60-70	70-80
Number of students	31	42	51	35	31

Q3) Attempt any two of the following: [10]

- a) State and prove newton's formula for backward interpolation.
- b) Given that $\log 100=2$, $\log 101=2.0043$, $\log 103=2.0128$, $\log 104=2.0170$. Find $\log 102$.
- c) Find the best linear fit to the following data points:

x	1	2	3	4	5
y	3	4	5	6	8

Q4) Attempt any One of the following: [10]

- a) i) State general quadrature formula and hence derive Trapezoidal rule for numerical integration.
- ii) Given that $\frac{dy}{dx} = x + y$, $y(1)=0$, obtain Taylor's series for $y(x)$ and compute $y(1.2)$ correct upto four decimal places.
- b) i) Evaluate $\int_1^3 \frac{1}{x} dx$ by simpson's $\frac{1}{3}^{\text{rd}}$ rule.
Take $h=0.25$.
- ii) By using Runge-kutta method of fourth order find $y(1)$ if $\frac{dy}{dx} = \frac{x^2 + y^2}{10}$, $y(0) = 1$ Take $h=1$

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No.

P-711

[Total No. of Pages : 2

[5315]-250

**S.Y. B.Sc (Semester - II)
URDU General (Paper-II)
(2013 Pattern)**

maximum Marks : 40]

[Time : 2 Hours

Instructions to candidates :

- 1) *Attempt all questions.*
- 2) *Figures to the left indicate full marks.*

نوٹ:- تمام سوالات کے جوابات لازمی ہیں۔

خوشخطی کا لحاظ رکھیں۔

[10]

سوال نمبر ۱:- منشی پریم چند کی افسانہ نگاری کا مختصر جائزہ لیجئے۔

یا

منشی پریم چند کی حالات زندگی بیان کیجئے۔

[10]

سوال نمبر ۲:- افسانہ کے آغاز پر روشنی ڈالیں۔

یا

افسانے کے اجزائے ترکیبی بتائیے۔

[10]

سوال نمبر ۳:- کسی دو کرداروں کا تجزیہ کیجئے۔

۳۔ الوپی دین ۴۔ عباسی

۱۔ شری کنٹھ ۲۔ آمندی

P.T.O.

[10]

سوال نمبر ۴:- نیچے دئے گئے سائنٹفک اصطلاحات میں سے کوئی دس کا اردو میں ترجمہ کیجئے۔

1. Conduction
2. Boiling Point
3. Irregular reflection
4. Nuclear force
5. Solar Eclips
6. Biomass
7. Radiation
8. Micro organism
9. Density
10. Atomic weight
11. pesticide
12. Voltage
13. Components



Total No. of Questions : 4]

SEAT No. :

P712

[Total No. of Pages : 2

[5315] - 301

T.Y.B.Sc.

MATHEMATICS

MT - 331 : Metric Spaces

(2013 Pattern) (Semester - III) (Paper - I) (91113)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following:

[10]

- a) Does $d(x,y) = |\sin(x+y)|$ define a metric on \mathbb{R} ? Justify.
- b) In a discrete metric space \mathbb{R}_d , find $S_3(2)$ and $S_{\frac{1}{3}}[2]$.
- c) State true or false with justification: If A and B are subsets of \mathbb{R}_u such that $\bar{A} \subset \bar{B}$ then $A \subset B$.
- d) Let $A = \left\{ \frac{1}{n} / n \in \mathbb{N} \right\}$ be a subset of \mathbb{R}_u . Find ∂A (boundary of A).
- e) Let $Y = (0,1)$ be a subspace of \mathbb{R}_u and $A = \left(0, \frac{1}{2} \right]$. State with justification whether A is closed in Y.
- f) Give an example of compact set which is not connected and connected set which is not compact.
- g) Is the set $A = \left\{ \frac{1}{n} / n \in \mathbb{N} \right\} \cup \{0\}$ nowhere dense in \mathbb{R}_u ? Justify.

Q2) Attempt any two of the following:

[10]

- a) In a metric space (X,d) , prove that the arbitrary intersection of closed sets in X is closed.

P.T.O.

- b) Let A and B be subsets of a metric space (X, d) . Show that $\overline{A \cup B} = \overline{A} \cup \overline{B}$. Is it true that $\overline{A \cap B} = \overline{A} \cap \overline{B}$? Justify.
- c) Let (X, d) be metric space. Show that $|d(x, z) - d(z, y)| \leq d(x, y)$ for all $x, y, z \in X$.

Q3) Attempt any two of the following: **[10]**

- a) Let $f: (X, d) \rightarrow (Y, \rho)$ be a homomorphism. Prove that $F \subset X$ is closed in X if and only if $f(F)$ is closed in Y .
- b) Let (Y, d_Y) be a subspace of complete metric space (X, d) . If Y is closed then prove that Y is complete.
- c) Let \mathbb{C}_u be usual metric space with metric $d(z_1, z_2) = |z_1 - z_2|; z_1, z_2 \in \mathbb{C}$ (set of complex numbers). Show that \mathbb{C}_u is complete.

Q4) Attempt any one of the following:

- a) i) Prove that a metric space (X, d) is compact if and only if every collection of closed subsets of X having FIP (finite intersection property) has non-empty intersection. **[7]**
- ii) Prove that any finite subset of metric space (X, d) is compact. **[3]**
- b) i) Let (X, d) be metric space and $Y \subset X$ is connected. If $Z \subset X$ is such that $Y \subset Z \subset \overline{Y}$ then prove that Z is connected. Hence prove that \overline{Y} is connected. **[5]**
- ii) Let (X, d) be complete metric space and $A \subset X$. Prove that \overline{A} is compact if and only if A is totally bounded. **[5]**

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Total No. of Questions : 4]

SEAT No. :

P713

[Total No. of Pages : 2

[5315] - 302

T.Y.B.Sc.

MATHEMATICS

MT - 332 : Real Analysis - I

(2013 Pattern) (Semester - III) (Paper - II) (91123)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following:

[10]

- a) If $f(x)=x$ and $g(x)=-x$, $x \in \mathbb{R}'$ then find $\max(f,g)$ and $\min(f,g)$.
- b) Give an example of countable bounded subset A of \mathbb{R}' , whose g.l.b. and l.u.b. lies in $\mathbb{R}-A$.
- c) Give an example of unbounded sequence $\{S_n\}_{n=1}^{\infty}$ such that $\lim_{n \rightarrow \infty} \frac{S_n}{n} = 0$.
- d) If sequence $\{S_n\}_{n=1}^{\infty}$ converges to 0 then prove that $\{S_n\}_{n=1}^{\infty}$ converges to 0.
- e) Show that $\sum_{n=1}^{\infty} \frac{x^n}{m^n}$ converges for all $x \in \mathbb{R}'$.
- f) Define conditionally convergent series. Also, give an example of conditionally convergent series.
- g) Give an example of sequence $\{S_n\}_{n=1}^{\infty}$ in l^2 such that $\sum_{n=1}^{\infty} |S_n| = \infty$.

Q2) Attempt any two of the following:

[10]

- a) If $\{S_n\}_{n=1}^{\infty}$ and $\{t_n\}_{n=1}^{\infty}$ are real sequences such that $\lim_{n \rightarrow \infty} S_n = L$ and $\lim_{n \rightarrow \infty} t_n = M$ then prove that $\lim_{n \rightarrow \infty} S_n t_n = LM$.
- b) If $\{S_n\}_{n=1}^{\infty}$ is convergent sequence of real numbers then prove that $\limsup_{n \rightarrow \infty} S_n = \lim_{n \rightarrow \infty} S_n$.

P.T.O.

- c) If $\{S_n\}_{n=1}^{\infty}$ is real sequence such that $\lim_{n \rightarrow \infty} \frac{S_n - 1}{S_n + 1} = 0$ then show that $\lim_{n \rightarrow \infty} S_n = 1$.

Q3) Attempt any two of the following: **[10]**

- a) If $\{a_n\}_{n=1}^{\infty}$ is nonincreasing sequence of positive numbers such that

$$\sum_{n=0}^{\infty} 2^n a_{2^n} \text{ converges, then prove that } \sum_{n=1}^{\infty} a_n \text{ converges.}$$

- b) If $\sum_{n=1}^{\infty} a_n$ converges absolutely, then prove that $\sum_{n=1}^{\infty} a_n$ converges.

- c) Discuss convergence of series $\sum_{n=1}^{\infty} \frac{3}{4 + 2^n}$ and $\sum_{n=1}^{\infty} \frac{\left(1 + \frac{1}{n}\right)^{2n}}{e^n}$.

Q4) Attempt any one of the following: **[10]**

- a) i) Prove that every Cauchy sequence is bounded. Is converse true? Justify.
 ii) If A and B countable sets then show that cartesian product $A \times B$ is countable.
- b) i) Show that $(0,1)$ and $(0, \infty)$ are equivalent.
 ii) If $S = \{S_n\}_{n=1}^{\infty}$ and $t = \{t_n\}_{n=1}^{\infty} \in l^2$ then prove that $\sum_{n=1}^{\infty} S_n t_n$ converges

$$\text{absolutely and } \left| \sum_{n=1}^{\infty} S_n t_n \right| \leq \left(\sum_{n=1}^{\infty} S_n^2 \right)^{\frac{1}{2}} \left(\sum_{n=1}^{\infty} t_n^2 \right)^{\frac{1}{2}}.$$

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Total No. of Questions : 4]

SEAT No. :

P714

[Total No. of Pages : 3

[5315] - 303

T.Y.B.Sc.

MATHEMATICS

MT - 333 : Problem Course Based On MT - 331 & MT - 332

(2013 Pattern) (Semester - III) (Paper - III) (91133)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Answer to the two sections should be written in separate answer sheets.*
- 4) *Tie answer books of both sections together.*

SECTION - I

(Metric Spaces)

Q1) a) Attempt any three of the following: **[6]**

- i) Let \mathbb{R}_u be a usual metric space. Then for $a \in \mathbb{R}_u$ find $S_1(a)$ and $S_1[a]$.
- ii) Show that the discrete metric space X_d is bounded.
- iii) Find Å for the subset $A=(0, 1]$ in \mathbb{R} and $A=S_1[0]$ in \mathbb{R}^2 with respect to standard metric.
- iv) Let X be a set containing more than one point with discrete metric. Show that X is not connected.

b) Attempt any one of the following: **[4]**

- i) For $x=(x_1, x_2), y=(y_1, y_2) \in \mathbb{R}^2$, let $d_1(x, y)=|x_1-y_1|+|x_2-y_2|$ and $d_2(x, y)=\sqrt{(x_1-y_1)^2+(x_2-y_2)^2}$ be metrics for \mathbb{R}^2 .

Show that d_1 and d_2 are equivalent metrics.

- ii) Let $G=\left\{\left(\frac{1}{n}, 1\right) / n \in \mathbb{N}, n \geq 2\right\}$. Is G an open covering of $(0, 1)$?

Justify.

P.T.O.

Q2) Attempt any two of the following: **[10]**

- a) Show that any closed subset of a compact metric space is compact.
- b) Let $f: [0,1] \rightarrow \mathbb{R}$ be function given by $f(x) = \begin{cases} x & , \text{ if } x \text{ is rational} \\ 1-x & , \text{ if } x \text{ is not rational} \end{cases}$
then show that f is continuous only at $x = \frac{1}{2}$ in $[0,1]$.
- c) Let (x,d) be a metric space and let K be a fixed positive real number. For $x,y \in x$, define $d^*(x,y) = Kd(x,y)$. Prove that d^* is a metric on x .

SECTION - II

(Real Analysis - I)

Q3) a) Attempt any three of the following: **[6]**

i) Give an example of function which is one-one but not onto.

ii) Find $N \in \mathbb{I}$ such that $\left| \frac{2n}{n+3} - 2 \right| < \frac{1}{4}, (n \geq N)$.

iii) Evaluate: $\lim_{n \rightarrow \infty} \frac{n^2}{(n-7)^2 - 6}$.

iv) If the series $a_1 + a_2 + \dots$ converges to S , then prove that $a_2 + a_3 + \dots$ converges to $S - a_1$.

b) Attempt any one of the following: **[4]**

i) If for $n \in \mathbb{N}, S_n = \frac{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}{2 \cdot 4 \cdot 6 \cdot \dots \cdot 2n}$, then prove that $\{S_n\}_{n=1}^{\infty}$ is convergent.

ii) Prove that the series $\sum_{n=0}^{\infty} \frac{1}{(2n)!}$ is convergent.

Q4) Attempt any two of the following:

[10]

a) Show that the set $[0,1]=\{x \in \mathbb{R} \mid 0 \leq x \leq 1\}$ is uncountable.

b) Prove that the sequence $\left\{ \left(1 + \frac{1}{n} \right)^n \right\}_{n=1}^{\infty}$ is convergent.

c) Show that the series $\sum_{n=0}^{\infty} x^n$ converges to $\frac{1}{1-x}$ if $0 < x < 1$ and diverges if $x \geq 1$.

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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P715

[5315] - 304

T.Y.B.Sc.

MATHEMATICS

MT-334: Group Theory

(2013 Pattern) (Semester - III) (Paper - IV) (91143)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Five of the following:

[10]

- a) Let m and n be positive integers and consider a subgroup $H = \{mx + ny \mid x, y \in \mathbb{Z}\}$ of a group \mathbb{Z} . Show that H is a cyclic subgroup of \mathbb{Z} .
- b) Find the maximum possible order for an element of S_{15} .
- c) Let $\mu = (1, 2, 4, 5)(3, 6)$ in S_6 . Find the index of a subgroup $\langle \mu \rangle$ in S_6 .
- d) Let G be a finite group with identity e and let $a \in G$. Show that there exists a positive integer n such that $a^n = e$.
- e) Determine the condition under which the map $\phi: G \rightarrow G$ defined by $\phi(x) = x^{-1}, \forall x \in G$ is a group homomorphism?
- f) Show that a group of prime order is a simple group. Also, give an example of a non-cyclic simple group.
- g) Give an example of a group G having no element of finite order > 1 , but having a factor group G/H , all of whose elements are of finite order.

P.T.O.

Q2) Attempt any Two of the following: [10]

- a) Show that a non-empty subset H of a group G is a subgroup of G if and only if $ab^{-1} \in H$, for all $a, b \in H$.
- b) Let $\phi: G \rightarrow G'$ be a group homomorphism with kernel H . Prove that $\phi[G]$ is a group and is isomorphic to G/H .
- c) Show that there is no permutation σ such that $\sigma^{-1}(1, 2, 3)\sigma = (1, 3)(5, 7, 8)$.

Q3) Attempt any Two of the following: [10]

- a) Prove that a subgroup of a cyclic group is cyclic.
- b) Prove that every permutation σ of a finite set is a product of disjoint cycles.
- c) Show that the set of $n \times n$ matrices with determinant one form a normal subgroup of $GL(n, \mathbb{R})$.

Q4) Attempt any one of the following:

- a) i) Is the converse of the Lagrange theorem true in general? Justify. [4]
ii) Let $\phi: G \rightarrow G'$ be a group homomorphism. Prove that ϕ is a one-to-one map if and only if $\text{Ker}(\phi) = \{e\}$.
Also, show that $\text{Ker}(\phi)$ is a normal subgroup of G . [6]
- b) i) Show that the binary structure $\langle \mathbb{R}, + \rangle$ is isomorphic to the structure $\langle \mathbb{R}^+, \cdot \rangle$. [4]
ii) Prove that the group $\mathbb{Z}_m \times \mathbb{Z}_n$ is cyclic if and only if m and n are relatively prime. [6]

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Total No. of Questions :4]

SEAT No. :

P716

[Total No. of Pages :2

[5315] - 305

T.Y.B.Sc.

MATHEMATICS

MT - 335 : Ordinary Differential Equations

(2013 Pattern) (Semester - III) (Paper - V) (91153)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following.

[10]

- a) Find the general solution of the differential equation $(D^2 - 4D + 7)y = 0$.
- b) Find the particular solution of the differential equation $(D^2 + 9)y = \sin 3x$.
- c) If $y_1=1$ is one solution of the equation $xy'' + 3y' = 0$, then find another solution y_2 of this equation.
- d) Classify all singular points in the finite plane of the differential equation
$$x(3x + 1)y'' - (x + 1)y' + 2y = 0.$$
- e) Show that $x = 2e^{4t}$, $y = 3e^{4t}$ are solutions of homogeneous system

$$\frac{dx}{dt} = x + 2y, \quad \frac{dy}{dt} = 3x + 2y.$$

- f) Find a power series solution of the differential equation $y' + y = 0$.
- g) Form a homogeneous linear differential equation with constant coefficients whose solution is $y = 5 + xe^{2x}$.

P.T.O.

Q2) Attempt Any two of the following.

[10]

- a) With usual notation prove that $\frac{1}{D^2 + a^2} \cos ax = \frac{x}{2a} \sin ax$.
- b) Solve the differential equation $(D^2 - 2D + 1)y = x^2 e^{3x}$.
- c) Solve the differential equation $(D^5 - D^3)y = 1$.

Q3) Attempt any two of the following.

[10]

- a) Explain the method of undetermined coefficients to solve non homogeneous linear differential equations with constant coefficients.
- b) Solve the differential equation $(D^2 + 1)y = \sec x \tan x$, by method of variation of parameters.
- c) Solve the differential equation $(D^2 + 2D + 1)y = \frac{1}{(e^x - 1)^2}$, by reduction of order method.

Q4) Attempt any one of the following.

[10]

- a) i) If $x = x_1(t), y = y_1(t)$; and $x = x_2(t), y = y_2(t)$ are two solutions of the equations $\frac{dx}{dt} = a_1(t)x + b_1(t)y, \frac{dy}{dt} = a_2(t)x + b_2(t)y$, then show that $x = c_1 x_1(t) + c_2 x_2(t), y = c_1 y_1(t) + c_2 y_2(t)$ is also its solution.
- ii) Solve the system of equations

$$\frac{dx}{dt} = 4x - y, \quad \frac{dy}{dt} = -4x + 4y.$$

- b) Find the power series solution of the differential equation

$$(1 - x^2)y'' - 2xy' + p(p + 1)y = 0.$$



Total No. of Questions : 4]

SEAT No. :

P717

[Total No. of Pages : 3

[5315] - 306

T.Y.B.Sc.

MATHEMATICS

MT-336: Problem Course Based on MT-334 and MT-335

(2013 Pattern) (Semester - III) (Paper - VI) (91163)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Write both sections on separate answer books and tie together.*

SECTION-I

(Group Theory)

Q1) a) Attempt any three of the following: **[6]**

- i) Determine whether the binary operation* defined on \mathbb{Z} by letting $a * b = a - b$ is commutative. Is it associative?
- ii) Let (\mathbb{Q}, \cdot) be a binary structure with multiplication. Let $\phi: \mathbb{Q} \rightarrow \mathbb{Q}$ defined by $\phi(x) = x^2, \forall x \in \mathbb{Q}$. Show that ϕ is a homomorphism. Is ϕ an isomorphism? Justify.
- iii) Let G be a group of order pq where p and q are prime numbers. Show that every proper subgroup of G is cyclic.
- iv) Let $\sigma(1, 2, 5, 4)(2, 3) \in S_5$. Find the index of $\langle \sigma \rangle$ in S_5 .

b) Attempt any one of the following: **[4]**

- i) List all subgroups of \mathbb{Z}_{50} and draw its subgroup diagram.
- ii) Let H be a subgroup of group G and $g \in G$. Show that order of subgroups H and gHg^{-1} are same.

P.T.O.

Q2) Attempt any one of the following: **[10]**

- a) i) Let G be a group and g be one fixed element of G . Show that the map i_g such that $i_g(x) = gxg^{-1}$, for $x \in G$ is an isomorphism of G .
- ii) Show that a group that has only a finite number of subgroups must be a finite group.
- b) i) Let H be a subgroup of $\mathbb{Z}_4 \times \mathbb{Z}_6$ generated by $(0, 1)$. List all elements of the factor group $\frac{\mathbb{Z}_4 \times \mathbb{Z}_6}{H}$. Also, find the order of $(2, 0) + H$.
- ii) Let $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 8 & 7 & 6 & 5 & 2 & 4 & 3 & 9 & 1 \end{pmatrix} \in S_9$. Then
- 1) Express τ as product of disjoint cycles.
 - 2) Express τ as product of transpositions.
 - 3) Determine whether τ is odd or even permutation.
 - 4) Find inverse of τ .
 - 5) Find order of τ .

SECTION-II

(Ordinary Differential Equations)

Q3) a) Attempt any three of the following: **[6]**

- i) Solve $y''' - 4y'' + y' + 6y = 0$.
- ii) Find a homogeneous linear differential equation with real, constant coefficients which satisfied by $y = 6 + 3xe^x - \cos x$.
- iii) Verify that $y = e^x$ is a solution of the equation $(x-1)y'' - xy' + y = 0$.
- iv) Show that $y = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$ is a solution of $y'' + y = 0$.

b) Attempt any one of the following: [4]

i) Find the particular solution of the differential equation:

$$(D^3 - 3D - 2)y = 0; y(0) = 0, y'(0) = 0 \text{ \& } y''(0) = 0.$$

ii) Solve: $(D^2 + 1)y = 2$ by using variation of parameter methods.

Q4) Attempt any Two of the following: [10]

a) Solve the system: $\frac{dx}{dt} = 8x - y$

$$\frac{dy}{dt} = 4x + 12y.$$

b) Solve: $y'' + 4y = 0$ by using power series method.

c) Solve: $y'' - 3y' - 4y = 6e^x$ by using the method of undetermined coefficients.

EEE

Total No. of Questions :4]

SEAT No. :

P718

[Total No. of Pages :4

[5315] - 307

T.Y.B.Sc.

MATHEMATICS

MT - 337 (A) : Operations Research

(2013 Pattern) (Semester - III) (Paper - VII) (911A3)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculator or log table is allowed.*

Q1) Attempt any five of the following.

[5×2=10]

- a) What do you mean by redundant constraint in L.P.P.?
- b) Define unit worth of a resource.
- c) Justify whether true or false: Assignment problem is a special case of transportation problem.
- d) Solve the following L.P.P.
Maximize $z = 3x_1 + 2x_2$
Subject to $x_1 \leq 2, x_1, x_2 \geq 0$.
- e) Identify the direction of increase in z of the function maximize $Z = 2x_1 - x_2$.
- f) Write the dual of the following L.P.P.

$$\text{Maximize } z = 2x_1 - x_2$$

$$\text{Subject to } x_1 + 2x_2 = 5$$

$$3x_1 + 7x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

P.T.O.

- g) Find the initial basic feasible solution of the following transportation problem by least cost method.

	I	II	III	IV	Supply
A	10	30	20	13	5
B	22	9	7	16	10
C	4	32	5	29	15
Demand	5	5	10	10	

Q2) Attempt Any two of the following.

[2×5=10]

- a) Ozark Farms uses at least 800 lb of special feed daily. The special feed is a mixture of corn and soyabean meal with the following compositions:

lb per lb of feed stuff

Feedstuff	Protein	Fiber	Cost (\$/lb)
corn	0.09	0.02	0.30
Soyabean meal	0.6	0.06	0.90

The dietary requirements of the special feed are at least 30% protein and at most 5% fiber. Formulate the problem as a linear programming 50 as to minimize the cost of the feed mix.

- b) Solve the following L.P.P. by graphical method.

$$\text{Maximize } z = 3000x + 2000y$$

$$\text{Subject to } x + 2y \leq 6$$

$$2x + y \leq 8$$

$$y \leq 2$$

$$x - y \geq -1$$

$$x, y \geq 0$$

- c) Solve the following L.P.P. by simplex method.

$$\text{Maximize } z = 3x_1 + 9x_2$$

$$\text{Subject to } x_1 + 4x_2 \leq 8$$

$$x_1 + 2x_2 \leq 4$$

$$x_1, x_2 \geq 0.$$

Q3) Attempt any two of the following.

[2×5=10]

- a) Find the optimal solution of following assignment problem. Also find alternate optional solution if it exists.

	I	II	III	IV	V
A	3	9	2	3	7
B	6	1	5	6	6
C	9	4	7	10	3
D	9	6	2	4	5
E	2	5	4	2	1

- b) Four operators are to be assigned to four machines. The assignment costs in dollars are given as below. Operator 1 cannot be assigned to machine C. Also operator 3 cannot be assigned to machine D. Find the optimal assignment.

		Machine			
		A	B	C	D
Operator	1	5	5	—	2
	2	7	4	2	3
	3	8	3	5	—
	4	7	2	6	7

- c) Find the initial basic feasible solution of the following transportation problem by VAM.

	F ₁	F ₂	F ₃	supply
A	9	6	0	5
B	5	1	0	20
C	3	2	4	10
D	7	5	2	15
Demand	25	10	15	

Q4) Attempt any one of the following.

[1×10=10]

a) Solve the following L.P.P. by Big M-method.

$$\text{Minimize } Z = 600x_1 + 500x_2$$

$$\text{Subject to } 2x_1 + x_2 \geq 80$$

$$x_1 + 2x_2 \geq 60$$

$$x_1, x_2 \geq 0.$$

b) Find the optimal solution of the following transportation problem.

Warehouses	W_1	W_2	W_3	W_4	Supply
F_1	1	2	1	4	30
Factory F_2	3	3	2	1	50
F_3	4	2	5	9	20
Demand	20	40	30	10	



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P719

[5315] - 308

T.Y.B.Sc.

MATHEMATICS

MT-337(B): Dynamical Systems

(2013 Pattern) (Semester - III) (Paper - VII) (911B3)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Five of the following:

[10]

a) Is the equilibrium point $(0, 0)$ a saddle point for the system $X' = \begin{bmatrix} -2 & 1 \\ -1 & 1 \end{bmatrix} X$?

Justify.

b) Find the eigenvalues and eigenvectors of $\exp(A)$ if $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$.

c) Find the eigenvalues and eigenvectors of $A = \begin{bmatrix} 1 & 3 \\ \sqrt{2} & 3\sqrt{2} \end{bmatrix}$.

d) Give an example of a system of differential equations for which $(t, 1)$ is a solution for $t > 0$.

e) For which values of k and b is the system $X' = \begin{bmatrix} 0 & 1 \\ -k & -b \end{bmatrix}$ a center?

Justify.

P.T.O.

f) Find the stable and unstable line of the system $X' = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} X$.

g) If $\lambda, \mu \in \mathbb{R}$ then show that, $\exp \begin{bmatrix} \lambda & 0 \\ 0 & \mu \end{bmatrix} = \begin{bmatrix} e^\lambda & 0 \\ 0 & e^\mu \end{bmatrix}$.

Q2) Attempt any two of the following: **[10]**

a) If V_0 is an eigenvector of $A_{n \times n}$ with associated eigenvalue λ , then show that $X(t) = e^{\lambda t} V_0$ is a solution of the system $X' = AX$.

b) Show that $x^2 - y^2 = 1$ is a solution of the system $X'(t) = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} X(t)$ passing through $(1, 0)$.

c) Find the general solution of $X' = AX$ and sketch the phase portrait if

$$A = \begin{bmatrix} 0 & 1 \\ -4 & 0 \end{bmatrix}.$$

Q3) Attempt any two of the following: **[10]**

a) Let A be an $n \times n$ matrix. Show that the initial value problem $X' = AX$ with $X(0) = X_0 \in \mathbb{R}^n$ has unique solution $X(t) = \exp(tA)X_0$.

b) Let A be a 3×3 matrix for which λ is the only eigenvalue. If $\ker(A - \lambda I) = 2$ then show that there exists a 3×3 matrix T such that,

$$T^{-1}AT = \begin{bmatrix} \lambda & 1 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix}.$$

c) Find the general solution of $X' = \begin{bmatrix} -1 & 0 \\ 1 & -2 \end{bmatrix} X$ and sketch the phase portrait of the system.

Q4) Attempt any two of the following:

[10]

- a) Let A be a 2×2 matrix which has two real distinct eigenvalues λ_1, λ_2 with associated eigenvectors V_1, V_2 . Show that $T^{-1}AT = \begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix}$ is the canonical form of matrix A .

- b) Find the canonical form of $A = \begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 1 \\ -1 & -1 & 2 \end{bmatrix}$.

- c) Find the exponential of $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$.

EEE

Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P720

[5315] - 309

T.Y.B.Sc.

MATHEMATICS

MT- 337 (C) : C Programming - I

(2013 Pattern) (Semester - III) (Paper - VII) (911C3)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculator or log table is allowed.*

Q1) Attempt any Five of the following.

[10]

- a) What is difference between 5 and '5'?
- b) Evaluate $5\% 2 \times 3 + 6 - 4$.
- c) Explain meaning of the following statements.
 - i) float class [10];
 - ii) int sum (int a, int b);
- d) What are keywords? List any two.
- e) Explain conditional operator.
- f) What is C language? Who developed it?
- g) Which of the following are valid identifiers?
 - i) 2class
 - ii) Class -1

P.T.O.

Q2) Attempt Any Two of the following. [10]

- a) Write a short note on a while loop.
- b) Write a short note on types of operators.
- c) Write a C program to generate Fibonacci sequence upto n terms.

Q3) Attempt any two of the following. [10]

- a) Write a short note on a switch statement.
- b) Explain one dimensional array.
- c) Write a C program to find g.c.d. of two numbers using function.

Q4) Attempt any One of the following. [10]

- a)
 - i) Explain break and continue statement.
 - ii) Write a C program to check whether a given number is perfect or not.
- b)
 - i) Explain use of printf function with an example.
 - ii) Describe the output generated by the following C program.

```
# include <stdio.h>
main ()
{
int x = 1, y = 1, z, i;
for (i = 1; i <= 5, i++)
{
z = x + y;
printf (“\n %d”, z);
x = y;
y = z;
}
}
```



Total No. of Questions :4]

SEAT No. :

P721

[Total No. of Pages :2

[5315] - 310

T.Y.B.Sc.

MATHEMATICS

MT- 337 (D) : Lattice Theory

(2013 Pattern) (Semester - III) (Paper - VII) (911D3)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Five of the following.

[10]

- a) Define a partially ordered set.
- b) Let P be an ordered set and $x, y \in p$. prove that if $x \leq y$ then $\downarrow x \subseteq \downarrow y$.
- c) Draw the Hasse diagram of $M_2 \oplus M_3$.
- d) Is the ordered set $\{1, 2, 4, 8, 16\}$ a lattice? Where divisibility as a partial order relation. Justify your answer.
- e) Show that the intersection of two sublattices of a lattice is a sublattice.
- f) Give an example of a lattice which is modular but not distributive.
- g) Draw a circuit diagram of $(xvy') \wedge z \wedge (wvx')$.

P.T.O.

Q2) Attempt any two of the following. **[10]**

- a) Define linear sum of two ordered sets.
Draw the linear sum of $\bar{1} \oplus \bar{2} \oplus \bar{3}$.
- b) State and prove connecting lemma.
- c) Let L and K be bounded lattices and $f : L \rightarrow K$ be a $\{0,1\}$ -homomorphism. Prove that $f^{-1}(0)$ is an ideal and $f^{-1}(1)$ is a filter of L .

Q3) Attempt any two of the following. **[10]**

- a) State and prove Knaster Tarski fix point theorem.
- b) Let L be a lattice satisfying DCC. Suppose $a, b \in L$ and $a \not\leq b$. Prove that there exists a join irreducible element x such that $x \leq a$ and $x \not\leq b$.
- c) If L is a distributive lattice then prove that any sublattice of L is also distributive.

Q4) Attempt any One of the following. **[10]**

- a)
 - i) Let L denote a lattice of all positive divisors of 100 with divisibility as a partial order relation. list all ideals of L .
 - ii) Show that any chain is a distributive lattice.
- b)
 - i) Show that the homomorphic image of modular lattice is modular.
 - ii) Put the function $f = [(x \wedge y)' \vee z'] \wedge (x' \vee z)'$ in the disjunctive normal form.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :3

P722

[5315] - 311

T.Y.B.Sc.

MATHEMATICS

MT- 337 (E) : Financial Mathematics

(2013 Pattern) (Semester - III) (911E3)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of non-programmable calculator is allowed.*

Q1) Attempt any Five of the following.

[10]

- a) Define the term : Equilibrium set.
- b) Define the term : Perfect competition.
- c) Define the term : Startup point.
- d) Define elasticity of demand. Give it's relation to revenue.
- e) Explain when cobweb model is stable.
- f) What is technology matrix?
- g) If S consist of the pair (q, p) Such that $3q - 2p = 18$. Determine the supply function $q^s(p)$ and inverse supply function $p^s(q)$.

P.T.O.

Q2) Attempt any two of the following: **[10]**

- a) Suppose the market for a commodity is governed by supply and demand sets defined as follows. The supply set S is the set of pairs (q, p) for which $q - 6p = -12$ and the demand set D is the set of pairs (q, p) for which $q + 2p = 40$. Sketch S and D and determine the equilibrium set $E = S \cap D$, the supply and demand functions q^S, q^D , and the inverse supply and demand functions p^S, p^D .
- b) Suppose you have won a competition and that you are given the choice between \$ 180000 now or \$ 10000 at the start of each year, for the rest of your life. Assume that the bank has a constant interest rate 6% and that you currently have no debts. Which option should you choose if you think you will live
 - i) until 65,
 - ii) until 100,
 - iii) forever?
- c) Determine whether the cobweb models predicts stable or unstable equilibrium for the market with
 - i) $q^S(p) = 0.05p - 4, q^D(p) = 20 - 0.15p$.
 - ii) $q^S(p) = 2p - 3, q^D(p) = 18 - p$.

Q3) Attempt any two of the following. **[10]**

- a) Suppose you own a piece of land whose value $V(t)$ after t years is $V(t) = e^{\sqrt{t}}$. Assuming that interest on a bank deposit will be compounded continuously at the equivalent annual rate of 12.5%, write down an expression for the present value of the amount realised by selling the land after t years, and determine the optimum time to sell.
- b) In each of the following cases find.
 - i) all points where the derivative of the function is zero;
 - ii) the points in the given interval where the function attains its maximum and minimum values:
 - I) $2x^3 - 9x^2 + 12x$ in $[0, 2]$;
 - II) $x \sin x + \cos x$ in $[0, 2]$.
- c) Idlers Incorporated is a monopoly with cost function $C(q) = q^3 - 105q^2 + 140q + 200$,

the demand set for its product is

$$D = \{(q, p) \mid p + q^2 - 5q = 100\},$$

and the upper limit on its production is 150. Find the level of production q_m which maximises the firm's profit and determine the maximum profit Sketch a graph of the profit function $\pi(q)$.

Q4) A) Attempt any One of the following: [10]

- a) Suppose that Alpern and co. is an efficient small firm which cannot produce more than 6 units of its product each week. If their cost function is $C(q) = 100 + 20q - 6q^2 + q^3$ determine:
- i) their fixed cost,
 - ii) their profit function ,
 - iii) their startup point,
 - iv) their breakeven point,
 - v) their supply set.

- b) Use the method of elementary row operations to express the vector $(6, 4, 9)$ as a linear combination of the vectors $(3, 1, 5)$ $(-3, 7, 10)$, $(5, 5, 15)$.

- B) a) consider an economy with three industries: coal, electricity, railways To produce \$1 of coal requires \$ 0.25 worth of electricity and \$ 0.25 rail costs for transportation. To produce \$1 of electricity requires \$0.65 worth of coal for fuel, \$0.05 electricity for the auxiliary equipment, and \$0.05 for transport. To provide \$1 worth of transport the railway requires \$0.55 coal for fuel and \$0.10 electricity, Each week the external demand for coal is \$ 50, 000. and the external demand for electricity is \$25,000. There is no external demand for the railway. What should be the weekly production schedule for each industry?

- b) A factory makes three products, X, Y, and Z. The production process for these products are interrelated. To produce \$1 of X requires 0.005 units (in dollars) of X, 0.1 of Y and 0.1 of Z. To produce \$1 of Y requires \$0.4 worth of X and 0.1 of Z . To produce \$1 worth of Z requires 0.1 of X and 0.2 of Y. Each week the external demands for X, Y and Z are 200, 500 and 1500 units, respectively. What should be the weekly production level of each good?

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P723

[5315] - 312

T.Y. B.Sc.

MATHEMATICS

MT-337 (F): Number Theory

(2013 Pattern) (Semester-III) (Paper-VII) (911F3)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any FIVE of the following.

[10]

- a) If c/b and $(b,c) = 1$ then prove that c/a .
- b) Evaluate $\sum_{j=1}^n \mu(j!)$.
- c) Find the values of $\left(\frac{2}{17}\right)$ and $\left(\frac{-2}{17}\right)$.
- d) Find two Pythagorean triples whose terms form an arithmetic progression.
- e) Find highest power of 5 dividing $3000!$
- f) Prove that for any real number x , $0 \leq x - [x] < 1$.
- g) Find the last digit in the ordinary decimal representation of 3^{101} .

Q2) Attempt any TWO of the following.

[10]

- a) Apply Wilson's theorem to show that
 $18! + 1 \equiv 0 \pmod{19}$ and $18! + 1 \equiv 0 \pmod{23}$.
- b) State and prove the chinese Remainder Theorem.
- c) Prove that the number of primes is infinite.

P.T.O.

Q3) Attempt any TWO of the following.

[10]

- a) If p and q are distinct odd primes, then show that

$$\left(\frac{p}{q}\right)\left(\frac{q}{p}\right) = (-1)^{\left(\frac{p-1}{2}\right)\left(\frac{q-1}{2}\right)}$$

- b) Use Euclidean algorithm to obtain the g.c.d. 'd' of 3997 and 2947. Also find integers x and y such that $d = 3997x + 2947y$
- c) Prove that the function $\mu(n)$ is multiplicative function and hence show that

$$\sum_{d|n} \mu(d) = \begin{cases} 1, & \text{if } n=1 \\ 0, & \text{if } n \neq 1 \end{cases}$$

Q4) Attempt any ONE of the following.

[10]

- a) i) A pineapple worth Rs.5, a coconut Rs.1 and 20 oranges together Rs.1 How many pineapples, coconuts and oranges totaling 100 can be bought for Rs.100?
- ii) Find the form of all positive integers n satisfying $d(n) = 10$. what is the smallest positive integer such that $d(n) = 10$?

- b) i) Prove that $ax \equiv ay \pmod{m}$ if and only if $x \equiv y \pmod{\frac{m}{(a,m)}}$.

- ii) Find a positive integer n such that $\frac{n}{2}$ is a square, $\frac{n}{3}$ is a cube and

$\frac{n}{5}$ is fifth power.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P724

[5315] - 313

T.Y.B.Sc.

PHYSICS

PH-331 : Mathematical Method in Physics - II

(2013 Pattern) (Semester - III) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*

Q1) Attempt all of the following: (One mark each)

[10]

- a) Write generating function for Hermite polynomials.
- b) State the postulate of special theory of relativity.
- c) State Fuch's theorem.
- d) State degree of differential equations.
- e) Define orthogonal co-ordinate system.
- f) Define Metric coefficients.
- g) What is length contraction?
- h) What is partial differential equation? Give one example.
- i) What is co-ordinate system.

j) State order and degree of differential equation $\frac{d^3 y}{dx^3} + \frac{\sqrt{d^2 y}}{dx^2} + x = 0$

Q2) Attempt any two of the following: (5 Mark each)

[10]

- a) Prove that $J_{n+1}(x) + J_{n-1}(x) = \frac{2n}{x} J_n(x)$.
- b) Derive an expression for length contraction on the basis of Lorentz transformation equation.
- c) Find the element of arc length and volume element in cylindrical coordinates.

P.T.O.

Q3) Attempt any two of the following: (5 Mark each) **[10]**

- a) Show that the point $x=0$ is a regular singular point of the Bessel differential equation $x^2y''+xy'+(x^2-n^2)y=0$.
- b) Prove that the spherical polar co-ordinate system is orthogonal.
- c) Show that the point $x=\infty$ is a regular singular point of the Legendre's differential equation $(1-x^2)y''-2xy'+l(l+1)=0$.

Q4) a) Attempt any one of the following: **[8]**

- i) Obtain power series solution of $y''-2xy'+2\lambda y=0$ for $x=0$.
- ii) Describe Micheson-Morley experiment and explain the physical significance of negative result.

b) Attempt any one of the following: **[2]**

- i) Prove that $P_n(1)=1$.
- ii) What is the increase in relativistic mass of a particle of rest mass 1 gm when it is moving with velocity $0.8c$?

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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P725

[5315] - 314

T.Y.B.Sc.

PHYSICS

PH-332 : Solid State Physics

(2013 Pattern) (Semester - III) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use of log tables and calculator is allowed.*

Q1) Attempt all of the following: (One mark each)

[10]

- a) Define packing fraction.
- b) Define the term symmetry operation.
- c) State Bragg's diffraction condition in reciprocal lattice.
- d) What is nearly free electron model.
- e) What do you mean by quantitative analysis?
- f) Define Fermi energy.
- g) What are domains?
- h) What is Neel temperature?
- i) Define super conductors.
- j) Define primitive unit cell.

Q2) Attempt any two of the following: (5 Marks each)

[10]

- a) Discuss crystal structure of NaCl in details.
- b) With the help of Ewald's construction show that the diffraction condition in reciprocal lattice is exactly equivalent to $2d \sin \theta = n\lambda$ in the direct lattice.
- c) Write a note on type-I and type - II superconductors.

P.T.O.

Q3) Attempt any two of the following: (5 Marks each) **[10]**

- a) Find out the number of atoms per square millimeter on a plane (100) of lead whose interatomic distance is 3.499 \AA . Lead has Face-centred cubic structure.
- b) In a Hall effect experiment on Zinc, a potential of $4.5 \mu\text{V}$ is developed across a foil of thickness 0.02 mm . When a current of 1.5 A is passed in a direction perpendicular to a magnetic field of 2.0 T . Calculate
- The Hall coefficient for Zinc.
 - The electron density.
- (Given: Charge on electron = $1.6 \times 10^{-19} \text{ C}$).
- c) A paramagnetic substance has 10^{28} atoms/ m^3 . The magnetic moment of each atom is $1.79 \times 10^{-23} \text{ A-m}^2$. Calculate the paramagnetic susceptibility of the material at temperature 320°K . What would be the dipole moment of the rod of this material 0.1 m long and 1 cm^2 cross-section placed in a field of $7 \times 10^4 \text{ A/m}$? ($K = 1.38 \times 10^{23} \text{ J/}^\circ\text{K}$, $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/A-m}$).

Q4) a) Attempt any one of the following: (Eight marks) **[8]**

- State three assumptions of Sommerfeld's free electron model and obtain an expression for energy levels and density of states in one dimension.
 - Write detailed note on TGA and Ultraviolet visible spectrophotometer.
- b) Attempt any one of the following: (two marks) **[2]**
- What are ferrites? Give two examples.
 - Sketch (112) and (2,0,0) planes in simple cubic cell.

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Total No. of Questions :4]

P726

SEAT No. :

[Total No. of Pages : 2

[5315]-315

T.Y.B.Sc.

(PHYSICS)

PH-333 : Classical Mechanics

(2013 Pattern) (Paper - III) (Semester-III)

Time : 2Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of Logtables and Calculators is allowd*

Q1) Attempt all of the following (1mark each).

[10]

- a) Define Centre of mass of a system.
- b) What is the effect of Magnetic field on the kinetic energy of a charged particle.
- c) What is geosynchronous orbit?
- d) Define apsidal distance.
- e) What do you mean by total cross-section in Scattering process?
- f) What is impact parameter?
- g) What do you mean by degree of freedom?
- h) State D'Alembert's principle.
- i) What is the condition for a transformation to be canonical?
- j) Write Jacobis identity.

Q2) Attempt any two of the following.

- a) State and prove kepler's third law of planetary motion. **[5]**
- b) Obtain the relation between scattering angles in LAB and CM systems. **[5]**
- c) What do you mean by constraints? Explain holonomic and nonholonomic constraints with suitable examples. **[5]**

P.T.O.

Q3) Solve any two of the following.

- a) A body is projected at such an angle that the horizontal range is 3 times the maximum height. calculate the angle of projection. **[5]**
- b) Evaluate following poisson's bracket.
 - i) $[J_x, P_x]$ **[5]**
 - ii) $[J_x, P_y]$ **[5]**
- c) A geostationary satellite is orbiting the earth at a height of $11 R_e$ above the surface of earth, where R_e is radius of earth. Calculate the time period of another satellite at height of $5 R_e$ from surface of earth. **[5]**

Q4) a) Attempt any one of the following.

- i) Write the Hamiltonian of the system in terms of lagrangian. Obtain Hamilton's canonical equations of motion. **[8]**
- ii) What is inelastic scattering? Obtain the Q-value equation in inelastic scattering process. **[8]**
- b) Attempt any one of the following.
 - i) show that the poisson bracket of any two dynamical variables is anti-commutative. **[2]**
 - ii) What is central force? Give examples. **[2]**



Total No. of Questions :4]

P727

SEAT No. :

[Total No. of Pages : 2

[5315]-316

T.Y.B.Sc.

PHYSICS

**PH-334 : Atomic and Molecular Physics
(2013 Pattern) (Paper - IV) (Semester-III)**

Time : 2Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of Logtables and Calculator is allowed.*

Q1) Attempt all of the following (one mark each).

[10]

- a) State any two limitations of Bohr's theory.
- b) State Pauli's exclusion principle.
- c) What is ground state of an electron?
- d) State the values of m_l for $l=4$.
- e) State formula for wavelength of Balmer series.
- f) What is the conclusion of Frank-Hertz experiment?
- g) What is the physical significance of principal quantum number?
- h) Define equivalent electrons.
- i) State Bohr's first postulate in Bohr's theory.
- j) State formula for reduced mass of molecule.

Q2) Attempt any two of the following.

- a) What is Raman effect? Describe experimental set up to observe Raman spectra. **[5]**
- b) State and explain Lande Interval rule. Represent it graphically for 3D term. **[5]**
- c) Obtain an expression for rotational energy level of rigid diatomic molecule. **[5]**

P.T.O.

Q3) Attempt any two of the following.

- a) In an experiment of Raman effect using mercury green radiation of $\lambda = 546.1 \text{ nm}$, a stoke's line of wavelength 554.3 nm was observed. Find Raman shift and wavelength corresponding to anti-Stoke's line. [5]
- b) A sample of certain element is placed in 1 Tesla magnetic field and suitably excited. How far apart are the zeeman components of the 5000 \AA spectral line of this element?

Given: $e = 1.6 \times 10^{-19} \text{ C}$, $m = 9.11 \times 10^{-31} \text{ kg}$, $c = 3 \times 10^8 \text{ m/s}$. [5]

- c) The force constant of the bond in CO molecule is 1956 N/M Calculate the frequency of vibration of the molecule and the spacing between its vibrational energy levels in eV. [5]

Given: $h = 6.63 \times 10^{-27} \text{ erg-sec}$, $1 \text{ eV} = 1.6 \times 10^{-12} \text{ erg}$.

$c = 3 \times 10^8 \text{ m/s}$, $\mu = 1.16 \times 10^{-26} \text{ kg}$.

Q4) a) Attempt any one of the following.

- i) What are x-rays? Discuss in detail production of characteristic x-ray spectra with energy level diagram. [8]
- ii) Obtain an expression for spin-orbit interaction energies for two valence electron system (LS coupling). [8]

b) Attempt any one of the following.

- i) What are 'L' and 'S' quantum numbers corresponding to 3D_2 ? [2]
- ii) What is vibrational-rotational spectrum? [2]



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P728

[5315] - 317

T.Y.B.Sc.

PHYSICS

**PH - 335 : Computational Physics
(2013 Pattern) (Semester - III) (Paper - V)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculator or log table is allowed.*

Q1) Attempt all of the following (one mark each).

[10]

- a) What is flow chart?
- b) Define Key words.
- c) What is library function?
- d) Define the term error.
- e) Why break statement is used?
- f) What is pixel?
- g) Write general format of scanf function.
- h) What do you mean by user defined function?
- i) Give uses of gets () and puts () functions.
- j) Give two examples of Jump statements.

P.T.O.

Q2) Attempt any two of the following.

- a) Evaluate $\int_4^{5.2} \ln(x)dx$ using Trapezoidal rule. [5]
- b) Describe relational and logical operators in C. [5]
- c) Write 'C' program to draw line, circle, ellipse, and bar. [5]

Q3) Attempt any two of the following.

- a) Find root of x^4-x-10 using Newton - Raphson method. [5]
- b) Explain storage classes with suitable examples. [5]
- c) What is array? Explain with suitable examples. [5]

Q4) A) Attempt any ONE of the following.

- a) i) Describe simpson's $\frac{1}{3}^{\text{rd}}$ method of computing integral. [4]
- ii) What is meant by looping? Describe two forms of looping. [4]
- b) i) Write an algorithm to print N prime numbers. [4]
- ii) Write a program to calculate and print square of the number. [4]

B) Attempt any ONE of the following.

- a) Why C language is a middle level language. [2]
- b) Find the output of the following 'C' program. [2]

```
# include <stdio.h>
main ( )
{ int i=5;
While (i)
{i - -;
if (i == 3)
break;
Printf ("%d", i);
}
}
```



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :12

P729

[5315] - 318

T.Y.B.Sc.

PHYSICS

PH - 336 (A) : Astronomy and Astrophysics

(2013 Pattern) (Semester - III) (Elective - I) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

Q1) Attempt all of the following.

[10]

- a) What are white Dwarfs?
- b) What are meteors?
- c) What is meant by a main squence star?
- d) What is the use of image intensifier tube?
- e) State kepler's laws of planetary motion.
- f) State Wien's law.
- g) What is cosmic microwave background radiation?
- h) What is a Radio Galaxy?
- i) Where do comets originate from?
- j) What are Binary stars?

P.T.O.

Q2) Attempt any two (five marks each)

- a) What is meant by solar maxima and solar minima? [5]
- b) What is Butterfly Diagram? [5]
- c) Explain the cassegrain reflector telescope. [5]

Q3) Attempt any two (Five marks each)

- a) What are the advantages of Radio Telescopes over optical Telescopes? [5]
- b) How is rotational period of a star obtained from its spectra. [5]
- c) What is Non- optical Astronomy? [5]

Q4) A) Attempt any one

- a) Explain the formation of Heavier element in stars. [8]
- b) Write a short note on Quasar Red shift. [8]

B) Attempt any one

- a) What is steady state cosmology? [2]
- b) What is a Neutron star? [2]



Total No. of Questions :4]

P729

[5315] - 318

T.Y.B.Sc.

PHYSICS

PH - 336 (B) : Elements of Material Science

(2013 Pattern) (Semester - III) (Elective - I) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of log table and calculator is allowed.*

Q1) Attempt all of the following.

[10]

- a) What is tensile strength of material?
- b) What do you mean by eutectic temperature?
- c) Define electrical resistivity of material.
- d) Give any two properties of single phase alloys.
- e) What do you mean by addition polymerization?
- f) Why tempered glasses are used for windows of car?
- g) Define smart materials.
- h) State lever rule.
- i) Define diffusivity.
- j) What do you mean by degree of polymerization?

Q2) Attempt any two of the following. **[10]**

- a) Explain organic polymer with an illustration of polyethylene polymer and state the unique characteristics of organic polymer.
- b) State and explain Fick's first law of diffusion.
- c) Distinguish between elastic and plastic deformation.

Q3) Attempt any two of the following. **[10]**

- a) Copper has resistivity of 17×10^{-9} ohm-m. What is the resistance of copper wire of length 4m and radius of 0.04 cm.
- b) Calculate the volume of unit cell and density of compound of cds having structure same as ZnS. The centres of unlike ions are separated by 2.5 \AA . The atomic weight of cd is 112.4 dmu and that of S is 32.1 amu.
- c) A tensile stress of 10 MNm^{-2} is applied along the [112] direction of an iron crystal. What is the shear stress in the (010) direction lying on the (001) plane?

Q4) a) Attempt any one of the following. **[8]**

- i) What are phase diagrams? Explain the phase diagram of lead -tin (pb-sn) system qualitatively.
- ii) Explain ZnS and NaCl type Ax structure.

b) Attempt any one of the following. **[2]**

- i) Enlist any four applications of smart materials.
- ii) What do you mean by condensation polymerization?



Total No. of Questions :4]

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T.Y.B.Sc.

PHYSICS

PH - 336 (C) : Motion Picture Physics

(2013 Pattern) (Semester - III) (Elective - I) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*

Q1) Attempt all questions.

[10]

- a) What is angle of view?
- b) Define the term: Perspective.
- c) State types of Enlarger.
- d) What are film formats.
- e) What is depth of field.
- f) Write shutter speed scale.
- g) List the contents of fixer.
- h) What are special lenses?
- i) What is ideal shutter?
- j) State different types of printing methods.

Q2) Attempt any two of the following.

- a) What are the factors affecting the developing process? Explain in brief. **[5]**
- b) Explain the characteristics and types of films. **[5]**
- c) Explain advantages and disadvantages of any one type of camera shutter. **[5]**

Q3) Attempt any two of the following.

- a) Explain wide angle and Tele photo lenses. **[5]**
- b) Explain Indoor Lighting setup. **[5]**
- c) Explain operation of focal plane shutter. **[5]**

Q4) a) Attempt any one of the following.

- i) Explain construction, working and features of SLR camera. **[8]**
- ii) Describe different stages involved in processing of photographic materials and the chemicals used at these stages. **[8]**

b) Attempt any one of the following.

- i) Draw a neat labelled diagram of TLR camera. **[2]**
- ii) What do you mean by equivalent exposure. **[2]**



Total No. of Questions :4]

P729

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T.Y.B.Sc.

PHYSICS

PH - 336 (D) : Biophysics

(2013 Pattern) (Semester - III) (Elective - I) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of log tables and calculator is allowed.*

Q1) Attempt all of the following.

[10]

- a) Define the term 'Biometry'.
- b) What is x-rays.
- c) State the principle of colorimeter.
- d) What do you mean by biopotential.
- e) Define the term 'diffusion'.
- f) Define bond length.
- g) Define Resting potential.
- h) What do you mean by ECG?
- i) Define 'Half cell potential'.
- j) Define surface tension.

Q2) Attempt any two of the following.

- a) Explain the structural aspects of Mitochondria. [5]
- b) Explain the construction and working of glass electrode. [5]
- c) Explain Ramchandran plot. What is its physical significance. [5]

Q3) Attempt any two of the following.

- a) Describe crystallography as a method for a structure determination of biomolecules using NmR. [5]
- b) Describe in detail SEM with suitable examples. [5]
- c) Describe the construction and working of centrifuge. [5]

Q4) a) Attempt any one of the following.

- i) What is spectro photometer? Explain construction and working of spectro photometer. [8]
- ii) What is polarization Describe in detail polarizable and non-polarizable electrodes with suitable examples. [8]

b) Attempt any one of the following.

- i) If heart rate 80 beats/ min. and paper speed is 40 mm/sec, calculate the distance between two consecutive R waves. [2]
- ii) Define the term 'Resistive transducers'. [2]



Total No. of Questions :4]

P729

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T.Y.B.Sc.

PHYSICS

PH - 336 (E) :Renewable Energy Sources

(2013 Pattern) (Semester - III) (Elective - I) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of log tables and calculators is allowed.*

Q1) Attempt all of the following.

[10]

- a) What is gasifier?
- b) State the principle of solar dryer.
- c) What is wind energy?
- d) What is solar constant?
- e) What are non-conventional sources of energy?
- f) Define efficiency of solar cell.
- g) State two factors affecting bio-digestion.
- h) Define diffuse radiation.
- i) State any two advantages of biological conversion of solar energy.
- j) What is solar concentrator?

Q2) Attempt any two.

- a) Describe various types of wind machine rotors. [5]
- b) Write a note on solar cooker. [5]
- c) State the advantages and disadvantages of floating and fixed dome type plant. [5]

Q3) Attempt any two.

- a) Calculate the efficiency of solar cell using the following data.
Given : $V_{oc} = 400\text{mV}$, $I_{sc} = 40\text{mA}$, F.F. = 0.7 Input power of the cell = $6 \times 10^{-2}\text{W}$. [5]
- b) The solar radiation intensity leaving the surface of the sun is $5.961 \times 10^7 \text{ W/m}^2$ and radius of sun surface is $6.960 \times 10^8 \text{ m}$. If the sun emits radiation pically then determine the radiant flux crossing the surface.
[Given : mean earth-sun distance = $1.5 \times 10^{11} \text{ m}$]. [5]
- c) With suitable diagram, discuss the structure of sun. [5]

Q4) a) Attempt any one

- i) Describe the construction and working of solar distillation and solar water heater (Natural circulation). [8]
- ii) Discuss in detail presentation of wind data. What is energy audit? [8]

b) Attempt any one.

- i) State the energy balance equation for the collector. [2]
- ii) State the advantages of biological conversion of solar energy. [2]



Total No. of Questions :4]

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T.Y.B.Sc.

PHYSICS

PH - 336 (F) : Applied Optics

(2013 Pattern) (Semester - III) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Note :- 1) All Questions are compulsory.

2) Figures to the right indicate full marks.

3) Draw neat diagrams wherever necessary.

Q1) Attempt All of the following.

[10]

- a) Define Nodal Points.
- b) State Malus law.
- c) What are coherent sources?
- d) What is Rochon Prism?
- e) Give any one application of Fermat's principle.
- f) What are unit planes?
- g) Define the term Numerical aperture.
- h) Define photo - voltaic detector.
- i) What are the types of losses in optical fibre?
- j) What are cardinal points?

Q2) Attempt any two of the following. **[10]**

- a) Obtain the system matrix for a thin lens.
- b) Give theory & construction of a half wave plate.
- c) Write a note on Gaussian beam propagation.

Q3) Attempt any two of the following:- **[10]**

- a) Using Fermat's principle establish the laws of refraction of light.
- b) Explain APD photodiode in detail.
- c) Calculate the NA & acceptance angle of an optical Fibre.

Given : μ (core) = 1.55, μ_2 (cladding) = 1.50

Q4) a) Attempt any one:- **[8]**

- i) Explain the phenomenon of interference of thin film due to transmitted light & obtain the expression for minima & maxima.
- ii) Explain non - destructive testing in detail.

b) Attempt any one:- **[2]**

- i) Define photo emissive detector.
- ii) Define Matrix method.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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T.Y.B.Sc.

CHEMISTRY

CH-331 : PHYSICAL CHEMISTRY

(2013 Pattern) (Paper - V) (Semester - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of log table and calculator is allowed.
- 5) Actual calculations must be shown while solving problems.

Q1) Answer the following:

[10]

- a) Write the exponential form of Arrhenius equation.
- b) Write relationship between $t_{1/2}$ & initial concentration of reactant(a) for third order reaction.
- c) Define equivalent conductance what is its unit?
- d) Transport number of cation is 0.837 calculate transport number of Anion.
- e) State Snell's law.
- f) What is C-Br bond length in bromobenzene if its dipole moment is 1.75 D?
- g) Define the terms
 - i) Wavelength.
 - ii) Frequency.
- h) Why CO_2 molecule does not show rotational spectra?
- i) What is degree of freedom?
- j) Calculate the no. of phases for the system having $F=3$ and $C=2$.

Q2) a) Attempt any two of the following:

[6]

- i) Explain half life method for determination of order of reaction.
- ii) Explain the electrophoretic effect.
- iii) Explain stokes and antistokes line in Raman Spectra.

P.T.O.

- b) Solve ANY ONE of the following: [4]
- A first order reaction is 50% completed in 30 min at 27°C and in 10 min at 47°C. Calculate the activation energy of the reaction.
 - The dielectric constant of CH₄(g) at 0°C and 1atm pressure is 1.00094, Assuming that methane behaves as an ideal gas, calculate
 - The induced molar polarization.
 - The polarizability of the substance.

Q3) Attempt any two of the following: [10]

- What is specific & equivalent conductance? Explain the effect of dilution on specific and equivalent conductance.
- Derive exponential form of Arrhenius equation.
- Discuss main features of the phase diagram of two component system.

Q4) a) What is vibrational motion? State equation of fundamental vibration frequency $\bar{\omega}$ & discuss pure vibrational spectrum in case of heteronuclear molecules. [6]

OR

Attempt the following:

- How solubility of Sparingly Soluble salt is determined by conductance measurement?
 - Define phase, component and Degree of freedom.
- b) Solve the following (any one): [4]
- Calculate rotational constant of NO molecule if bond length is 1.15 Å (At. wt. N=14, O=16 $h=6.624 \times 10^{-27}$ erg sec., Avogadro's number = 6.023×10^{23} C = 3×10^{10} Cm).
 - At 25°C the equivalent conductance of 0.1 N acetic acid is 5.2 cm² ohm⁻¹ equivalent⁻¹. λ_{∞} for acetic acid is 390.7 cm² ohm⁻¹ equivalent⁻¹. Calculate the dissociation constant of acetic acid at 25°C.

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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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T.Y.B.Sc.

CHEMISTRY

CH-332 : Inorganic Chemistry

(2013 Pattern) (Paper - VI) (Semester - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*
- 4) *Marks are reserved for neat diagram.*
- 5) *Atomic numbers : He-2; Be-4; C-6; O-8; V-23; Cr-24; Ni-28 Cu-29; Zn-30.*

Q1) Answer the following:

[10]

- a) Calculate bond order of He₂ molecule.
- b) Give oxidation state of Fe in [Fe(Co)₅].
- c) Define hydrate isomerism.
- d) What is EAN rule?
- e) What are possible geometries for coordination number 4?
- f) Calculate the stabilization energy of Be₂ molecule.
- g) What type of hybridization is shown by [Ni(CN)₅]³⁻ ion?
- h) Calculate CFSE for d⁶ ion in strong octahedral field.
- i) Give the symmetry symbol for dx²-y² and dz² orbitals.
- j) Give any two limitations of CFT.

Q2) a) Answer any two of the following:

[6]

- i) Draw M.O. energy level diagram of C₂ molecule and calculate bond order.
- ii) Give assumptions of Valence bond theory (VBT).

P.T.O.

iii) Write IUPAC names following complexes:

- 1) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- 2) $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$
- 3) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$

b) Answer any two of the following: [4]

- i) Sketch the MOs formed from 'p-p' combination of atomic orbitals.
- ii) What are the factor's affecting magnitude of $10 Dq$?
- iii) State whether EAN rule is obeyed in the following Complexes
 - 1) $[\text{Cu}(\text{CN})_4]^{2-}$
 - 2) $[\text{V}(\text{CO})_6]$

Q3) Answer any two of the following: [10]

- a) Explain the formation of CO and CO^+ ion on the basis of MOT.
- b) Discuss the formation of $[\text{Zn}(\text{NH}_3)_6]^{2+}$ ion without 'pi' bonding on the basis of MOT.
- c) For the $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Cr}(\text{CN})_6]^{4-}$ the Δ_0 values are 17830cm^{-1} and 26280cm^{-1} respectively. The pairing energy is 23520cm^{-1} . Calculate the number of unpaired electrons and magnetic moment.

Q4) a) With the help of MO energy level diagram explain the formation of ' O_2 ' molecule and comment how does bond order and magnetic property vary in O_2^- , O_2^{2-} and O_2^+ ions. [6]

OR

- a) Answer the following: [6]
 - i) Discuss stepwise and overall formation constant.
 - ii) Give the Crystal field splitting diagram for square planer complex.
- b) Answer any one of the following: [4]
 - i) Give postulates of Werner's Coordination theory.
 - ii) Draw all possible geometrical isomers of $[\text{pt}(\text{NH}_3)_2(\text{PY})_2(\text{Cl})_2]$ complex. Which isomers shows optical activity?

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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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T.Y.B.Sc.

CHEMISTRY

CH-333 : Organic Chemistry

(2013 Pattern) (Paper - III) (Semester - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw the structure and neat diagrams if necessary.

Q1) Answer the following:

[10]

- a) Why amides are neutral?
- b) Trans 1, 3 - dimethyl cyclohexane is optically active explain.
- c) Which is a good nucleophile amongst $\overset{\ominus}{\text{M}}\text{H}_2$ & MH_3 .
- d) Why cyclopropanone easily form hydrate with water?
- e) What is E_2 reaction?
- f) What is σ -complex?
- g) What is kinetic isotopic effect?
- h) Write the reaction of 2-butyne with Lindlar catalyst.
- i) How will you convert bad leaving group - OH into good leaving group.
- j) Write the reaction of acetaldehyde with hydroxylamine.

Q2) a) Answer any two of the following

[6]

- i) Guanidine is very strong base. Explain.
- ii) Discuss the mechanism of Reformatsky reaction.
- iii) What is ozonolysis? Explain the addition of ozone to 1-propene.

b) Answer any two of the following:

[4]

- i) Explain Steric effect with suitable example.
- ii) What are arynes? Give evidences for it.
- iii) Explain E_1CB mechanism with suitable example.

P.T.O.

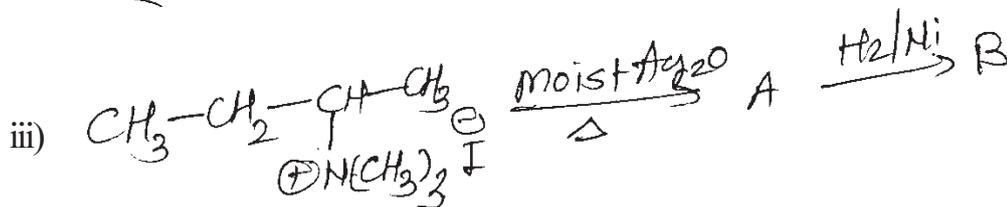
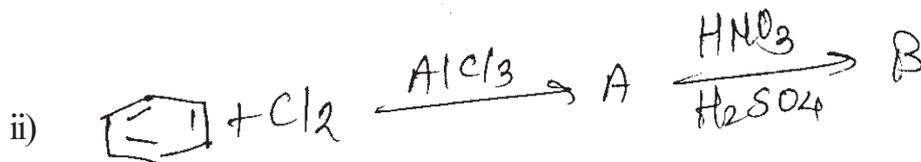
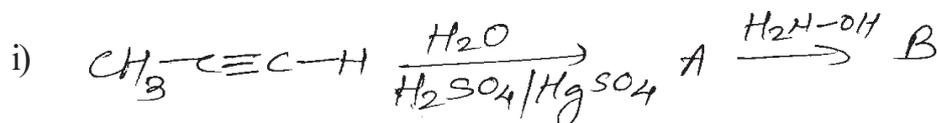
Q3) Answer any two of the following: [10]

- Draw the chair conformations of trans-1, 4-dimethyl cyclohexane and comments on their stability and optical activity.
- What is E_1 mechanism? Discuss the evidences for E_1 mechanism.
- What is SN^1 reaction? Discuss the stereo chemistry of SN^1 reaction.

Q4) a) Answer any two of the following: [6]

- Discuss the Friedel craft acylation? Give its applications.
- Trans 2-butene on hydroxylation by OsO_4 gives dl products. Why?
- Give the mechanism of benzaldehyde with hydrazine.

b) Predict the products with mechanism (any two): [4]



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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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T.Y.B.Sc.

CHEMISTRY

CH-334 : ANALYTICAL Chemistry

(2013 Pattern) (Paper - IV) (Semester - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator and logarithmic table is allowed.*

Q1) Answer the following:

[10]

- a) Define the term solubility.
- b) Define co-precipitation.
- c) What is residual current.
- d) Define Lambert's law.
- e) Define the term migration current in polarography.
- f) What is meant by chemical interference in AAS.
- g) Give solubility product equation for BaCO_3 .
- h) Draw a Typical T.G. curve.
- i) Name any two fuels used in FES
- j) Calculate absorbance of a solution if it has transmittance 0.5.

Q2) a) Answer any two of the following

[6]

- i) Write note on total consumption burner.
- ii) Give principle of polarography and explain the role of supporting electrolyte in polarography.
- iii) Write short note on photomultiplier tube.

P.T.O.

- b) Answer any two of the following: [4]
- Draw and explain the pyrolysis curve for Magnesium Oxalate.
 - When current of 2.5 Amp. Passed through AgNO_3 solution for 30 min during electrolysis. Calculate weight of Ag deposited (ECE of Ag= 1.118×10^{-3}).
 - Calculate the molar absorptivity of 3×10^{-4} M solution having 0.28 Absorbance when passed in 1.5 cm path length.

Q3) Answer any two of the following: [10]

- What is difference between co-precipitation and post-precipitation. How will you minimize co-precipitation.
- Draw schematic diagram of FES and explain component used in it.
- Define Beer's law. Derive mathematical equation of Beer's law.

Q4) a) Explain the principle of AAS and differentiate between AAS and FES. [6]

OR

- What is thermogravimetric analysis and give labeled diagram of thermobalance. [3]
 - Explain principle of Electrogravimetry. Define Faraday's first law with terms involved in it. [3]
- b) The solubility product of $\text{Mg}(\text{OH})_2$ is 1.2×10^{-11} at 25°C . Calculate solubility of $\text{Mg}(\text{OH})_2$ in water in grams/Lit. (Mol. wt. of $\text{Mg}(\text{OH})_2$ is 58) [4]

OR

Calculate the diffusion coefficient of Cu^{2+} ion of 2×10^{-3} M CuSO_4 solution shows $45 \mu\text{A}$. The mercury drop time is 3.75 second per drop and mass of Hg flowing per second through capillary is 1.011 mg/s. [4]

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Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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T.Y.B.Sc.

CHEMISTRY

CH - 335 : Industrial Chemistry

(2013 Pattern) (Semester - III) (Paper - V)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams and flow sheet wherever necessary.*

Q1) Answer the following.

[10]

- a) Explain the term selectivity.
- b) Give two important uses of nitric acid.
- c) What is salting?
- d) Give uses of cement.
- e) What is lubricant?
- f) Define the term unit operation.
- g) What are antioxidants?
- h) What is glass?
- i) What are herbicides?
- j) Draw the structure of sulphuric acid fog.

P.T.O.

Q2) a) Answer any two of the following. [6]

- i) Explain the terms process control and quality control.
- ii) Give important uses of ammonia.
- iii) Give advantages of agrochemicals.

b) Answer the following. (any two) [4]

- i) Explain the terms capital investment and manufacturing cost.
- ii) Write a note on coloured glass.
- iii) What are safety precautions that should be taken in chemical process industry?

Q3) Answer any two of the following. [10]

- a) Explain the properties of good fuel.
- b) Discuss the manufacture of starch from corn with flowsheet.
- c) Discuss the importance of proportioning of raw material in manufacture of cement.

Q4) a) Give synthesis and applications of [6]

- i) DDT
- ii) Endosulphan

OR

a) Describe the process of manufacture of nitric acid with flow sheet.

b) Define the terms ignition temperature and fire point. [4]

OR

b) Discuss modern techniques of food preservation.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :12

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T.Y.B.Sc.

CHEMISTRY

CH - 336 (A) : Nuclear Chemistry

(2013 Pattern) (Semester - III) (Paper - VI) (913A3)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams whenever necessary.*
- 4) *Use of logtables and calculator is allowed.*

Q1) Answer the following.

[10]

- a) What is mass defect? Give the relation between binding energy & mass defect.
- b) Which of the following nuclei is least stable?
 - i) ${}^4_2\text{He}$
 - ii) ${}^{16}_8\text{O}$
 - iii) ${}^{24}_{12}\text{Mg}$
 - iv) ${}^2_1\text{H}$
- c) What is anode electron?
- d) State the magic numbers in shell model.
- e) State two general characteristics of radioactive decay processes.

P.T.O.

- f) The half life of radioactive element is 140 days. What is the value of decay constant.
- g) What are thermonuclear reactions?
- h) Complete the following nuclear reaction ${}^9_4\text{Be} + \text{---} \rightarrow {}^{12}_6\text{C} + {}^1_0\text{n}$.
- i) State one example of conservation of proton in nuclear reaction.
- j) What is internal conversion?

Q2) a) Attempt any two of the following. **[6]**

- i) Write short notes on theory of α -decay.
- ii) Define photonuclear reaction. What are the different types of photonuclear reaction?
- iii) Explain periodicity in nuclear properties.

b) Attempt any two of the following. **[4]**

- i) Calculate the energy released in the following fission reaction.



Atomic masses are 249

$$\text{Es} = 249.076 \text{ amu}$$

$$\text{n} = 1.0087 \text{ amu}$$

$${}^{161}\text{Gd} = 160.928 \text{ amu}$$

$${}^{87}\text{Br} = 86.022 \text{ amu}$$

- ii) Explain the sequence of filling the orbit in nuclear model
- iii) What is reaction cross section? What is its unit?

Q3) Answer any two of the following. **[10]**

- a) State and explain semi-empirical mass equation.
- b) Explain Bethe's notation. What are the different types of nuclear reactions.
- c) Explain different tuypes of radioactive decay processes with examples.

Q4) a) Explain Fermi theory of β decay. [6]

OR

a) Give salient features of shell model. What are the merits and limitations of the shell model? [6]

a) Describe liquid drop model in detail giving postulates. [4]

OR

b) Define half life and average life show that radioactive decay follows first order Kinetics. [4]



Total No. of Questions :4]

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T.Y.B.Sc.

CHEMISTRY

**CH - 336 (B) : Polymer Chemistry
(2013 Pattern) (Semester - III) (Paper - VI)**

Time : 2 Hours]

[Max. Marks :40

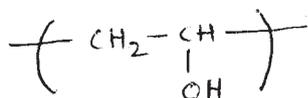
Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use of log tables and calculator is allowed.*

Q1) Answer the following.

[10]

- a) Define the term – polymerisation.
- b) Polymer celluloid was invented by ----.
- c) Draw the structure of following polymers.
 - i) Polystyrene
 - ii) Teflon
- d) Write the IUPAC name of



- e) Give any two initiator used in anionic polymerisation.
- f) State whether the following statement is true or false.
'Silicone polymer is an inorganic polymer'.

- g) What is meant by biopolymer?
- h) Name any two commonly used U.V. stabilizer.
- i) Calculate molecular weight of polypropylene whose DP value is 2000.
- j) Give any two important application of polyvinyl chloride.

Q2) a) Explain the following. [6]

- i) Polymer science has tremendously developed over the last few decades.
 - ii) Nylon – 6, 6 is used for making Fisherman's nets.
 - iii) In polymer solution, saturation point is absent.
- b) How will you distinguish between the following. (any two) [4]
- i) Homopolymers and co-polymers.
 - ii) Thermoplastic and thermosetting polymers.
 - iii) Free radical and ionic polymerisation.

Q3) Answer any two of the following. [10]

- a) Discuss in brief the mechanism of co-ordination polymerisation.
- b) Give an account of end group analysis method used for determination of molecular weight of polymer.
- c) Describe the melt and solution polymerisation in detail with suitable example.

Q4) a) Attempt any two of the following. [6]

- i) A box of mangoes contains sets A, B, and C with their numbers and weight as shown below:

Set A: 30 mangoes with weight of each mango 200 gm

Set B : 20 mangoes with weight of each mango 300 gm

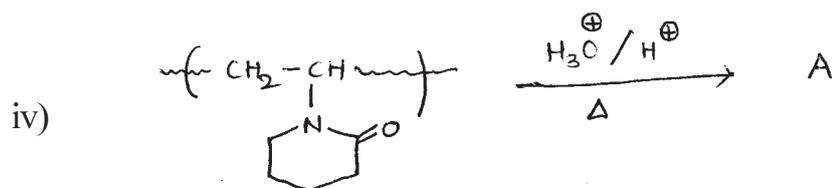
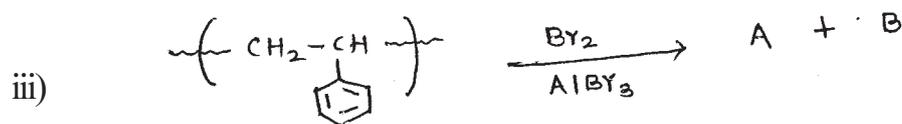
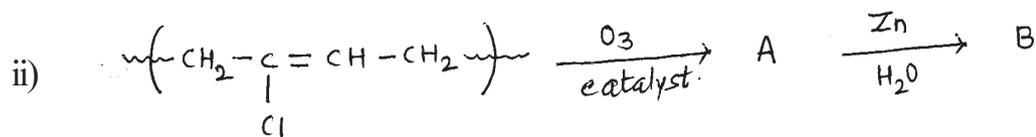
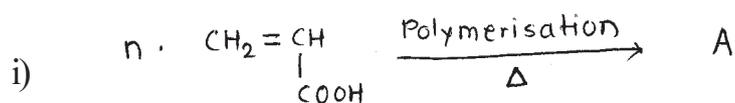
Set C : 40 mangoes with weight of each mango 100 gm

Calculate number average molecular (\bar{M}_n) weight for the mangoes.

- ii) Explain the role of flame retardant and antistatic agent during polymer processing.
- iii) Write a note on - Rayon polymer.

b) Complete the following polymeric reactions.

[4]



Total No. of Questions :4]

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T.Y.B.Sc.

CHEMISTRY

**PH - 336 (C) : Introduction to Biochemistry & Molecular Biology
(2013 Pattern) (Semester - III) (Paper - VI)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*

Q1) Answer the following.

[10]

- a) What is affinity chromatography?
- b) Give the names of two basic amino acids.
- c) Name the deficiency disorder of Vitamin -A.
- d) What are disaccharides? give example.
- e) Give the function of mitochondria.
- f) What is denaturation of protein?
- g) Define saponification number.
- h) What is active site of enzyme?
- i) Name the two pancreatic hormones.
- j) Define K_m .

Q2) a) Attempt any two of the following. [6]

- i) What are the factors that stabilise protein structure?
- ii) Give the classification of carbohydrate.
- iii) Draw the structure of endoplasmic reticulum and give its function.

b) Write structures of any two. [4]

- i) Gly - Trp
- ii) Galactose
- iii) lecithin

Q3) Answer any two of the following. [10]

- a) Comment on distinguishing features of prokaryotic & eukaryotic cell.
- b) What is Enzyme inhibition? Discuss reversible & irreversible enzyme inhibition.
- c) Give Principle, procedure and applications of electrophoresis.

Q4) a) What are lipids? Classify lipids with suitable examples. [6]

OR

Elaborate on titration curve of amino acids. Give its significance.

b) Write note on C.AMP as second messenger. [4]

OR

Write note on enzyme specificity.



Total No. of Questions :4]

P735

[5315] - 324

T.Y.B.Sc.

CHEMISTRY

**CH - 336 (D) : Environmental and Green Chemistry
(2013 Pattern) (Semester - III) (Elective - I) (913D3) (Paper - VI)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following.

[10]

- a) Define Pollutant.
- b) Name any two trace components of atmosphere.
- c) Define producers.
- d) Draw the structure of m-hydroxy benzaldehyde.
- e) Define atmosphere.
- f) Arrange in order of greater health risk.
1 Butanol, Acetic unhydride, Benzene.
- g) Define speciation.
- h) What is mean by carcinogen.
- i) Define the term Temperature Inversion.
- j) Give any two examples of Green products.

- Q2)** a) Attempt any two of the following. [6]
- i) What is the effect of hazardous solvents on environmental and workers of chemical industry.
 - ii) How detergents can cause water pollution?
 - iii) Explain organic particulate matter.
- b) Write any two of the following. [4]
- i) Hydrosphere
 - ii) Green Solvents
 - iii) Use of biomaterials as feedstock.

- Q3)** Attempt any two of the following. [10]
- a) Explain Earth's radiation balance.
 - b) What is Green Chemistry? Give examples, use of Green Chemistry in industry.
 - c) Give any four scientific areas for practical applications of Green Chemistry.

- Q4)** a) Discuss the factors required in order to obtain good sample of air. Explain how gaseous and Vapour samples are collected. [6]

OR

Describe Thermal Pollution.

- b) Write short note on (any one) [4]
- i) Renewable energy sources.
 - ii) Greener Synthesis of methyl Methacrylate.



Total No. of Questions :4]

P735

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T.Y.B.Sc.

CHEMISTRY

**CH - 336 (E) : Agriculture Chemistry (Elective - I)
(2013 Pattern) (Semester - III) (New Course) (Paper - VI)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*

Q1) Answer the following.

[10]

- a) Give Importance of agriculture chemistry.
- b) What is Bordeaux Mixture?
- c) What is neutral soil?
- d) Define 'Particle density'.
- e) Define 'Ammonification'.
- f) What is Total soluble salts.?
- g) What is Manure?
- h) What are organic fertilizers?
- i) What are attractants?
- j) What are the objectives of soil testing?

- Q2)** a) Attempt any two of the following. [6]
- i) What is humus? Explain its functions.
 - ii) What is Herbicide? Give classification of herbicides according to mode of action.
 - iii) Explain role of nitrogen and deficiency symptoms of it in the plant.
- b) Attempt any two. [4]
- i) Explain the term m. eq/L and ppm.
 - ii) What is the role of magnesium in the plants?
 - iii) Explain 'Lime Requirement'.

- Q3)** Attempt any two. [10]
- a) Discuss in brief sources of water.
 - b) Describe vermicompost in details.
 - c) Discuss reclamation of alkali soil.

- Q4)** a) Attempt any two. [6]
- i) Discuss Sodium Adsorption Ratio.
 - ii) Give advantages of mixed fertilizers.
 - iii) Give physical properties of soil.
- b) Attempt any two. [4]
- i) Discuss anion exchange in soil.
 - ii) Give deficiency symptoms of calcium.
 - iii) Give structure and uses of BHC.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 325

T.Y.B.Sc.

BOTANY

BO-331 : CRYPTOGAMIC BOTANY

(Algae, Fungi, Bryophytes and Pteridophytes)

(2013 Pattern) (Semester - III) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following

[10]

- a) Mention any two classes of pteridophyta as per sporne, 1975.
- b) What are Higher Cryptogams.
- c) Mention any two classes of Fungi as per Alexopoulos, 1979.
- d) Name the sex organs in Chara.
- e) Mention any two divisions of algae as per Chapman and Chapman, 1973.
- f) Give any two general characters of Bryophytes.
- g) Enlist any two types of spores in Puccinia.
- h) Give any two economic importance of pteridophyta.
- i) Enlist the parts of sporophyte of Polytrichum.
- j) Mention the sex organs in Batrachospermum.

Q2) Attempt any two of the following:

[10]

- a) Explain the Sporophyte of Marchantia.
- b) Give taxonomic position and describe thallus structure of Nostoc.
- c) Describe the cell structure of Saccharomyces.

P.T.O.

Q3) Write notes on any two: **[10]**

- a) Female conceptacle of Sargassum.
- b) Thallus structure of Rhizopus.
- c) External morphology of sporophyte of Psilotum.

Q4) Describe external and internal structure of thallus of Anthoceros. **[10]**

OR

Describe the external morphology and internal structure of petiole of Marsilea. **[10]**

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Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages : 2

[5315]-326

T.Y.B.Sc.

BOTANY

BO-332 : Cell and Molecular Biology

(2013 Pattern) (Semester-III) (Paper - II) (New Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagram wherever necessary*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following.

[10]

- a) Define cell.
- b) Enlist major chemical constituents of matrix.
- c) Enlist any two functions of cell wall.
- d) What is endocytosis?
- e) What is Karyotype?
- f) Enlist any two types of chromosomes.
- g) What is C-value paradox?
- h) Define nucleotide.
- i) Enlist units of gene.
- j) Enlist components of Lac-operon?

Q2) Attempt any two of the following.

[10]

- a) Describe Hershey and chase experiment on DNA.
- b) Describe Watson and Crick model of DNA.
- c) Explain one gene one enzyme hypothesis.

Q3) Write notes on any two.

[10]

- a) Dark excision repair system of DNA.
- b) Characteristics of forms of DNA.
- c) Structure and functions of lysosomes.

P.T.O.

Q4) What are giant chromosomes ? Describe in brief the giant chromosome studied by you. **[10]**

OR

What is genetic code? Explain the properties of genetic code.



Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages : 2

[5315]-327

T.Y.B.Sc.

BOTANY

**BO-333 : Genetics and Evolution
(2013 Pattern) (Semester-III) (Paper - III)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagram wherever necessary*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following.

[10]

- a) Define heredity.
- b) What is monohybrid cross?
- c) Define crossing over.
- d) What is sex-limited genes?
- e) Define monosomy.
- f) What are sex influenced genes?
- g) Define deletion.
- h) What is gene pool?
- i) Define lethal genes.
- j) What is mean by Genetics polymorphism?

Q2) Attempt any two of the following.

[10]

- a) Explain inheritance of blood group in human.
- b) Differentiate between qualitative and quantitative traits.
- c) Explain origin and production of autopolyploidy.

Q3) Write note on (any two).

[10]

- a) Law of dominance.
- b) Duplicate genes (15:1).
- c) Evidences from bio- geographical relations of evolution.

P.T.O.

Q4) What is duplication ? Explain its types, cytology, position effect and bar eye phenotype in *Drosophila*. **[10]**

OR

Define evolution .Explain theory of inheritance of acquired characters (Lamarck's)



Total No. of Questions :4]

P739

SEAT No. :

[Total No. of Pages :2

[5315]-328

T.Y.B.Sc.

BOTANY

**BO-334 : Spermatophyta and Palaeobotany
(2013 Pattern) (Semester-III) (Paper - IV)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagram wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following.

[10]

- a) Enlist any two characters of Gymnosperms.
- b) Mention Fruit type of Family Asteraceae.
- c) Give any example of natural system of classification.
- d) Write any one economic importance of Gymnosperms.
- e) Write any one example of family Nyctaginaceae.
- f) Write type of inflorescence of family Magnoliaceae.
- g) Write any one economic importance of Orchidaceae.
- h) Write any one order of Lycopsidea.
- i) What are fossils.
- j) Give any two orders of Gymnosperms.

Q2) Attempt any two of the following.

[10]

- a) Give assumptions of Hutchinson's system of classification.
- b) Describe flower of Sub family Papilionaceae.
- c) Sketch, label and describe external characters of Lepidodendron.

Q3) Write notes on any two of the following.

[10]

- a) Pteridosperm theory.
- b) Petri faction.
- c) Salient features of Psilopsida.

P.T.O.

Q4) Describe external and internal morphology of male and female cone of pinus.

OR

Give distinguishing characters, floral formula and floral diagram of family
Capparidaceae and Lamiaceae. **[10]**



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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[5315] - 329

T.Y.B.Sc.

BOTANY

**BO - 335 : Horticulture and Floriculture
(2013 Pattern) (Semester - III) (Paper - V)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following:

[10]

- a) Define horticulture.
- b) Give source of Vitamin A.
- c) What is seed viability?
- d) Give any one objective of training of horticultural plants.
- e) Write any two physical properties of soil.
- f) Enlist any two names of famous gardens in India.
- g) Give any one scope of floriculture.
- h) What is impregnation?
- i) Write any two names of chemicals used for painting of dry flowers.
- j) What is canning?

P.T.O.

Q2) Attempt any two of the following. **[10]**

- a) Write about export potential of horticultural crops and products in India.
- b) Explain any two methods of artificial vegetative propagation.
- c) Give an account of classification of horticultural crops.

Q3) Write note on (any two) **[10]**

- a) Japanese Garden.
- b) Bahar treatment.
- c) Preservation methods for dry flowers.

Q4) Give an account of mango, with reference to soil, climatic requirements, commercial varieties, harvesting and post harvest management. **[10]**

OR

What is floriculture? Write scope and importance of floriculture. Add note on various methods of cultivation of Gladiolus. **[10]**



Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages :2

[5315]-330

T.Y.B.Sc.

BOTANY

**BO-336: Computational Botany
(2013 Pattern) (Semester-III) (Paper -VI)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following:

[10]

- a) What is null hypothesis?
- b) Give any two objectives of classification of data.
- c) What is standard error?
- d) Enlist any two types of correlation.
- e) What is vigor Index (VI)?
- f) Give any two Significance of chi-square test.
- g) Define Leaf Area Index (LAI).
- h) Give any two properties of correlation coefficient.
- i) What is primary and secondary data?
- j) Give formula to calculate frequency.

Q2) Attempt Any two of the following.

[10]

- a) What is biostatistics? Describe its applications.
- b) What is non- random sampling? Describe its methods.
- c) Explain how to compute frequency and density from data obtained through Quadrats.

P.T.O.

Q3) Write short notes on Any two of the following. **[10]**

- a) Pie diagram.
- b) Normal distribution.
- c) Standard deviation.

Q4) What are measures of central tendency? Give an account of any two central tendency with its merits and limitations. **[10]**

OR

What is seed germination? Give an account of seed germination and early seedling growth under stress.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 331

T.Y.B.Sc.

ZOOLOGY

ZY - 331 : ANIMAL SYSTEMATICS AND DIVERSITY - V

(2013 Pattern) (Semester - III) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following:

[10]

- a) Define commissure.
- b) Give one example of Hemichordata.
- c) State the name of organ of aquatic respiration in Pila.
- d) State the function pectin in calotes.
- e) Define heterodont dentition.
- f) Define mesonephros kidney.
- g) Define Oligopyrine sperm.
- h) State the function of mantle.
- i) Define astevation.
- j) Give two names of scale in calotes.

Q2) Attempt any two of the following:

[10]

- a) Eye of calotes.
- b) Sketch and lable brain of frog.
- c) Describe the heart of calotes.

P.T.O.

Q3) Write short notes on any two of the following:

[10]

- a) Radula.
- b) Accessory respiratory organs in fishes.
- c) Hyoid apparatus.

Q4) Describe male reproductive system of Pila.

[10]

OR

Describe the digestive system of calotes.

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Total No. of Questions :4]

SEAT No. :

P743

[5315]-332

[Total No. of Pages : 1

T.Y.B.Sc.

ZOOLOGY

**ZY -332 : Mammalian Histology
(2013 Pattern) (Semester-III) (Paper - II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following. **[10]**

- a) What are crypts of Liberkuhn?.
- b) State the names of lingual papillae.
- c) What is Graafian follicle?
- d) What are PEYER's patches?
- e) State the name of any two layers of adrenal cortex.
- f) State the names of any two layers of epidermis.
- g) Define vasa vasorum.
- h) Define stratified epithelium.
- i) State the name of voluntary muscles.
- j) State the names of any two types of cells in adenohypophysis.

Q2) Attempt any two of the following. **[10]**

- a) Sketch and label T.S. of testis.
- b) Describe the histological structure of thyroid gland.
- c) Describe fluid connective tissue.

Q3) Write short notes on any two of the following: **[10]**

- a) Nervous tissue.
- b) Histology of pancreas.
- c) Histology of sublingual salivary gland.

Q4) Describe the histological structure of duodenum. **[10]**

OR

Describe histological structure of Kidney.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages :2

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[5315]-333

T. Y. B. Sc.

ZOOLOGY

ZY-333: Biological Chemistry

(2013 Pattern) (Semester-III) (paper III)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates.

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following:

[10]

- a) Define isoenzymes.
- b) Define covalent bonds.
- c) State two Properties of Water.
- d) What is V_{max} of an enzyme catalysed reaction?
- e) Define monosaccharides.
- f) Name the Protein Possessing α - helical structure.
- g) What are allosteric enzymes?
- h) Define hypoglycemia.
- i) What is AKU?
- j) What is atherosclerosis?

Q2) Attempt any two of the following:

[10]

- a) Describe the Structure of water molecule.
- b) Explain reversible enzyme inhibition.
- c) Explain Secondary Structure of protein.

P.T.O.

Q3) Write short notes on any two of the following: **[10]**

- a) Mutarotation
- b) Buffering capacity
- c) Effect of temperature on enzyme reaction.

Q4) What are amino acids? Give an account of classification of amino acids based on structure with suitable examples. **[10]**

OR

What are lipids? Describe classification of lipids with suitable examples.



Total No. of Questions :4]

SEAT No. :

P745

[5315]-334

[Total No. of Pages : 1

T.Y.B.Sc.

ZOOLOGY

ZY -334 Environmental Biology and Toxicology

(2013 Pattern) (Semester-III) (Paper - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following.

[10]

- a) Define environmental biology.
- b) Define noise pollution.
- c) What is meant by vulnerable species?
- d) What is atmosphere?
- e) Define producers.
- f) What is industrial waste?
- g) What is water pollution?
- h) What is LC 50?
- i) Enlist soil pollutants.
- j) Define food web.

Q2) Attempt any two of the following.

[10]

- a) Forest conservation.
- b) Explain sources of air pollution.
- c) Population explosion.

Q3) Write notes on any two of the following.

[10]

- a) Describe wildlife conservation.
- b) Explain different types of toxicants.
- c) Non-renewable resources.

Q4) What are pollutants? Describe in detail any three types of environmental pollutants. **[10]**

OR

Define ecosystem, Describe biotic and abiotic components of ecosystem with their relationship.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P746

[5315] - 335

T.Y.B.Sc.

ZOOLOGY

ZY - 335 : Parasitology

(2013 Pattern) (Semester - III) (Paper - V)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Attempt the following.

[10]

- a) What is obligatory parasite.
- b) Give any two symptoms of Typhoid.
- c) Write the habitat of W. bancrofti.
- d) Define helminthology.
- e) State any one control measure of malarial parasite.
- f) Define symbiosis.
- g) Define definitive host.
- h) What is facultative parasite.
- i) Define reservoir host.
- j) Define mutualism.

P.T.O.

Q2) Attempt any two of the following. **[10]**

- a) Describe bladderworm in Taenia Solium.
- b) Explain parasitological significance of Toxoplasmosis.
- c) Describe structural specificity.

Q3) Write short notes on any two of the following. **[10]**

- a) Intermediate host.
- b) Control measures of arthropod vector of Dengue.
- c) Pathogenicity and control measures of Entamoeba histolytica.

Q4) Give an detail account of life cycle, mode of infection and control measures of Tick.

OR

Describe habit, habitat, moda of infection, pathogenicity and control measures of Ascaris Lumbricoides. **[10]**



Total No. of Questions : 4]

SEAT No. :

P747

[Total No. of Pages : 2

[5315] - 336

T.Y.B.Sc.

ZOOLOGY

ZY-336(a) : General Pathology

(2013 Pattern) (Semester - III) (Paper-VI)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following: [10]

- a) Define autopsy.
- b) What is clinical pathology?
- c) Define hyperemia.
- d) What is Calcification?
- e) What is pigmentation?
- f) Define benign tumour.
- g) Define primary healing.
- h) Define thrombus.
- i) State two examples of viral diseases.
- j) Define gas gangrene.

Q2) Attempt any two of the following. [10]

- a) Describe liver function test.
- b) Give an account of causes of necrosis.
- c) Describe fatty degeneration.

Q3) Write notes on any two of the following. [10]

- a) Embolism.
- b) Ischaemia.
- c) Cardinals of inflammation.

Q4) Define Neoplasia. Explain benign and malignant tumour. [10]

OR

What is Gangrene? Describe various types of gangrene.



Total No. of Questions : 4]

P747

[5315] - 336

T.Y.B.Sc.

ZOOLOGY

ZY-336(b) : Cell Biology

(2013 Pattern) (Semester - III) (Paper-VI)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following: [10]

- a) What is endocytosis?
- b) Define prokaryotic cell.
- c) What are membrane receptors?
- d) Give functions of Micro tubules.
- e) Define necrosis'.
- f) F₁ particles.
- g) What is unit membrane.
- h) Mention effects of free radicals on cell.
- i) Give significance of crossing over.
- j) What are carcinogens?

Q2) Attempt any two of the following: [10]

- a) Describe functions of plasma membrane.
- b) Mention composition and functions of nucleolus.
- c) Enlist the characteristics of cancer cell.

Q3) Write short notes on any two of the following: [10]

- a) Somatic mutation.
- b) Intra and extra cellular changes during cellular ageing.
- c) Significance of meiosis.

Q4) Describe the ultrastructure and functions of Lysosome and Golgi complex.[10]

OR

Define cell cycle. Describe various phases of cell cycle. Add a note on significance of mitotic cell division

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5315] - 337

T.Y.B.Sc.

GEOLOGY

GL - 331 : MINERALOGY

(2013 Pattern) (Semester - III) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) Answer in 2/3 lines:

[10]

- a) What is pleochroism?
- b) Give names of any two tektosilicate minerals.
- c) What is sign of elongation?
- d) What are refractory minerals?
- e) What is biaxial mineral?
- f) Give chemical composition of monazite.
- g) What is optic normal?
- h) What are accessory plates?
- i) What is relative retardation?
- j) What are orthopyroxenes?

Q2) Write notes on (Any two)

[10]

- a) Structure and composition of amphibole.
- b) Composition and properties of clay minerals.
- c) Determination of Interference colours.

P.T.O.

Q3) Write notes on (Any two)

[10]

- a) Physical properties and uses of sulphates.
- b) Properties of diamond, ruby and sapphire as precious stones.
- c) Composition and uses of calcite and paragenesis of apatite.

Q4) Give silicate structure, chemical and optical properties, paragenesis and alteration products of OLIVINE mineral group or GARNET mineral group. **[10]**

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Total No. of Questions :4]

SEAT No. :

P749

[5315]-338

[Total No. of Pages : 1

T.Y.B.Sc.

GEOLOGY

GL -332 :Igneous Petrology

(2013 Pattern) (New) (Semester-III) (Paper II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following in 2-3 lines. **[10]**

- a) Define primary magma.
- b) Define petrographic province.
- c) Give mineral composition of peridotite.
- d) What is inter granular texture?
- e) What is the basis for classification of igneous rocks according to IUGS?
- f) Define corona/ Reaction rim.
- g) Which minerals are usually found in the rock Anorthosite?
- h) Define Vesicular and Amygdoidal structure.
- i) Name the rock that usually exhibits columnar structure.
- j) Name any two derivative magmas.

Q2) Answer the following (any two). **[10]**

- a) Describe Graphic texture & flow structure.
- b) Flow differentiation.
- c) Significance of rock kindreds.

Q3) Write notes on (any two) **[10]**

- a) Generation of magmas in different tectonic settings.
- b) Contaminated Granites.
- c) Origin and mineral composition of Basalts.

Q4) Describe CIPW classification of Igneous rocks. **[10]**

OR

Describe in detail the crystallisation of Ab-An-D+system &its significance.



Total No. of Questions :4]

SEAT No. :

P750

[5315]-339

T. Y. B. Sc.

GEOLOGY

[Total No. of Pages :2

**GL-333: Sedimentary Petrology
(2013 Pattern) (Semester-III)(Revised) (paper III)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following in 2/3 Lines

[10]

- a) What is epigenetic deposit?
- b) Which sedimentary rocks are suitable for hydrocarbon Prospecting?
- c) Name two oxides which do not undergo mobility.
- d) What are heavy minerals?
- e) Define selective abrasion.
- f) Which Process operates for the Size reduction of Sedimentary particles?
- g) Who Proposed phi scale?
- h) Name any two physical parameters for Sedimentary environmental analysis.
- i) What do you mean by Stylolites?
- j) Name any two heavy minerals which indicate I'gheous Provenance.

Q2) Answer in short (any two)

[10]

- a) Explain the methodology for Studying Sedimentary rocks in laboratory.
- b) Compare grade-scales of Udden and Went worth.
- c) Explain the climatic control on Sedimentation.

P.T.O.

Q3) Answer in short (any two) [10]

- a) Describe with the help of example the mobility of oxides.
- b) Describe the process of progressive dilution.
- c) What is Provenance of Sediments. Describe the Provenance with the help of heavy minerals.

Q4) Describe the classification of depositional sedimentary environments [10]

OR

Define texture. Enumerate the factors controlling texture of Sedimentary rocks. Distinguish between elastic and Non-elastic textures [10]



Total No. of Questions :4]

SEAT No. :

P751

[5315]-340

[Total No. of Pages : 2

T.Y.B.Sc.

GEOLOGY

GL -334 :Structural Geology

(2013 Pattern) (Semester-III) (Paper IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw Neat labelled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following in 2/3 lines.

[10]

- a) Axis of folds.
- b) Any two applications of structural Geology.
- c) Shear fractures.
- d) Gravity faults.
- e) Flexure -slip folding
- f) Factors controlling rock deformation.
- g) Types of forces.
- h) Mullion structure.
- i) Segregation banding.
- j) Plastic deformation.

Q2) Write notes on (any two).

[10]

- a) Balanced and unbalanced forces.
- b) Flutey's classification of folds.
- c) Stoess-strain ellipsoid.

Q3) Answer the following (any two).

[10]

- a) Mechanics of faulting.
- b) Slaty cleavage and bedding cleavage.
- c) Intergranular and Intragranular movements.

P.T.O.

Q4) Describe the concept and mechanics of folding. Add a note on Ramsay's Classification of folds. **[10]**

OR

Define lineations. Explain with suitable examples primary and secondary lineations. Add a note on lineations related to major structures.



Total No. of Questions :4]

SEAT No. :

P752

[Total No. of Pages :2

[5315] - 341

T.Y.B.Sc.

GEOLOGY

**GL - 335 : Precambrian Stratigraphy of India
(2013 Pattern) (Semester - III) (Paper - V)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following in 2/3 lines.

[10]

- a) Name the tectonic elements of oceans.
- b) Give lithology of chalk Hills.
- c) Name the three physiographic divisions of India.
- d) Name any two important acidic intrusives found on Singhbhum - Odisha craton.
- e) Name the two cratons which form the Aravalli craton.
- f) Give tectonic subdivisions of Himalaya.
- g) Give the lithostratigraphic subdivisions of Cuddapah supergroup.
- h) Give economic importance of Aravalli craton.
- i) Which geological time is represented by Aryan Era of Sir T.H. Holland?
- j) What is CITZ?

P.T.O.

Q2) Write Notes on (Any Two) [10]

- a) Sausar Group.
- b) Current classification of Archaean formations of India.
- c) Precambrians of Central Lesser Himalayas.

Q3) Write Notes on (Any two) [10]

- a) World Precambrian History.
- b) Stratigraphic Succession of Chhattisgarh Supergroup.
- c) Stratigraphic succession and lithology of Bhilwara supergroup.

Q4) Give detailed general stratigraphy of Dharwar Craton in a tabular form.

OR

Give the geographic distribution, classification with stratigraphic succession, lithology and economic importance of Vindhyan supergroup. [10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P753

[5315] - 342

T.Y.B.Sc.

GEOLOGY

GL - 336 : Applied Geology - I

(Geomorphology, Remote Sensing & Field Geology)

(2013 Pattern) (Semester - III) (Paper - VI)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Define/Answer/ Explain the following 2/3 lines:

[10]

- a) Field correlation.
- b) Attitude of an outcrop.
- c) Give the significance of stefan-Boltzmann's law.
- d) Factors controlling Relief displacement in an aerial photo.
- e) Atmospheric windows.
- f) Stereo-pair.
- g) What do the terms "RADAR" & "LIDAR" stand for?
- h) Geo-stationary satellites.
- i) What is meant by "Buffer analysis" in GIS.
- j) Alluvial fan.

Q2) Write notes on any two of the following:

[10]

- a) Role of lithology in land form development.
- b) Atmospheric scattering.
- c) Geometrical characteristics of an aerial photograph.

P.T.O.

Q3) Answer any two of the following:

[10]

- a) Give applications of Oceansat-1 satellite.
- b) Discuss the photocharacters of horizontally bedded shale.
- c) Explain the Raster data model used in GIS?

Q4) a) Enlist the different photo-recognition elements and describe any four. **[10]**

OR

- b) Discuss the aims, objectives and uses of Geological surveying.

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Total No. of Questions : 4]

SEAT No. :

P754

[Total No. of Pages : 3

[5315] - 343

T.Y.B.Sc.

STATISTICS (Principal)

ST-331 : Distribution Theory

(2013 Pattern) (Semester - III) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

[1 each]

a) Choose correct alternative in each of the following:

i) If $X \sim W(\alpha, \beta)$ then the distribution of $Y = (X/\alpha)^\beta$ is

- 1) Exponential with mean α
- 2) Exponential with mean α / β
- 3) Exponential with mean β
- 4) Exponential with mean 1

ii) If $X \sim LN(a, \mu, \sigma^2)$ then $E(X)$ is

- | | |
|---------------------------------------|-----------------------------------|
| 1) $a + e^{\mu + \frac{\sigma^2}{2}}$ | 2) $a + \mu + \sigma^2$ |
| 3) $a + e^{\mu + \sigma^2}$ | 4) $a + \mu + \frac{\sigma^2}{2}$ |

iii) If $X \sim \beta_1(m=2, n=2)$ then mode of X is

- | | |
|--------|--------|
| 1) 2 | 2) 4 |
| 3) 0.5 | 4) 1/5 |

P.T.O.

iv) Let X be a continuous r.v. with distribution function $F_X(x)$. Let $X_1, X_2, X_3, \dots, X_n$ be a random sample of size n is drawn from above distribution. The distribution function of 1st order statistic $X_{(1)}$ is

- 1) $[1 - F_X(x)]^n$ 2) $[F_X(x)]^n$
 3) $1 - [1 - F_X(x)]^n$ 4) $n * [F_X(x)]^{n-1}$

b) State whether each of the following statements is true or false: **[1 each]**

- i) If $X \sim L(\mu, \lambda)$ then distribution of X is symmetric and leptokurtic.
 ii) If $X \sim C(\mu, \lambda)$ then distribution of X^2 is also $C(\mu, \lambda)$.

c) Define the following: **[1 each]**

- i) Bi-variate normal distribution.
 ii) Beta distribution of second kind.

d) Attempt the following: **[1 each]**

- i) If $X \sim W(\alpha, \beta)$ then state the distribution function of X .
 ii) If $X \sim \beta_2(m, n)$ then state variance of X .

Q2) Attempt any two of the following: **[5 each]**

- a) If $X \sim L(\mu, \lambda)$ then find MGF of X .
 b) If $X \sim W(\alpha, \beta)$ then obtain the distribution of $Y = X^c$, $c > 0$.
 c) Let $X_1, X_2, X_3, \dots, X_n$ be a random sample of size n is drawn from $U(0, 1)$ distribution. Obtain the distribution of n^{th} order statistic $X_{(n)}$.

Q3) Attempt any two of the following: **[5 each]**

- a) Let X and Y be two i.i.d r.v.s having $G(1, 1)$ distribution. If $U = X + Y$ and $V = \frac{x}{(x + y)}$ then find $P\left(U > 1, V > \frac{1}{2}\right)$.

- b) If $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find conditional distribution of X given $Y=y$. Further state the mean of the conditional distribution.
- c) Let X and Y be two i.i.d r.v.s having $\beta_1(1,1)$ distribution. Obtain the distribution of $U=X+Y$.

Q4) Attempt any one of the following:

- a) i) If $X \sim \beta_2(m, n)$ then find harmonic mean of X. [3]
- ii) Let $X \sim C(0, 1)$. Derive the distribution of $\frac{1}{X}$ and X^2 . [7]
- b) i) If X and Y are i.i.d LN $(0, \mu, \sigma^2)$ variates. State the p.d.f of $U=XY$ and $V=\frac{X}{Y}$. Further obtain $P[U > e^{2\mu}]$ and $P[V > 1]$. [5]
- ii) If $X \sim L(\mu, \lambda)$ then obtain inter quartile range of X. [5]

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Total No. of Questions : 4]

SEAT No. :

P755

[Total No. of Pages : 3

[5315] - 344

T.Y.B.Sc.

STATISTICS (Principal)

ST-332 : Theory of Estimation

(2013 Pattern) (Semester - III) (Paper - II) (Theory)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

a) In each of the following cases, choose the correct alternative: [1 each]

i) If X_1, X_2, \dots, X_n is a random sample from a population with variance

$$\sigma^2 \text{ and } S^2 = \frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2 \text{ then}$$

- A) S^2 is unbiased estimator of σ^2
- B) $\frac{nS^2}{n-1}$ is an unbiased estimator of σ^2
- C) S is an unbiased estimator of σ
- D) S^2 is inconsistent estimator of σ^2

ii) If X_1, X_2, \dots, X_n is a random sample from beta distribution of first kind with parameters $(\theta, 1)$ then is a sufficient statistic of θ .

- A) $\sum_{i=1}^n X_i$
- B) $\prod_{i=1}^n X_i$
- C) $X_{(n)}$
- D) $X_{(1)}$

P.T.O.

iii) T_n is said to be a consistent estimator of θ if

A) $P(|T_n - \theta| > \epsilon) = 1$ for every $n \geq 1$

B) $\lim_{n \rightarrow \infty} P(|T_n - \theta| > \epsilon) = 1$

C) $\lim_{n \rightarrow \infty} P(|T_n - \theta| < \epsilon) = 1$

D) $P(|T_n - \theta| < \epsilon) = 1$ for every $n \geq 1$

iv) If $(X_{(r)}, X_{(s)})$, $r < s$ is the confidence interval for population median then the confidence coefficient associated with $(X_{(r)}, X_{(s)})$ is

A) $\sum_{i=1}^n {}^n C_i \left(\frac{1}{2}\right)^n$

B) $\sum_{i=r}^s {}^n C_i \left(\frac{1}{2}\right)^n$

C) $\sum_{i=r}^n {}^n C_i \left(\frac{1}{2}\right)^n$

D) $\sum_{i=r}^{s-1} {}^n C_i \left(\frac{1}{2}\right)^n$

b) State whether each of the following statements is true or false: **[1 each]**

i) If T is an unbiased estimator of θ then T^2 is also an unbiased estimator of θ^2 .

ii) Minimum variance unbiased estimator (MVUE) is unique if it exists.

c) Define the following terms with one illustration each: **[1 each]**

i) Fisher information function $I_X(\theta)$.

ii) Pivotal quantity.

d) Attempt each of the following: **[1 each]**

i) Distinguish between estimator and estimate.

ii) Explain the concept of sufficient statistic with one illustration.

Q2) Attempt any two of the following: **[5 each]**

a) If X_1, X_2, \dots, X_n is a random sample from $U(\theta, \theta+1)$ find the estimator of θ using the method of moments.

- b) If X_1, X_2, \dots, X_n is a random sample from $N(\mu, \sigma^2)$ μ known, find C such that $T = C \sum_{i=1}^n |x_i - \mu|$ is an unbiased estimator of σ .
- c) If X_1, X_2, \dots, X_n is a random sample from beta distribution of first kind with parameter $(\theta, 1)$ find the maximum likelihood estimator (MLE) of θ .

Q3) Attempt any two of the following: **[5 each]**

- a) If $X \rightsquigarrow$ Poisson (λ) find the Fisher information function $I_X(\lambda)$.
- b) If X_1, X_2, \dots, X_n is a random sample from Bernoulli distribution with parameter p , find the sufficient statistic of p .
- c) If X_1, X_2, \dots, X_n is a random sample from $N(\mu, \sigma^2)$ construct a $(1-\alpha)100\%$ confidence interval for σ^2 when μ is unknown.

Q4) Attempt any one of the following:

- a) State and prove Cramer-Rao inequality. Derive the condition when equality holds. **[10]**
- b) i) State and prove Chebychev's inequality for continuous distribution. **[5]**
- ii) Suppose T_n is a biased estimator of θ . If the bias and $\text{var}(T_n)$ both tend to zero as n tends to infinity then show that T_n is a consistent estimator of θ . **[5]**

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Total No. of Questions : 4]

SEAT No. :

P756

[Total No. of Pages : 3

[5315] - 345

T.Y.B.Sc.

STATISTICS (Principal)

ST- 333 : Sampling Methods

(2013 Pattern) (Semester - III) (Paper - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

a) Choose correct alternatives in each of the following: **[1 each]**

i) In simple random sampling without replacement (SRSWOR), variance of sample mean is

A) $\left(\frac{N-n}{Nn}\right)S^2$ B) $\left(\frac{n-N}{Nn}\right)S^2$

C) $\left(\frac{N-1}{Nn}\right)S^2$ D) $\left(\frac{N-n}{N}\right)S^2$

ii) In case of stratified random sampling with proportional allocation, the sample size from i^{th} stratum is

A) nW_i B) $n \frac{W_i S_i}{\sum_{i=1}^k W_i S_i}$

C) $nW_i S_i$ D) $\frac{W_i S_i}{\sum_{i=1}^k W_i S_i}$

P.T.O.

- c) A population consists of 550 units. By total count, it was found that population mean is 49 and population mean square is 46 under SRSWOR, how many sampling units should be chosen to estimate \bar{X}_N with permissible margin of error 10% of population mean and 95% confidence coefficient?

Q3) Attempt any two of the following: [5 each]

- a) With usual notation prove that systematic sampling is more efficient than SRSWOR if $\rho \leq -\frac{1}{N-1}$ where ρ is intra class correlation coefficient.
- b) Given the following data, determine the sample size n_1, n_2, n_3 by using Neyman's allocation if total sample size is $n=12$

Sr.No	N_i	S_i
1	4000	3
2	2000	5
3	3000	2

Also find variance of an estimator of population mean in case of Neyman's allocation.

- c) For SRSWOR method for attribute, derive an expression for an unbiased estimator of variance of sample proportion.

Q4) Attempt any one of the following:

- a) i) Explain reliability and validity test of questionnaire by using internal consistency method with the help of Kuder Recharadson coefficient. [5]
- ii) Define ratio estimator of population mean and compare its efficiency with SRSWOR estimator. [5]
- b) i) Prove that in SRSWR, sample mean is an unbiased estimator of population mean and also derive an expression for variance of sample mean. [5]
- ii) Explain in brief characteristics of good questionnaire. [5]

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Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P757

[5315] - 346

T.Y.B.Sc.

STATISTICS (Principal)

ST-334: Design of Experiments

(2013 Pattern) (Semester - III) (Paper - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:

- A) Choose the correct alternative in each of the following: **[1 each]**
- a) The principle of local control is not used in
- | | |
|----------|-----------------|
| i) RBD | ii) CRD |
| iii) LSD | iv) CRD and LSD |
- b) For a RBD with error degrees of freedom 12, with 4 blocks, the required number of treatments would be
- | | |
|--------|-------|
| i) 5 | ii) 4 |
| iii) 6 | iv) 3 |
- c) The expected value of error component in a design of experiment is assumed to be
- | | |
|--------|------------|
| i) 1 | ii) 2 |
| iii) 0 | iv) 0 or 1 |

P.T.O.

- d) The main purpose of carrying out confounding in a factorial experiment is to reduce the size of
- i) blocks
 - ii) replicates
 - iii) treatments
 - iv) experimental units
- B) State whether each of the given statements are true or false: **[1 each]**
- a) For carrying out analysis of LSD, the required number of experimental units would be square of an integer.
 - b) All factorial effects of a 2^3 factorial experiment are linear orthogonal contrasts.
- C) Define the following terms: **[1 each]**
- a) Experimental error.
 - b) Treatment.
- D) a) Write the expression for intraction effect AB for a 2^2 factorial experiment with factors A and B. **[1]**
- b) State the test statistic for testing the equality of any two treatment effects using critical difference for CRD with 't' treatments, each replicated $n_i (i = 1, 2, \dots t)$ times. **[1]**

Q2) Attempt any two of the following: [5]

- a) State the mathematical model used in RBD with 't' treatments each replicated 'b' times with the underlying assumptions. Also obtain least squares estimates of parameters involved.
- b) i) Compute relative efficiency of LSD over corresponding CRD with the following information:

$$\text{Treatment. S. S} = 98.4$$

$$\text{Row S. S} = 121.3$$

$$\text{Column S. S} = 103.1$$

$$\text{Error S.S} = 111.8$$

degrees of freedom for total S.S. = 24.

- ii) Identify the confounded effect in the following replicate divided into 2 blocks.

(a)	(b)	(c)	(abc)
(b)	(ac)	(bc)	(1)

- c) Test for the significance of regression coefficient β in RBD with ANOCOVA for 't' treatments arranged in 'b' blocks.

Q3) Attempt any two of the following: **[5]**

- a) Describe the basic principles randomization and local control in a design of experiment.
- b) Obtain the expression for the expectation of mean sum of squares due to error for CRD.
- c) Explain what is ANOCOVA with one real life situation. Also state the least squares estimates of parameters for a CRD.

Q4) Attempt any one of the following:

- a) i) Explain the concept of confounding in factorial experiments, by differentiating between total and partial confounding.
- ii) Give the ANOVA table for a 2^3 factorial experiment with 4 replicates, where all interaction effects are confounded in each of the replicates divided into 2 blocks of size 4 each.

[4+6]

- b) i) Describe Scheffe's method for comparing treatment contrasts in RBD.
- ii) Explain yate's procedure to obtain factorial effect totals in a 2^3 factorial experiment.

[5+5]

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Total No. of Questions :4]

SEAT No. :

P758

[Total No. of Pages :3

[5315] - 347

T.Y.B.Sc.

STATISTICS (Principle)

ST - 335 : C - Programming (Turbo C)

(2013 Pattern) (Semester - III) (Paper - V)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:

A) Choose the correct alternative in each of the following:

- a) The following is not valid identifier [1]
- | | |
|----------|--------------|
| i) area | ii) tax-rate |
| iii) 12b | iv) x22 |
- b) Which of the following is not arithmetic operator [1]
- | | |
|--------|-------|
| i) * | ii) / |
| iii) & | iv) % |
- c) The function, Which compares the two strings is [1]
- | | |
|-------------|----------------|
| i) strcpy | ii) strcmp () |
| iii) strlen | iv) strcat () |
- d) If $a = 6$, $b = 5$, then the expression $a + b/2$ results in value [1]
- | | |
|----------|-------|
| i) 8 | ii) 7 |
| iii) 8.5 | iv) 1 |

P.T.O.

- B) State whether each of the following statement is True or False:
- i) Character constants are coded using double quotes. [1]
 - ii) The modula operator (%) can be used only with integers. [1]
- C) i) Write an expression in c for the following arithmetic expression.
- $$m \left[ah + \frac{V^2}{2} \right] \quad [1]$$
- ii) Give the syntax with an illustration of getchar(). [1]
- D) i) What will be the value of x when the following segment is executed?
- ```
int x =10, y = 15;
x = (x < y)? (y + x) : (y - x);
```
- [1]
- ii) Give the syntax of if -else. [1]

**Q2)** Attempt any two of the following: [each 5]

- a) Explain the syntax and one illustration for each of the following:
  - i) print f ( ).
  - ii) for ( ).
- b) Draw a flowchart to check whether the integer is prime or not.
- c) Write a C program to obtain arithmetic mean and variance of given n observations.

**Q3)** Attempt any two of the following: [each 5]

- a) Define one dimensional array. Give the syntax and one illustration of declaration and initialization of one dimensional array.
- b) Write a C program to convert decimal number to equivalent binary number.
- c) Write a C program to check whether a given string is palindrome or not. (Palindrome e.g. malayalam).

**Q4)** Attempt any one of the following:

- a) i) What is recursion? Write a C program to find GCD of two integers using recursive function. [7]
- ii) Write a C program to convert the temperature from °C to °F. [3]
  
- b) i) Write a C program to fit Binomial (n, p) distribution to given sample data  $(x_i, f_i), i = 1, 2, \dots, k$  [7]
- ii) define 'Pointer'. Give one illustration. How it is declared and assigned? [3]



Total No. of Questions : 4]

SEAT No. :

**P759**

[Total No. of Pages : 3

[5315] - 348

F.Y.B.Sc.

STATISTICS (Principal)

ST-336: Introduction to Regression Analysis

(2013 Pattern) (Semester - III) (Paper - VI)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

**Q1) A)** In each of the following cases, choose correct alternative : [1 each]

a) The estimate of the variance of residuals in multiple regression model involving K regressors is given by:

i)  $\frac{SS_{Res}}{n - k - 1}$

ii)  $\frac{SS_{Res}}{n - 1}$

iii)  $\frac{SS_R}{n - k}$

iv)  $\frac{SS_T}{n - (k - 1)}$

b) In a regression model, if  $\sigma^2$  is proportional to  $[E(y)]^3$  then the suitable variance stabilizing transformation is:

i) Arcsin

ii) Reciprocal square root

iii) Reciprocal

iv) Square root

c) The sum of the residuals weighted by the corresponding value of the regressor is always:

i) Positive

ii) Negative

iii) Zero

iv) 1

P.T.O.

d) Suppose a regression model with three regressors ( $X_1, X_2, X_3$ ) is fitted to a data set containing 25 observations. If one wishes to test whether  $X_1$  is significant, the degrees of freedom associated with t-test is:

- |         |        |
|---------|--------|
| i) 20   | ii) 21 |
| iii) 25 | iv) 19 |

B) State whether the following statements are true or false: [1 each]

- a) The hat matrix maps the vector of observed values into a vector of fitted values.
- b) An outlier is indicated by a large value of  $MS_{Res}$ .

C) Define the following: [1 each]

- a) Deviance statistic  $D$ .
- b) Studentized residual.

D) Answer the following: [1 each]

- a) Consider the simple linear regression model  $\gamma = \beta_0 + \beta_1 x + \varepsilon$ , with  $E(\varepsilon) = 0$ ,  $Var(\varepsilon) = \sigma^2$  and  $\varepsilon$  uncorrelated. Show that  $\hat{\beta}_1$  is linear combination of the observations  $y_i, i = 1, 2, \dots, n$ .
- b) State multiple linear regression model with  $k$  regressors. Also state the assumptions.

Q2) Attempt any two of the following: [5 each]

- a) Write a short note on the backward elimination method for regression model.
- b) Explain the procedure to fit a multiple linear regression model  $\gamma = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$ .
- c) State logistic regression model with single regressor. Discuss logit transformation.

**Q3)** Attempt any two of the following: **[5 each]**

- a) Consider the simple linear regression model  $y = \beta_0 + \beta_1 x + \varepsilon$ . Obtain the least square estimator of  $\beta_0$  and  $\beta_1$ .
- b) Write a short note on method of weighted least squares for fitting linear regression models.
- c) Write a short note on plot of residuals against the fitted values.

**Q4)** Attempt any one of the following:

- a)
  - i) In multiple linear regression model derive  $100(1-\alpha)$  percent confidence interval for regression coefficient  $\beta_j, j = 0, 1, 2, \dots, k$ . Also explain the notations used in it. **[5]**
  - ii) In a simple linear regression problem with sample size of 25, the slope was estimated to be 1.12 and standard error estimate ( $\hat{\sigma}$ ) is equal to 8.65. The quantity  $\sum x_i^2 - n(\bar{x})^2 = 327.52$ . Find the standard error of the regression coefficient ( $\beta_1$ ). Also test whether the regression coefficient is different from zero at a significance level 0.05. **[5]**
- b)
  - i) Consider a multiple linear regression model with  $k$  regressors  $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \varepsilon$  obtain an estimate of  $\sigma^2$ . **[5]**
  - ii) What are outliers? How do they affect regression coefficients? Discuss how outliers are to be treated in regression analysis. **[5]**

*EEE*

Total No. of Questions : 4]

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**T.Y.B.Sc.**

**GEOGRAPHY**

**Gg-331 : FUNDAMENTALS OF HUMAN GEOGRAPHY**

**(2013 Pattern) (Semester - III) ( Paper - I) (Part - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Diagrams and maps must be drawn wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following questions in one or two sentences (any ten) **[10]**

- a) What is neodeterminism?
- b) Who gave the concept of stop-and-go-determinism?
- c) Name any two contemporary approaches.
- d) Name any two branches of settlement geography.
- e) Name the major human races in the world.
- f) List the human race known for its unique physical trait.
- g) Which two countries contribute to most of world's population?
- h) Give reasons-river valleys are highly populated.
- i) Define migration.
- j) Name the countries with highest Human Development Index.
- k) Define Probabilism.
- l) What is cultural diffusion.
- m) Name the minor cultural realms of the world.

**Q2)** Write a short notes (any two): **[10]**

- a) Branches of Human Geography.
- b) Human Development Index (HDI).
- c) Population policies of India and China.
- d) Hagerstrand's model of diffusion.

**P.T.O.**

**Q3)** Answer the following questions in 100 words (any two): **[10]**

- a) Explain the nature of Human Geography.
- b) Differentiate between determinism and possibilism.
- c) Describe the trends in the growth of population of developing countries.
- d) Explain the economic & political factors affecting population density.

**Q4)** Answer the following questions in 200 words (any one): **[10]**

Describe the Griffith Taylor's migration zone theory of evolution of human races.

OR

Explain the world distribution of population.

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Total No. of Questions :4]

SEAT No. :

**P761**

[Total No. of Pages : 2

**[5315]-350**

**T.Y.B.Sc.**

**GEOGRAPHY**

**Gg-332 : Geography of Travel and Tourism (Part-I)**

**(2013 Pattern) (Semester-III) (Paper - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagram and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following questions in one or two sentences (any ten).[10]

- a) What is tourism?
- b) Define absolute location.
- c) Name any two UNESCO world heritage sites in Maharashtra.
- d) In which State is the Sundarbans National park located?
- e) Name any two hill stations in Himachal Pradesh.
- f) Name any two beaches in North Goa.
- g) What are summer resorts?
- h) Name any two sea forts of Maharashtra.
- i) In which state are the Khajuraho Temples located?
- j) In which state is Kanyakumari located.
- k) Name any two historical places in Rajasthan.
- l) Name any two Waterfalls in India.
- m) Name any two traditional types of accommodation.

**P.T.O.**

**Q2)** Write short notes (any two). **[10]**

- a) Locational factors in tourism.
- b) Man- made attractions.
- c) Seaside resorts in India.
- d) National parks and sanctuaries.

**Q3)** Answer the following questions in 100 words (any two). **[10]**

- a) Explain the role of tourism as a regional resource.
- b) Describe the climatic factors affecting tourism.
- c) What is the difference between travel and tourism?
- d) Describe the cultural diversity of India.

**Q4)** Answer the following questions in 200 words (any one). **[10]**

- a) Explain the physical factors affecting tourism.
- b) Describe the importance of beaches & islands in tourism with reference to India.



Total No. of Questions :4]

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T.Y.B.Sc.

**GEOGRAPHY**

**Gg-333 : Fundamentals of Geo-Informatics (Part-I)**

**(2013 Pattern) (Semester-III) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Diagrams and maps must be drawn wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following questions in two to three sentences (any ten). **[10]**

- a) Mention any two components of GIS.
- b) Give any two methods of manipulation techniques in GIS.
- c) Define remote sensing.
- d) State any two data sources in GIS.
- e) What is aspatial data?
- f) What is meant by raster data model?
- g) Mention any two GIS tasks.
- h) What is data generation?
- i) Mention the features of a vector data model.
- j) Give any two disadvantages of vector data format.
- k) Give any two applications of remote sensing in Earth science.
- l) What is meant by SQL?
- m) Name any two input devices in GIS.

**P.T.O.**

**Q2) Write short notes (any two) [10]**

- a) Importance of Geo-informatics.
- b) Satellite data as a major data source in GIS.
- c) Vector data model.
- d) Spatial information technology.

**Q3) Answer the following questions in 100 words (any two) [10]**

- a) Explain in brief the functions of Geoinformatics.
- b) Describe the non-spatial data in GIS.
- c) Explain the raster data analysis in GIS.
- d) Discuss the role of GIS in urban planning.

**Q4) Answer the following questions in 200 words (any one) [10]**

- a) Give an account of GIS applications in soil resource management.
- b) Explain in detail the differentiating characteristics of raster and vector data models in GIS.



Total No. of Questions :4]

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SEAT No. :

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T.Y.B.Sc.

**GEOGRAPHY**

**Gg-334 : Geography of India (Part-I)  
(2013 Pattern) (Semester-III) (Paper - VII)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Diagrams and maps must be drawn wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following questions in two or three sentences (any ten): **[10]**

- a) What is the total length of land frontier of India's mainland?
- b) List any two minerals found along the Indian coast.
- c) Name any two rivers originating in Himalayas.
- d) Define Tarai plain.
- e) Which is the highest peak in Sahyadri?
- f) Name any four tributaries of Indus river.
- g) List any two east flowing rivers of India.
- h) Name any two highest peaks along shiwalik range.
- i) List any two mountain ranges of Eastern ghats.
- j) Mention any two characteristics of Retreating monsoon.
- k) List any two type of soils found in peninsular India.
- l) In which states of India, laterite soil is found?
- m) Which type of natural vegetation is found in Maharashtra?

**P.T.O.**

**Q2) Write short notes (any two):-** **[10]**

- a) Indo -China political relationship.
- b) Bramhaputra River system.
- c) Types of Natural vegetation in India.
- d) Summer season in India.

**Q3) Answer the following questions in 100 words (any two):** **[10]**

- a) What is the political significance of Indian Ocean?
- b) Describe the Factors affecting the mechanism of monsoon.
- c) Explain the Peninsular river system.
- d) Discuss the type of soils in India.

**Q4) Answer the following questions in 200 words (any one):** **[10]**

Discuss the Physiography of coastal lowlands and islands in India.

OR

Define soil degradation Explain the factors responsible for soil degradation.



Total No. of Questions :4]

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**T.Y.B.Sc.**

**GEOGRAPHY**

**GG - 335 : Geography of Soils (Part - I)  
(2013 Pattern) (Semester - III) (Paper - IX)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of map stencils is allowed.*
- 4) Draw neat diagrams and sketches wherever necessary*

**Q1)** Answer the following questions in two or three sentences (any ten). **[10]**

- a) What are peds?
- b) Name the horizons of the soil profile.
- c) What is 'Illuviation'?
- d) Write the types of clay minerals.
- e) What is Montmorillonite?
- f) Give the methods of mechanical analysis of soils?
- g) Define gravitational water.
- h) Define Intrazonal soils.
- i) What is redox potential?
- j) Write the types of soil erosion.
- k) Define Biological weathering.
- l) What is water holding capacity of soils.
- m) Write the types of Azonal soils.

***P.T.O.***

**Q2) Write short notes (any two) [10]**

- a) Importance of soil studies.
- b) Components of soils.
- c) Alkalization.
- d) Cation Anion Exchange

**Q3) Answer the following questions in 100 words (any two) [10]**

- a) Define pedology and explain the brief history of pedology.
- b) Explain how weathering affects the soil structure and texture.
- c) Write chemical processes of oxidation- Reduction and Hydrogen ion concentration.
- d) Give an account of zonal soil classification.

**Q4) Answer the following questions in 200 words (any one) [10]**

- a) Draw a neat sketch of ideal soil profile and explain the factors affecting on soil profile development.
- b) Explain any five pedogenetic processes.



Total No. of Questions :4]

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T.Y.B.Sc.

**GEOGRAPHY**

**Gg-336 : Fundamentals of Geo-informatics (Part-I)**

**(2013 Pattern) (Semester-III) (Paper - XI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Diagrams and maps must be drawn wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following questions in two to three sentences (any ten): **[10]**

- a) Mention any two applications of remote sensing.
- b) What do you mean by the term illumination.
- c) Define Wavelength.
- d) What are framing cameras.
- e) What do you understand by the term tilt in an aerial photography.
- f) What is meant by swing of aircraft.
- g) What is principal point.
- h) What is meant by the term sortie number.
- i) What is meant by flight line.
- j) What do you understand by non-selective scattering.
- k) What is meant by FCC?
- l) What do you understand by vertical aerial photography.
- m) Give the spectral range for microwave region.

**P.T.O.**

**Q2) Write short notes on: (any two) [10]**

- a) Application of remote sensing in Geology.
- b) Electromagnetic radiation.
- c) Strip cameras.
- d) Oblique photographs

**Q3) Answer the following in 100 words (any two): [10]**

- a) Explain visible and spectral range of the electromagnetic radiation.
- b) Give the importance of remote sensing in ocean and coastal monitoring.
- c) Explain the types of scattering.
- d) Describe in brief about stereopairs.

**Q4) Answer the following in 200 words (any one): [10]**

- a) Give an account of types of films used in remote sensing.
- b) Explain in detail the process of remote sensing.



Total No. of Questions : 4]

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T.Y.B.Sc.

**MICROBIOLOGY**

**MB-331 : MEDICAL MICROBIOLOGY - I**

**(2013 Pattern) (Paper - I) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagram wherever necessary.*

**Q1)** Attempt the following

A) Match the following [5]

- |                             |                              |
|-----------------------------|------------------------------|
| a) <u>Vibrio</u>            | i) Prostate gland secretions |
| b) <u>Mycobacterium</u>     | ii) Opportunistic pathogen   |
| c) Cardiolipin antigen      | iii) Darting motility        |
| d) <u>Pseudomonas</u>       | iv) Acid fast bacillus       |
| e) Male reproductive system | v) VDRL                      |

B) State true or false [3]

- a) The cells of clostridium tetani are of drumstick appearance.
- b) Kupffer cells are present in brain.
- c) E.coli can be the cause of intestinal infections in humans.

C) Fill in the blanks. [2]

- a) Time/ place/ Person distribution is examined in ..... studies.
- b) Pneumococci are normal inhabitants of human ..... system.

**Q2)** Attempt any two of the following: [10]

- a) Diagrammatically Represent: Anatomy of kidney.
- b) Explain the role of carriers in transmission of disease.
- c) Comment on: Acinetobacter is an opportunistic pathogen.

**P.T.O.**

**Q3)** Write short notes on any two of the following: **[10]**

- a) Pathogens and diseases of central nervous system.
- b) Laboratory diagnosis of typhoid.
- c) Cultivation of Rickettsia.

**Q4)** Attempt any one of the following: **[10]**

- a) Describe epidemiology, laboratory diagnosis and treatment of leprosy.
- b) Describe various virulence factors and diseases caused by staphylococci.

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Total No. of Questions : 4]

SEAT No. :

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T.Y.B.Sc.

**MICROBIOLOGY**

**MB-332 : Genetics & Molecular Biology - I**

**(2013 Pattern) (Paper - II) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagram wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Answer the following

A) Match the following **[5]**

- |                 |                         |
|-----------------|-------------------------|
| a) Ori C gene   | i) Removal of primers   |
| b) -10 sequence | ii) N-formyl Methionine |
| c) DNA pol I    | iii) r-RNA synthesis    |
| d) All G codon  | iv) Replicon            |
| e) RNA Pol I    | v) Pribnow box          |

B) Attempt the following **[5]**

- a) DNA- B is a \_\_\_\_\_
- |               |                |
|---------------|----------------|
| i) Primase    | ii) Polymerase |
| iii) Helicase | iv) Ligase     |
- b) The protein required for Bacterial transcription initiation is
- |             |             |
|-------------|-------------|
| i) $\alpha$ | ii) $\beta$ |
| iii) Rho    | iv) Sigma   |
- c) Eukaryotic mRNA's have
- |                     |                      |
|---------------------|----------------------|
| i) 5' tail & 3' Cap | ii) 5' Cap & 3' tail |
| iii) 5' Cap & 3' OH | iv) 5' p & 3' tail   |

**P.T.O.**

- d) Define - Map Unit.
- e) State True or False - Agarose gel electrophoresis is usually employed for the separation, identification and characterisation of proteins.

**Q2)** Diagrammatically represent any two of the following: **[10]**

- a) Replication fork.
- b) Western blot technique.
- c) Cloverleaf structure of t-RNA.

**Q3)** Write short notes on any two of the following: **[10]**

- a) Potential uses of Recombinant DNA technology.
- b) Northern blot technique.
- c) Role of Ribosomes in translation.

**Q4)** Attempt any one of the following: **[10]**

- a) What is Tetrad analysis? How is it done? Explain in detail mapping of Chromosome by Tetrad analysis.

OR

- b) What is Post transcriptional modification? Explain in detail the mechanism of post transcriptional modifications in case of Eukaryotic mRNA?

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Total No. of Questions :4]

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**T. Y. B. Sc.**  
**MICROBIOLOGY**  
**MB-333: ENZYMOLOGY**  
**(2013 Pattern) (Semester-III) (paper- III)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates :*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *figures to the right indicate full marks.*
- 4) *Draw neat labelled diagrams wherever necessary*

**Q1) Attempt the following** **[5]**

a) Match the following

- |                           |                               |
|---------------------------|-------------------------------|
| 1) Covalent modification  | i) 'Coenzyme A'               |
| 2) Pyruvate dehydrogenase | ii) Glycogen phosphorylase    |
| 3) Ammonium sulfate       | iii) Carboxy methyl Cellulose |
| 4) Pantothenic acid       | iv) Multienzyme complex       |
| 5) Cation exchanger       | v) Divalent salt              |

b) Draw the structure of Nicotinic acid **[01]**

c) Name any 2 ligands used in affinity Chromatography **[01]**

d) State True or False **[02]**

- 1) PDH is an example of an isoenzyme
- 2) In Competitive inhibition inhibitor binds to both free enzyme and bound enzyme.

e) What is turn over number of an enzyme **[01]**

**P.T.O.**

**Q2)** Attempt any 2 of the following **[10]**

- a) Write short note on SDS-PAGE
- b) Explain the concept of isoenzymes with suitable example
- c) Explain the use of radioisotope technique in enzyme assay.

**Q3)** Attempt any two of the following **[10]**

- a) Derive the equation for Line Weaver Plot.
- b) Explain structure, occurrence and biochemical role of Thiamin.
- c) Explain the concept of 'salting in' and salting out' in enzyme purification.

**Q4)** Attempt any one of the following

- a) Explain principle, working and applications of Ion Exchange chromatography. **[10]**

- b) Explain the concept of allosterism with suitable example.



Total No. of Questions :4]

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SEAT No. :

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**T.Y.B.Sc.**

**MICROBIOLOGY**

**MB-334 : Immunology-I**

**(2013 Pattern) (Semester-III) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat Labelled Diagrams wherever necessary.*

**Q1) a) Match the following and rewrite:-**

**[5]**

- |                              |                             |
|------------------------------|-----------------------------|
| 1) Primary Lymphoid organ    | i) Repetitive epitopes      |
| 2) Properdin pathway         | ii) CTL                     |
| 3) T independent antigens    | iii) Thymus                 |
| 4) Granzymes                 | iv) Booster dose of vaccine |
| 5) Secondary immune response | v) Factor B                 |
|                              | vi) Spleen                  |

**b) State true or false:-**

**[2]**

- i) Normal flora is important in first line of defense.
- ii) IC-2 plays important role in differentiation of T cells.

**c) Attempt the following:-**

**[3]**

- i) Write an example of superantigen.
- ii) Enlist domains of light chain.
- iii) Define - antigenic determinants.

**P.T.O.**

**Q2) Attempt any two. [10]**

- a) Illustrate diagrammatically : antigen processing pathways.
- b) Compare in tabular form: innate and acquired immunities.
- c) Comment on: molecular basis of heavy chain diversity.

**Q3) Write short note: (any two) [10]**

- a) Types of grafts.
- b) Mucous Associated Lymphoid Tissues.
- c) Biological properties of immunoglobulins.

**Q4) Attempt (any one): [10]**

- a) Describe macrophages w.r.t formation, distribution and various functions carried out by them.
- b) Explain factors affecting immunogenicity with examples.



Total No. of Questions :4]

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T.Y.B.Sc.

MICROBIOLOGY

MB - 335 : Fermentation Technology -I  
(2013 Pattern) (Semester - III) (Paper - V)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) All questions carry equal marks.
- 3) Figures to the right indicate full marks.
- 4) Draw neat labelled diagrams wherever necessary.

Q1) Answer the following.

- a) i) Bioassay. [2]  
ii) Analogue resistant mutant.
- b) State True or False. [3]  
i) Sham test is used for pyrogen testing.  
ii) Protoplast fusion technique is used for mutant selection.  
iii) Revertants do not show characters of wild type.
- c) Match the following and write correct pairs. [5]

| A                                   | B                                         |
|-------------------------------------|-------------------------------------------|
| 1) Centrifugation                   | i) Media optimization                     |
| 2) Use of restriction endonucleases | ii) Recurring                             |
| 3) RSM                              | iii) Periodicity of fermentation products |
| 4) Expenses on electricity          | iv) Separation of Biomass                 |
| 5) Shelflife                        | v) rDNA technology                        |
|                                     | vi) Scale up                              |

P.T.O.

**Q2) Short Answers (Any Two):**

**[10]**

- a) Explain criteria of scale-up.
- b) Describe methods of cell disruption.
- c) Compare Batch and continuous sterilization.

**Q3) Attempt any two:**

**[10]**

- a) What is strain improvement? Explain the method of isolation of altered permeability mutant.
- b) Describe in brief Liquid-liquid extraction.
- c) List various approaches of media optimization and explain any one.

**Q4) Write Any One.**

**[10]**

- a) Enlist various methods of quantification of fermentation products, explain enzymatic method of quantification

OR

- b) Enlist different quantity tests for fermentation product and explain pyrogen test.



Total No. of Questions :4]

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SEAT No. :

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T.Y.B.Sc.

MICROBIOLOGY

MB-336 : Food And Dairy Microbiology  
(2013 Pattern) (Semester-III) (Paper - VI)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) All questions carry equal marks.
- 3) Figures to the right indicate full marks.
- 4) Draw neat labelled diagrams wherever necessary.

Q1) Attempt the following:

a) Match the following: [5]

- |                                    |                        |
|------------------------------------|------------------------|
| 1) <u>Alcaligenes viscolactics</u> | i) Methylene blue      |
| 2) <u>Clostridium perfringens</u>  | ii) Intrinsic factor   |
| 3) Water activity                  | iii) Ropiness          |
| 4) Dye reduction test              | iv) Extrinsic factor   |
| 5) Temperature of storage          | v) Stormy fermentation |

b) Fill in the blanks: [2]

- i) The full form of NDDDB is \_\_\_\_\_.
- ii) Blue colour defect in milk is due to \_\_\_\_\_ organism.

c) List any two applications of recombinant dairy enzymes. [1]

d) Define: [2]

- i) Semi-perishable foods.
- ii) F-Value.

P.T.O.

**Q2) Write short note on (any two) [10]**

- a) Food grade Bio-preservatives.
- b) Brucella ring test.
- c) Sources of food spoilage microorganisms.

**Q3) Attempt any two: [10]**

- a) Give significance of fermented foods.
- b) Describe briefly food poisoning by Staphylococcus aureus.
- c) Define milk and add a note on types of milk.

**Q4) Attempt any one: [10]**

- a) Enlist different methods of food preservation and explain principles of food preservation by chemicals.
- b) Describe succession of microorganisms in milk leading to spoilage.



Total No. of Questions : 4]

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**P772**

[Total No. of Pages : 2

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T.Y.B.Sc.

**ELECTRONIC SCIENCE**

**EL-331 - ADVANCED DIGITAL SYSTEM DESIGN**

**(2013 Pattern) (Semester - III) ( Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt all of the following.

- a) List different variables used for state machine. [1]
- b) Write the role of input buffers in PLA. [1]
- c) What is meaning of 'forever' loop used in verilog? [1]
- d) List components of a verilog module. [1]
- e) Write two advantages of ASIC. [2]
- f) What is concatenation operator? [2]
- g) List four advantages of PLD. [2]
- h) List four data types used in verilog. [2]

**Q2)** Attempt any two of the following.

- a) Write a program in verilog for 4 bit full adder using data flow operators. [4]
- b) Explain 'for' loop in verilog with suitable example. [4]
- c) Compare synchronous and asynchronous sequential machines. [4]

**Q3)** Attempt any two of the following.

- a) Write various symbols used in ASM diagram and explain them in brief. [4]
- b) Write short note on complex programmable Logic Devices. [4]
- c) Write verilog code for 4 bit ripple counter using four T-Flipflops. [4]

**P.T.O.**

**Q4)** Attempt any two of the following:

- a) Draw the block diagram of ‘Automatic Tablet Filling System’. Describe its working. [6]
- b) i) A combinational logic is given by  $x=AB+ A\bar{B} + \bar{A}\bar{B}$ . Draw diagram of programmed PAL. [3]
- ii) Describe Mealy model with block diagram. [3]
- c) i) Explain in verilog multiway branching with example. [3]
- ii) State 3 ways of specifying delays in continuous assignment statements and explain any one with example. [3]

OR

**Q4)** Answer all of the following.

- a) Find the compatible state using merger graph [4]

| Present State | Next State |     |     |     |
|---------------|------------|-----|-----|-----|
| State         | 00         | 01  | 10  | 11  |
| A             | C/0        | –/– | A/0 | –/– |
| B             | –/–        | E/0 | B/0 | D/1 |
| C             | D/0        | B/1 | –/– | –/– |
| D             | C/0        | A/1 | E/0 | –/– |
| E             | B/0        | –/– | A/0 | E/1 |

- b) Write short note on ‘SPLD’. [4]
- c) Explain continuous assignments statements in verilog. [4]

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Total No. of Questions : 4]

SEAT No. :

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T.Y.B.Sc.

**ELECTRONIC SCIENCE**

**EL-332: Microcontrollers**

**(2013 Pattern) (Semester - III) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*

**Q1)** Attempt all of the following:

- a) What is the size of internal RAM of 8051  $\mu$ C? [1]
- b) If A = 31 H, what will be the content of register A after 'SWAP A' operation? [1]
- c) What is 'compiler'? [1]
- d) Write two merits of LCD over LED. [1]
- e) List 16-bit registers used in 8051. [2]
- f) Identify addressing modes of instructions [2]
  - i) MOV A, R
  - ii) MOV A, # 50H
- g) List the tools used in program designing. [2]
- h) What do you mean by 16 $\times$ 2 LCD? [2]

**Q2)** Attempt any two of the following:

- a) Write note on 'PSW'. [4]
- b) Which are the different addressing modes of 8051? Explain any two modes with proper example. [4]
- c) Draw the interfacing diagram of stepper motor with 8051. Explain it in brief. [4]

**P.T.O.**

**Q3)** Attempt any two of the following:

- a) Explain interrupt system of 8051. [4]
- b) Write assembly language program to add two 16 bit numbers. [4]
- c) Draw the diagram to interface single digit 7-segment display to 8051. [4]

**Q4)** Attempt any two of the following:

- a) Draw and explain internal block diagram of 8051  $\mu$ C. [6]
- b) With proper diagram and example, distinguish between the instructions 'RRA and RRC A'. [6]
- c) Interface 8 - bit DAC to 8051  $\mu$ C. Write assembly language program to generate a square wave. [6]

OR

Attempt all of the following:

- a) Write full note on 'Stack'. [4]
- b) With proper example, explain 'DAA' instruction of 8051  $\mu$ C. [4]
- c) Give brief explanation of [4]
  - i) Editor and
  - ii) Assembler

*EEE*

Total No. of Questions :4]

SEAT No. :

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T.Y.B.Sc.

ELECTRONIC SCIENCE

EL-333 : Analog Circuit Design & Applications of Linear IC's  
(2013 Pattern) (Semester-III) (Paper - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.

Q1) Attempt all of the following.

- a) Define the term “output offset voltage of op-amp”. [1]
- b) State the advantage of precision rectifier. [1]
- c) Draw the output characteristic of ideal band pass filter. [1]
- d) Write the number of three terminal voltage regulator IC for +5V. [1]
- e) “For no load voltage ( $V_{NL}$ ), value of load resistance ( $R_L$ ) is zero”. Comment. [2]
- f) Write the equation for ‘ $T_{charge}$ ’ for astable multivibrator designed using op-amp. [2]
- g) “Ideal integrator circuit is nothing but low pass filter”. Comment. [2]
- h) “In astable multivibrator using IC-555, if  $R_A = R_B$  then output square wave is symmetric”. Comment. [2]

Q2) Attempt any two of the following.

- a) Explain with proper diagram sample and hold circuit using op-amp. [4]
- b) With the help of circuit diagram, explain offset compensation of op-amp. [4]
- c) Explain working of monostable multivibrator using op-amp. [4]

P.T.O.

**Q3)** Attempt any two of the following .

- a) Draw and explain the working of “Regulated dual power supply using IC 7812 and IC 7912”. [4]
- b) Draw the circuit diagram of antilog amplifier using op-amp and diode as log element. Derive expression for output voltage. [4]
- c) With the help of circuit diagram, explain working of second order low pass filter using op-amp. [4]

**Q4)** Attempt any two of the following.

- a) Draw the circuit diagram of full wave precision rectifier using op-amp having 4 equal value resistors. Derive the expression for output voltage. [6]
- b) With the help of circuit diagram, explain working of “ON-OFF controller using op-amp”. [6]
- c) Draw internal block diagram of phase lock loop (PLL) and explain its working. Also state its characteristics. [6]

OR

Attempt all of the following.

- a) For astable multivibrator using timer IC-555 ,Given  $R_A=10k\Omega$  , $R_B=10k\Omega$  and  $C=0.01\mu F$ . Determine its frequency and duty cycle. [4]
- b) Design a second order low pass filter having lower cut off frequency of  $10k\Omega$  . [4]
- c) Determine frequency of VCO by using IC-566 if  $V_C=10V$ , $C_1=0.1\mu F$ ,  $R_1=5k\Omega$  and supply voltage  $V_{CC}=+12V$ . [4]



Total No. of Questions :4]

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SEAT No. :

[Total No. of Pages : 2

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**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL-334 : Principles of Semiconductor Devices**

**(2013 Pattern) (Semester-III) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw Neat diagram wherever necessary.*

**Q1)** Attempt all of the following.

- a) Define Lattice. [1]
- b) Draw symbol of JFET. [1]
- c) Which are the different types of semiconductors? [1]
- d) Define co-ordination number. [1]
- e) What is epitaxy? [2]
- f) What is amplification? [2]
- g) What is HEMT? [2]
- h) What do you mean by crystalline solids? [2]

**Q2)** Attempt any two of the following.

- a) Explain working of JFET. [4]
- b) Explain vapour phase epitaxy. [4]
- c) Explain direct and indirect semiconductors. [4]

**Q3)** Attempt any two of the following .

- a) What is ohmic contact? Explain in detail. [4]
- b) Explain working of NPN Transistor. [4]
- c) Explain pinch-off and saturation in case of JFET [4]

**P.T.O.**

**Q4)** Attempt any two of the following.

- a) Explain construction and working of MOSFET [6]
- b) With the help of diagram Explain metal, semiconductor, and insulator. [6]
- c) With proper diagram Explain simple cubic (sc), body centred cubic (bcc) and face centred cubic (fcc) structures in detail. [6]

OR

Attempt all of the following.

- a) Explain fermi energy and fermi level. [4]
- b) What is avalanche breakdown in Zener diode. [4]
- c) Explain current voltage characteristics of MOSFET. [4]



Total No. of Questions :4]

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**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL - 335 : 'C' Programming**

**(2013 Pattern) (Semester - III) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator is allowed.*

**Q1)** Answer all of the following.

- a) Write the general form of initialization of arrays. [1]
- b) State the function of getchar (). [1]
- c) What is pointer? [1]
- d) Give the general form of do - while statement. [1]
- e) Define an algorithm. Give its properties. [2]
- f) State meaning of strlen () function. [2]
- g) What is difference between prefix and post fix operator? [2]
- h) Give the basic structure of a C program. [2]

**Q2)** Attempt Any Two of the following.

- a) Write an algorithm to arrange number in ascending order using bubble sort method. [4]
- b) Explain function with no arguments but return value. [4]
- c) Explain with example relational and logical operators in 'C'. [4]

***P.T.O.***

**Q3)** Attempt any TWO of the following.

- a) What are formal and Actual arguments in functions? Give example. [4]
- b) Explain `getc()` and `putc()` functions in file handling. [4]
- c) Explain switch statement with suitable example. [4]

**Q4)** Attempt any TWO of the following.

- a) Explain `fprintf()` and `fscanf()` functions in file handling. Give example. [6]
- b) Write algorithm to accept city name from user and check given city is available or not, using linear search algorithm. [6]
- c) Write a program using one dimensional array to evaluate the following expressions. [6]

$$\text{Total} = \sum_{i=1}^{10} x_i^2$$

OR

**Q4)** Answer all of the following.

- a) What is a function? Give its prototype in 'C' language, and state types. [4]
- b) Explain while loop with suitable example. [4]
- c) Explain break and continue statements in 'C'. [4]



Total No. of Questions :4]

SEAT No. :

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**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL - 336 (A) : Fiber Optic Communication (Optional)**

**(2013 Pattern) (Semester - III) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following.

- a) Define the term acceptance angle. [1]
- b) What do you mean by absorption loss in fiber. [1]
- c) State total internal reflection phenomena. [1]
- d) Define the term quantum efficiency. [1]
- e) List the factors due to which connector losses occur. [2]
- f) Why optical amplifiers are needed in fiber optic communication system? [2]
- g) Compare between single mode and multimode fiber. [2]
- h) 'Semiconductor photodetectors are preferred in fiber optic communication system', comment. [2]

**Q2)** Attempt any Two of the following.

- a) Explain the working principle of LED. Draw the structures of surface emitter LED and edge emitter LED. State its response. [4]
- b) Explain the method for measurement of attenuation of fiber cable. [4]

**P.T.O.**

- c) Explain the propagation of light through step index single mode and multimode fiber with the help of index profile and ray diagram. State its characteristics and disadvantages. [4]

**Q3)** Attempt any two of the following.

- a) Write a note on Advanced fibers. [4]  
b) Explain scattering losses in optical fiber. [4]  
c) Explain optical transmitter system with suitable diagram and list its design specifications. [4]

**Q4)** Attempt any Two of the following.

- a) Explain working principle of Avalanche photodiode with suitable diagram. State its advantages and parameters. [6]  
b) Write short note on short haul and long haul communication system. [6]  
c) i) State the advantages of fiber optic communication system over wireless system. [3]  
ii) Explain bending loss in optical fiber. [3]

OR

Attempt all of the following.

- a) Compute the numerical aperture, acceptance angle, and the critical angle of the fiber having core refractive index 1.50 and refractive index of the cladding is 1.45. [4]  
b) Calculate the quantum efficiency of detector having responsivity  $9.6 \times 10^{-3} \text{ A/W}$  at  $0.8 \mu\text{m}$ .  
(Given: Planck constant =  $6.63 \times 10^{-34}$   
Velocity of light =  $3 \times 10^8$   
Charge on electron =  $1.6 \times 10^{-19}$ ) [4]  
c) The mean optical power launched into an 8km length of fiber is  $120 \mu\text{W}$  and mean optical power at the fiber output is  $3 \mu\text{W}$ . Calculate signal attenuation in dB per unit (km) length. [4]



Total No. of Questions :4]

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**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL - 336 (B) : Electronic Product Design and Entrepreneurship.  
(2013 Pattern) (Semester - III) (Paper - VI) (Optional)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat diagrams must be draw wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt all of the following.

- a) State any two types of co-operative societies. [1]
- b) What is meant by decision? [1]
- c) What is maintainability of electronic product? [1]
- d) Define the term pricing. [1]
- e) What is techno-commercial feasibility of a product? [2]
- f) Explain the term incentive for small business development. [2]
- g) State objectives of entrepreneurship development. [2]
- h) State merits of partnership firm. [2]

**Q2)** Attempt any two of the following.

- a) State the steps for registration of partnership firm. [4]
- b) Explain the basic problems of women entrepreneurship. [4]

- c) An electronic circuit that uses 4-resistors, 1-transistor, 2- capacitors, 1- power transformer and 2- diodes with failure rates 0.6, 0.62, 0.61 0.18 and 0.2 respectively per  $10^6$  hours. Calculate MTBF for the circuit. [4]

**Q3)** Attempt any two of the following.

- a) Explain any four points of sole proprietorship. [4]  
b) Explain the steps for electronic product design with neat diagram. [4]  
c) Explain break event point analysis. [4]

**Q4)** Attempt any two of the following.

- a) Explain the terms:  
i) Fund flow. [3]  
ii) Features of co-operative society. [3]  
b) State merits and demerits of joint stock company. [6]  
c) State and explain different sources of finance for starting business. [6]



Total No. of Questions : 4]

SEAT No. :

**P778**

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**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS. NO. : 301 - INDIA'S FOREIGN & DEFENCE POLICY**

**(2013 Pattern) (Semester - III) ( Core/ Compulsory Paper) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each.

**[16]**

- a) Define "Foreign policy".
- b) What do you mean by Defence policy?
- c) What do you mean by "Look East Policy"?
- d) Write any two characteristics of India's foreign policy.
- e) Why India conducted Nuclear Test in 1974?
- f) State the meaning of Panchsheel.
- g) What do you understand by "Nuclear Doctrine"?
- h) Write the basic objective of India's defence policy.

**Q2)** Answer in 8 to 10 sentences [Any Two]

**[8]**

- a) Explain in brief concept of Foreign policy.
- b) Write a few lines on P.N.E. of 1974.
- c) Why India declare her "Nuclear Doctrine" in 1998?

**Q3)** Write short notes on [Any Two]

**[8]**

- a) Concept of Defence Policy.
- b) Principles of Foreign Policy.
- c) Nuclear Doctrine of India.

**Q4)** Answer in 16 to 20 sentences [ Any One]

**[8]**

- a) Evaluate the India's Nuclear policy since 1974 to onwards.
- b) Explain in brief the determinant factors of Defence policy.

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Total No. of Questions : 4]

SEAT No. :

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**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS-302: Defence Economics**

**(2013 Pattern) (Semester - III)(Paper-II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each:

**[16]**

- a) Define Defence Budget.
- b) Write any two trends of India's defence spending.
- c) Write any two foreign sources of war finance.
- d) Write any two characteristics of war time economy.
- e) Define mobilization of national defence.
- f) Write full form of DPSU.
- g) What do you mean by defence vs development?
- h) Write any two domestic sources of war finance.

**Q2)** Answer in 8 to 10 Sentences each (any two):

**[8]**

- a) Explain economic consequences of war.
- b) Describe elements of war potential.
- c) Explain concept of public good.

**P.T.O.**

**Q3)** Write short notes on (any two): **[8]**

- a) Determinants of Defence Expenditure.
- b) Rational of armament production in India.
- c) Analyses India's defence spending during 1960's.

**Q4)** Answer in 18 to 20 sentences (Any one): **[8]**

- a) Write a note on relationship between war and economy.
- b) Describe relationship between industrial power and war.

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Total No. of Questions : 4]

SEAT No. :

**P780**

[Total No. of Pages : 1

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**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS:-303 : Research Methodology**

**( 2013 pattern) (Semester-III) (paper-III)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each:

**[16]**

- a) What do you mean by Social Science Research?
- b) What is scientific inquiry?
- c) Define hypothesis.
- d) What do you mean by Research design?
- e) State the meaning of secondary data.
- f) What do you mean by fundamental Research?
- g) What is Research problem?
- h) Write any two differences between research methods and methodology?

**Q2)** Answer in 8 to 10 Sentences each (any two)

**[8]**

- a) Explain objectives of research.
- b) Describe relationship between research and Scientific method.
- c) Explain conceptualization in research survey of literature.

**Q3)** Write short notes on (Any two)

**[8]**

- a) Features of good research design.
- b) Criteria for selecting a sample design.
- c) Criteria for good research.

**Q4)** Answer in 18 to 20 sentences (any one)

**[8]**

- a) Explain scope of research in security studies.
- b) Describe Research process in flow chart.



Total No. of Questions : 4]

SEAT No. :

**P781**

[Total No. of Pages : 1

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**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS-304 : Science, Technology and National Security**

**( 2013 pattern) (Semester-III) (paper-IV)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each:

**[16]**

- a) Define Science.
- b) Write full form of C4ISR.
- c) State the meaning of armament technology.
- d) What do you mean by accidental nuclear war?
- e) State the meaning of Battlefield information system.
- f) Write the meaning of surprise first strike.
- g) Write any two characteristics of submarine.
- h) What do you mean by Revolution in Military Affairs?

**Q2)** Answer in 8 to 10 Sentences each: (Any two)

**[8]**

- a) Explain impact of submarine in Naval Warfare.
- b) Describe Role of private sector in India's Defence production.
- c) Examine role of military technology in making foreign policy.

**Q3)** Write short notes on: (Any two)

**[8]**

- a) Science and armament technology.
- b) Transfer of technology and its economic impact.
- c) Impact of science on weapon development.

**Q4)** Answer in 18 to 20 sentences: (Any one)

**[8]**

- a) Explain impact of major technological breakthrough on society.
- b) Describe relationship between science and national security.



Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages :2

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**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 305 : Defence Planning and Management in India**

**(2013 Pattern) (Semester - III) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each.

**[16]**

- a) Write the meaning of effective defence management.
- b) Define team building.
- c) Define strategic perspectives.
- d) State the meaning of military industrial complex.
- e) State the meaning of Battlefield dynamism.
- f) Define military leadership.
- g) Write the meaning of supply chain management.
- h) Write any two principles of logistics.

**Q2)** Answer in 8 to 10 Sentences each (any two).

**[8]**

- a) Discuss scope of defence management.
- b) Describe human resource management in the armed forces.
- c) Explain role of military leadership in defence management.

***P.T.O.***

**Q3)** Write short notes on (Any two) **[8]**

- a) Team building in the armed forces.
- b) Structure of Department of Defence production.
- c) Elements of war potential.

**Q4)** Answer in 18 to 20 Sentences (Any one ). **[8]**

- a) Explain application of war principles in corporate management.
- b) Describe applications of war principles in supply chain management.



Total No. of Questions : 4]

SEAT No. :

**P783**

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**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**  
**DS:-306(A) : Military and Media (Optional)**  
**(2013 Pattern) (Semester - III) (Paper-VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each:

**[16]**

- a) Define defence journalism.
- b) Write the meaning of ethics in journalism.
- c) Define professional Defence journalism.
- d) Define research hypothesis.
- e) Write any two steps of scientific inquiry.
- f) Write any two characteristics of writing report.
- g) Define mass communication.
- h) State the meaning of main body of the report.

**Q2)** Answer in 8 to 10 Sentences each (any two):

**[8]**

- a) Explain types of journalism.
- b) Discuss challenges to defence journalism.
- c) Describe laws in defence journalism.

**Q3)** Write short notes on (any two):

**[8]**

- a) Ingredients of defence journalism.
- b) Evolution of defence journalism.
- c) Essential information for defence journalism.

**Q4)** Answer in 18 to 20 Sentences (any one):

**[8]**

- a) Explain role of media in maintaining national security.
- b) Describe nature and scope of defence journalism.

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Total No. of Questions : 4]

**P783**

[5315] - 372

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS:-306(B) : Armed Conflict and Human Rights (Optional)**

**(2013 Pattern) (Semester - III) (Paper-VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each: **[16]**

- a) What are fundamental rights?
- b) Define international conflicts.
- c) Define directive principles.
- d) Define ethnic conflict.
- e) Define terrorism.
- f) Define equality.
- g) What do you mean by human value?
- h) State the meaning of peace making force.

**Q2)** Answer in 8 to 10 Sentences each (any two): **[8]**

- a) Explain scope of human rights.
- b) Discuss relationship between equality and liberty.
- c) Write a note on Armed Forces Special Power Act (AFSPA).

**Q3)** Write short notes on (any two): **[8]**

- a) Military Intervention.
- b) Asymmetric warfare.
- c) Classification of human rights.

**Q4)** Answer in 18 to 20 Sentences (any one): **[8]**

- a) How do human rights work? Explain.
- b) Describe relationship between armed conflict and human rights.

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Total No. of Questions : 4]

SEAT No. :

**P784**

[Total No. of Pages : 2

**[5315]-373**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS-307(A) : Disaster Management**

**(2013 Pattern) (Semester-III) (Paper-VII)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each:

**[16]**

- a) State the meaning of disaster management.
- b) Define Biological warfare.
- c) Define Environmental disaster.
- d) What are the limitations of Disaster management?
- e) What do you mean by disaster policy perspectives?
- f) Write any two importance of pre-disaster plan.
- g) What do you mean by industrial disaster?
- h) Define Sustainable development.

**Q2)** Answer in 8 to 10 Sentences each: (any two)

**[8]**

- a) Explain characteristics of manmade disaster.
- b) Discuss contributive factors to vulnerability.
- c) Describe Global warming and its impact on society.

**Q3)** Write short notes on (any two)

**[8]**

- a) Disaster due to weapons of mass destructions.
- b) Latur Earthquake and relief operations.
- c) 26/11 Mumbai terror attack and Rescue operations.

**Q4)** Answer in 18 to 20 sentences (Any one)

**[8]**

- a) Explain role of social scientist in pre-disaster management.
- b) Describe relationship between disaster and national security.



Total No. of Questions : 4]

**P784**

**[5315]-373**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS-307(B) : Global Security-I**

**(2013 Pattern) (Semester-III) (Paper-VII)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1) Answer in 2 to 4 Sentences each: [16]**

- a) Define “Global warming”.
- b) State any two causes of “Terrorism”.
- c) What do you mean by “Taliban”?
- d) What do you mean by “Terrorism”?
- e) What was the basic cause for India-China war of 1962.
- f) State any one Example of “Ethnic problem”.
- g) In which year the first Arab -Israel war took place?
- h) Why the Iraq was the subject of American attack in 1990-91?

**Q2) Answer in 8 to 10 Sentences (Any two). [8]**

- a) Explain The Nature of India-China border dispute.
- b) Highlight on the various causes of Global warming.
- c) Explain the causes of conflict between North Korea & South Korea.

**Q3) Write short notes on (Any Two) [8]**

- a) Ethnicity:- As a source of conflict.
- b) Concept of global security.
- c) Preventive measures against global warming.

**Q4) Answer in 16 to 20 sentences (Any one) [8]**

- a) Explain how “Afghanistan” is an escalation point?
- b) Analyse the Arab-Israel conflict with special reference to the role of super powers in it.



Total No. of Questions : 4]

SEAT No. :

**P785**

[Total No. of Pages : 2

**[5315] - 374**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 308 (A): Indian Military Strategy (1857-1947)**

**(2013 Pattern) (Semester - III) (Paper-VIII)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 sentences each:

**[16]**

- a) Define "Military History".
- b) What do you mean by military strategy?
- c) State any two sources of Indian Military History.
- d) What do you mean by Limited war?
- e) Why Indian Army entered in Mesopotamia during world war-I.
- f) State any one example of Total war of 20<sup>th</sup> century.
- g) Who was the first supreme commander of Azad Hind Foj?
- h) State the durations of world war - II.

**Q2)** Answer in 8 to 10 sentences (Any Two).

**[8]**

- a) Why the study of Military History is necessary for us?
- b) Write a few lines on Battle of El-Alamein during world war-II.
- c) Write about Indian National Army.

**Q3)** Write short notes on (Any Two).

**[8]**

- a) Concept of Total War.
- b) Travelling Account: As a source of Indian Military History.
- c) Concept of strategy.

**Q4)** Answer in 16 to 20 sentences (Any one).

**[8]**

- a) Highlight on changing nature of war from limited to total.
- b) Explain the role of Indian Army during Burma campaign of world war-II.



Total No. of Questions : 4]

**P785**

**[5315] - 374**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 308 (B): Maratha Military Strategy (1630-1680 A.D.)**

**(2013 Pattern) (Semester - III) (Paper-VIII)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each: **[16]**

- a) When & where Shivaji was born?
- b) Who was Dadoji Konddev?
- c) State any four names of Shivaji's fort.
- d) Who was Mirza Raje Jaising?
- e) Which fort was a capital fort of Shivaji?
- f) State any two names of Shivaji's muslim commrade.
- g) Who was Chandrarao More?
- h) State any two names of saint in Maharashtra before Shivaji.

**Q2)** Answer in 8 or 10 sentences (Any Two). **[8]**

- a) Write few lines on economic condition of Maharashtra before Shivaji.
- b) Explain in brief geostrategic importance of Jawali territory.
- c) What were the objectives of Shivaji for Karnataka campaign.

**Q3)** Write short notes on (Any Two). **[8]**

- a) Fort system during Shivaji's period.
- b) Geographical condition of Maharashtra before Shivaji.
- c) Jijabai as a maker of Shivaji.

**Q4)** Answer in 16 to 20 sentences (Any one). **[8]**

- a) Assess Shivaji as a "Military Leader".
- b) Explain the battle of Purrandar with special reference to the "Treaty of Purandar".



Total No. of Questions : 4]

SEAT No. :

**P786**

[Total No. of Pages : 2

[5315] - 375

T.Y.B.Sc.

**DEFENCE AND STRATEGIC STUDIES**

**DS - 309 (A): Regional Security System**

**(2013 Pattern) (Semester - III) (Paper-IX)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 sentences each: **[16]**

- a) What do you mean by OPEC?
- b) Who was the chief organizer of NATO?
- c) State the long form of CENTO.
- d) What do you understand by SAFTA?
- e) When the "SAARC" came into existence?
- f) State the aim of NAFTA.
- g) Write the long form of ASEAN.
- h) State the aim of SAARC.

**Q2)** Answer in 8 to 10 sentences (Any Two). **[8]**

- a) Explain the concept of Regional Security system.
- b) Write a few lines on "WARSAW".
- c) Explain in brief objectives of W.T.O.

**Q3)** Write short notes on (Any Two). **[8]**

- a) Causes of managing of SEATO.
- b) Problems of SAARC.
- c) European Union.

**Q4)** Answer in 16 to 20 sentences (Any one). **[8]**

- a) Explain the significance of "OPEC" With special reference to "oil politics".
- b) Highlight on effects of W.T.O. on Third World Countries.



Total No. of Questions : 4]

**P786**

**[5315] - 375**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 309 (B): Strategic Environment of Indian Ocean**

**(2013 Pattern) (Semester - III) (Paper-IX)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 sentences each: **[16]**

- a) State the meaning of littoral countries.
- b) What do you mean by Maritime threat?
- c) State the meaning of power Rivalry.
- d) Write any four names of littoral countries of Indian Ocean.
- e) Where the Andaman & Nicobar Islands situated?
- f) Through which route terrorist came for Mumbai attack of 26/11.
- g) What do you mean by Maritime Security?
- h) To whom we called nose of Indian sub-continent?

**Q2)** Answer in 8 or 10 sentences (Any Two). **[8]**

- a) Explain in brief India's Indian Ocean policy.
- b) Write in short concept of Indian Ocean as a zone of peace.
- c) Write in brief India's Maritime strategy.

**Q3)** Write short notes on (Any Two). **[8]**

- a) Naval strategy of China.
- b) Concept of littoral countries.
- c) B.I.O.T.

**Q4)** Answer in 16 to 20 sentences (Any one). **[8]**

- a) Highlight on strategic consideration enjoying by U.S.A from Diego Garcia Islands.
- b) First & second world war was fought in Atlantic Pacific? Mediterranean Ocean but if third world takes place then certainly it will be in Indian Ocean. Do you agree? Justify your answer.

Total No. of Questions : 4]

SEAT No. :

**P787**

[Total No. of Pages : 2

[5315] - 376

T.Y.B.Sc.

**ENVIRONMENTAL SCIENCE**

**ENV-301 : Terrestrial Ecosystems and Management**

**(2008 & 2013 Pattern) (Semester - III) ( Paper - I) (92413)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory and carry equal marks.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1-2 lines each:

**[10]**

- a) What is meant by “Edge Effect”?
- b) Mention any two species found in Tundra biome.
- c) How habitat restoration is useful in conservation of species?
- d) What is commensalism?
- e) Write any two applications of GIS in ecosystem management.
- f) Mention any two ways to control forest fires.
- g) What is the significance of quadrat method of sampling?
- h) Write any two objectives of Joint Forest Management.
- i) Mention any two objectives of ecotourism.
- j) What is meant by “Carbon Pool”?

**Q2)** Write a short note on ANY TWO of the following:

**[10]**

- a) General Structure of Terrestrial Communities.
- b) Ecosystem Services.
- c) Biogeochemical cycles.

**P.T.O.**

**Q3)** Answer ANY TWO questions from the following: **[10]**

- a) Discuss the species composition of tropical grasslands.
- b) What are the ways involved in sustainable management of natural resources?
- c) Explain any two methods of vegetation sampling with environmental significance.

**Q4)** Attempt ANY ONE of the following: **[10]**

- a) Write an account on various approaches involved in ecodevelopment programme and community based forest management.
- b) What are hotspots of biodiversity? Discuss in detail on
  - i) Western Ghats.
  - ii) Eastern Himalaya.

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Total No. of Questions : 4]

SEAT No. :

**P788**

[Total No. of Pages : 2

[5315] - 377

T.Y.B.Sc.

**ENVIRONMENTAL SCIENCE**

**ENV-302: Wildlife Biology**

**(2008 & 2013 Pattern) (Semester - III) (Paper-II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory and carry equal marks.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1-2 lines each.

**[10]**

- a) What is meant by 'Wildlife' as per Wildlife Act?
- b) Mention any two characteristics of Bryophytes.
- c) What is meant by 'Radio tagging'?
- d) What is environmental significance of wetlands?
- e) Write scientific names of any two angiosperms.
- f) What are hotspots of biodiversity?
- g) Mention any two characteristics arid zones.
- h) Write any two objectives of camera trapping.
- i) Give an example of simple marine food chain.
- j) What are applications of diversity indices?

**Q2)** Write a short note on ANY TWO of the following:

**[10]**

- a) Conservation of Genetic Resources.
- b) Methods of plant Diversity Assessment.
- c) Diversity of vertebrates.

**P.T.O.**

**Q3)** Answer ANY TWO questions from the following: **[10]**

- a) Discuss in detail on ecological values of mangrove ecosystem.
- b) Write an account on applications of RS and GIS in wildlife management.
- c) Discuss the importance of terrestrial ecosystems as habitats for wildlife.

**Q4)** Attempt ANY ONE of the following: **[10]**

- a) Write a detailed account on various threats associated with wildlife destruction.
- b) Discuss on various population assessment techniques with reference to birds and mammals.

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Total No. of Questions : 4]

**P789**

SEAT No. :

[Total No. of Pages : 2

[5315]-378

T.Y.B.Sc.

ENVIRONMENTAL SCIENCES

ENV-303: Water Quality

(2008 & 2013 pattern)(New course)(Paper - III) (Semester-III)

(92433)

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the condidates:*

- 1) *All questions are compulsory.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1-2 lines each

**[10]**

- a) Define chemical weathering of rocks.
- b) What is meant by water vector habitat disease.
- c) Enlist two water borne disease.
- d) What is anionic detergent.
- e) Write full form of BIS.
- f) Enlist two advance water treatment.
- g) Define COD.
- h) What is ballast water?
- i) Write full form of UASB.
- j) What is hard water.

**Q2)** Write short note on(Any two)

**[10]**

- a) Solubility of gases in water.
- b) Biotransformation of heavy metals.
- c) Oil spills in marine environment.

**P.T.O.**

**Q3)** Answer any two from the following. **[10]**

- a) Which factor determines the movements and distribution of pollutants in water.
- b) Explain the role of indian legislation in water crisis.
- c) What are the effects of eutrophication.

**Q4)** Attempt any one of the following question **[10]**

- a) Explain the concept of oxygen demand. Briefly write the BOD analysis Procedure.
- b) What are the impact of thermal pollution on aquatic life .



Total No. of Questions : 4]

SEAT No. :

**P790**

[Total No. of Pages : 2

**[5315]-379**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV-304: Issues in Environmental Science -I**

**(2008 & 2013 pattern)(Paper - IV) (Semester-III) (92443)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the condidates:*

- 1) *All questions are compulsory and carry equal marks.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1-2 lines each

**[10]**

- a) Write the full form of 'CDM'.
- b) Define 'sustainable development'.
- c) Write examples of Green house gases.
- d) What is LCA?
- e) Mention effects of GM plants.
- f) What is pastoralism?
- g) Give examples of E-waste.
- h) Mention causes of chernobyl Disaster.
- i) What is Eco-journalism?
- j) Write reasons of water crisis in India.

**Q2)** Write a short note on ANY TWO of the following.

**[10]**

- a) Issues of degraded land.
- b) Objectives of Sustainable development.
- c) Eco- terrorism.

**P.T.O.**

**Q3)** Answer ANY TWO questions from the following. **[10]**

- a) Explain in brief LCA methodology.
- b) Discuss role of community in Environment conservation.
- c) Discuss impacts of population explosion on Environment.

**Q4)** Attempt any one of the following. **[10]**

- a) What is Global Warming? Explain causes & effects of Green house gas emissions. Add a note on Mitigation measures of it.
- b) Define carbon sequestration. Discuss methods of carbon sequestration. Add a note on benefits of it.



Total No. of Questions :4]

SEAT No. :

**P791**

[Total No. of Pages :2

**[5315] - 380**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 305 : Environmental Governance and Equity Law and Ethics  
(2008 & 2013 Pattern) (Semester - III) (Paper - V) (92453)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory and carry equal marks.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1-2 lines each.

**[10]**

- a) What is Green Tribunal?
- b) Write statement of Art S1 A (g).
- c) Enlist powers of pollution control board under Air Act, 1981.
- d) What is CCC?
- e) Write any two International obligations of India.
- f) Mention objectives of National Forest policy.
- g) What is public liability?
- h) Give any two elements of Environmental governance.
- i) Write objective of Motor vehicle regulation in India.
- j) Write any two principles of 'stock holm declaration'.

**P.T.O.**

**Q2)** Write a short note on ANY TWO of the following. **[10]**

- a) Ecomark Scheme.
- b) Biodiversity Act, 2002.
- c) PIL

**Q3)** Answer ANY TWO questions from the following. **[10]**

- a) Discuss salient features of Environment (protection) Act, 1986.
- b) Explain Role of public in Environment governance.
- c) Discuss outcomes of the Earth summit, 1992.

**Q4)** Attempt ANY ONE of the following. **[10]**

- a) Explain concept of Environmental Ethics. Add a note on challenges of world Environmental ethics.
- b) Discuss functions and powers of pollution control board under the water (Prevention & control of Pollution) Act, 1974.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P792**

**[5315] - 381**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV-306 : Environmental Biotechnology - I**

**(2008 & 2013 Pattern) (Semester - III) ( Paper - VI) (92463)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1-2 lines each:

**[10]**

- a) Enlist the types of composting technology.
- b) Define allomonas.
- c) Write any two microorganisms in biofuels.
- d) What is full form of 'PSM'.
- e) What is sustainable agriculture.
- f) Define micro propagation.
- g) Define bioleaching.
- h) What is C/N ratio in composting is desirable.
- i) Define in situ bioremediation.
- j) Enlist any two organisms used in biofertilizers.

**Q2)** Write a short note on ANY TWO of the following:

**[10]**

- a) Gasification of biomass.
- b) Bacterial pesticides.
- c) Ethanol production.

**P.T.O.**

**Q3) Answer ANY TWO questions from the following: [10]**

- a) Explain the manufacturing procedure for bacterium biopesticides.
- b) Elaborate the risk associated with GMO'S.
- c) What are the process factors influencing vermi composting.

**Q4) Attempt ANY ONE of the following: [10]**

- a) Discuss in detail 'Neem pesticide' with special emphasis on their mode of action.
- b) Briefly explain the biosafety guidelines in India.

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Total No. of Questions : 4]

**P793**

SEAT No. :

[Total No. of Pages : 2

**[5315]-383**

**T.Y.B.Sc.**

**BIOTECHNOLOGY (Vocational)  
(VOC-BIOTECH-335) Plant and Animal Biotechnology  
( 2013 Pattern) (Semester-III)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory .*
- 2) Figures to the right indicate full marks.*

**Q1)** Answer the following:-

**[10]**

- a) Define callus.
- b) What is meant by organogenesis?
- c) What is the role of insulin?
- d) Name two physical gene transfer methods in plants?
- e) What is meant by somatic embryogenesis?
- f) Give two applications of stem cells.
- g) What are vaccines?
- h) Name a few cell lines used in animal cell culture.
- i) Define cell fusion.
- j) What is meant by haploids?

**Q2)** Answer Any two of the following:-

**[10]**

- a) Explain production of transgenic mice using stem cells.
- b) Comment on the causes of somaclonal variation.
- c) Define androgenesis. Give applications of haploids.

**P.T.O.**

**Q3)** Write short notes on any two of the following. **[10]**

- a) In-vitro fertilization.
- b) Somatic embryogenesis.
- c) Cell fusion.

**Q4)** Explain production of monoclonal antibodies. **[10]**

OR

Explain Agrobacterium mediated gene transfer in plants.



Total No. of Questions : 4]

SEAT No. :

P1721

[Total No. of Pages : 2

[5315]-384

T.Y.B.Sc. (Semester - III)

**PHOTOGRAPHY AND AUDIO VISUAL PRODUCTION**  
**Video Recording and Playback Systems (Vocational) (Paper-V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Draw neat and labeled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the following.

**[10]**

- a) State the difference between audio and video signals.
- b) Explain the term contrast of a TV picture.
- c) A CCD sensor has higher power consumption than a CMOS sensor. Comment.
- d) State the bandwidth of TV signal used in India.
- e) State the horizontal and the vertical scanning frequency used in India.
- f) What is 'drop out' in a VCR?
- g) State any two adjustments required before using a video camera.
- h) Explain the function of synchronizing pulses in a TV receiver.
- i) State any two types of TV camera tubes.
- j) State two advantages of LCD TV over CRT TV.

**Q2)** Answer any two of the following.

**[10]**

- a) Explain the interlaced scanning pattern used in India.
- b) How is electrical signal recorded on a magnetic tape?
- c) Explain the need for rotating head mechanism in a VCR. Give track survey of a typical video tape.

**P.T.O.**

**Q3)** Answer any two of the following. **[10]**

- a) Explain the working of ACD player. What is the sampling frequency used for digital audio?
- b) Explain the layout and equipment available in a OB van. What are its applications?
- c) What do you mean by photoconductivity? How is this principle used in Vidicon camera tube? Draw a neat labelled diagram of Vidicon tube.

**Q4)** Answer any one of the following. **[10]**

- a) Describe the record and replay electronics in a VCR.
- b)
  - i) Explain the working of record electronics in a VCR.
  - ii) Compare the performance of a film camera with a digital camera. What does CCD mean?



Total No. of Questions : 4]

**P794**

SEAT No. :

[Total No. of Pages : 2

**[5315]-385**

**T.Y.B.Sc.(Vocational)**

**ELECTRONIC EQUIPMENT MAINTENANCE**

**Troubleshooting & Repair of Audio and video Equipment**

**( 2013 pattern) (Semester-III)(Paper - V)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator is allowed.*

**Q1)** Answer all of the following.

- a) In LCD monitor inky Stain Slowly spreads across the LCD screen. What may be the cause? [1]
- b) What are the types of backlight sources used in laptop screen? [1]
- c) What is 'motor boating' in a radio receiver? [1]
- d) State mechanical problems that can occur in a CD player. [1]
- e) State two advantages of plasma TV. [2]
- f) What is the cause of 'excessive hum' in a PA system? [2]
- g) In an FM receiver 'high fidelity is degraded'. Comment. [2]
- h) A laser printer produces distorted printout. Explain cause. [2]

**Q2)** Attempt any two.

- a) Give typical faults in a DVD player and their remedies. [4]
- b) List the basic tools required for laptop repair. [4]
- c) Explain the following faults in CRT monitor. [4]
  - i) Text is not visible.
  - ii) Distortion in display.

**P.T.O.**

**Q3)** Attempt any two.

- a) Give the steps for fault diagnosis in a PA system. [4]
- b) Give the step for troubleshooting a radio receiver. [4]
- c) Give the procedure to replace SMD IC in LCD monitor. [4]

**Q4)** Answer the following.

- a) Explain the faults in dot matrix printer and give their remedies. [6]
- b) Compare the performance of DVD and blue ray disc. What are wavelengths of laser used in the two players. [6]

OR

Answer the following.

- a) Discuss faults occurring specially in FM receiver. [4]
- b) Write a short note on home theater and likely faults in it. [4]
- c) What is a set-top box? What are its functions? [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P795**

**[5315]-386**

**T.Y.B.Sc.(vocational)**

**INDUSTRIAL MICROBIOLOGY**

**VOC-IND-MIC-335: Pollution Control Technology**

**(2013 Pattern) (Semester-III) (Paper-V)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All question carry equal marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*

**Q1)** Answer the following.

**[10]**

- a) State true or false: 'Flow equalization is a preliminary treatment process in wastewater treatment.
- b) Define physical process unit of waste water treatment plant.
- c) Breakpoint chlorination is crucial for removal of \_\_\_\_\_ from water.
- d) Name any two types of anaerobic digesters used in wastewater treatment.
- e) \_\_\_\_\_ are used in pre-treatment of water to remove solid objects.
- f) TDS is calculated by \_\_\_\_\_ TSS \_\_\_\_\_ TS.
- g) Name two pollutants present in an effluent discharged by paint industry.
- h) \_\_\_\_\_ is wastewater that originates from toilet fixtures, dishwashers and food preparation sinks.
  - i) Grey water
  - ii) Black water
  - iii) Yellow water
  - iv) Brown water
- i) State True or False - 'Activated sludge is an anaerobic process for treating sewage and industrial waste water'.
- j) Name two physical characteristics of wastewater.

**P.T.O.**

**Q2)** Attempt any two of the following: **[10]**

- a) Draw a neat labeled diagram of a rotating biological contactor showing all operational features and explain its functioning.
- b) Explain mass balance approach in activated sludge process.
- c) Write a detail note on denitrification of wastewater as a process of nutrient removal.

**Q3)** Write a short note on: (Any two of the following). **[10]**

- a) Explain principle of type II settling of particles in a sedimentation tank.
- b) Describe working of upflow anaerobic sludge blanket reactor for Wastewater treatment.
- c) Write a detail note on phosphate removal from waste water.

**Q4)** Attempt any one of the following: **[10]**

- a) Describe any two problems associated with functioning of activated sludge processes and their remedies.
- b) Given the following information, calculate the MCRT.

|                                               |                 |
|-----------------------------------------------|-----------------|
| Influent TSS                                  | 400 mg/L        |
| Waste activated sludge total suspended solids | 7000 mg/L       |
| Mixed liquor suspended solids                 | 3500 mg/L       |
| Effluent total suspended solids               | 10mg/L          |
| Influent flow                                 | 8.0 mgd         |
| Waste activated sludge flow                   | 0.05mgd         |
| Primary clarifier volume                      | 0.6million gal  |
| Aeration basin volume                         | 1.0 million gal |
| Secondary clarifier volume                    | 0.3 million gal |



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P796**

**[5315]-388**

**T.Y.B.Sc.**

**SEED TECHNOLOGY(Vocational)  
Seed Pathology and Entomology  
(2013 Pattern) (Semester-III) (Paper-V)**

*Time : 2Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following:

**[10×1=10]**

- a) Give one example of storage fungi.
- b) Give one distinguishing character of order coleoptera.
- c) Give one example of seed borne bacteria.
- d) Mention one step/ measure for the managment of seed storage structure.
- e) Give one example of seed borne viral diseases in plants.
- f) What is a pest?
- g) Mention one control measure adopted for insect pest of pulses.
- h) What is the purpose of seed treatment.
- i) What is infestation.
- j) What is infection.

**Q2)** Answer any two of the following:

**[2×5=10]**

- a) Explain any one method for seed health test .
- b) Give a brief history of seed pathology.
- c) Explain how the insects act as vectors of plant diseases?

**P.T.O.**

**Q3)** Write notes on any two:

**[2×5=10]**

- a) Seed transmission.
- b) Seed Storage and pest problem.
- c) History of insect pest.

**Q4)** Explain the life cycle, damage caused and symptoms due to any one insect pest of cereals or pulses.

**[10]**

OR

Describe the various entry points of seed infection.



Total No. of Questions : 4]

SEAT No. :

**P797**

[Total No. of Pages : 2

[5315] - 390

**T.Y. B.Sc.**

**BIOTECHNOLOGY (Vocational)**

**Microbial Biotechnology and Fermentation**

**(2013 Pattern) (Semester-III) (Paper-II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the following:

**[10]**

- a) What are the methods used for enzyme immobilization.
- b) Define microbial biotechnology.
- c) What are acidophiles. Give examples.
- d) What are biopolymers.
- e) Give two applications of GMO in agriculture.
- f) What is SOP?
- g) What is the role of impeller ?
- h) Name the organism used for production of citric acid ?
- i) Name the steps used for recovery of DPT vaccines.
- j) Name any two types of fermentors.

**Q2)** Write short notes on any two of the following:

**[10]**

- a) Diauxic growth.
- b) Strain improvement.
- c) Biosensors.

**P.T.O.**

**Q3)** Answer any two of the following: **[10]**

- a) Explain with the help of diagram a typical batch fermenter.
- b) What is screening? Discuss the types of screening employed in fermentation.
- c) What are thermophiles? Discuss the adaptations shown by thermophiles.

**Q4)** Describe in detail Biofertilizer and Biopesticides. **[10]**

OR

Describe in detail the production and recovery of penicillin antibiotic.



Total No. of Questions : 4]

SEAT No. :

P1722

[Total No. of Pages : 2

[5315]-391

T.Y.B.Sc. (Semester - III)

**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION  
(VOCATIONAL)**

**Television Software (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates :*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer the following .

**[10]**

- a) Differentiate between watching a TV programme and watching a movie.
- b) When is a compact shot and an extreme close up useful?
- c) Discuss : 'Brainstorming'.
- d) Discuss the importance of postproduction stage.
- e) Which format is used for generating a social message? Why?

**Q2)** Answer any two of the following .

**[10]**

- a) Give suitable examples and explain the concept of 'Following Camera'.
- b) Give suitable examples and discuss the use of various camera angles.
- c) Give suitable examples and distinguish between "Zoom in and Zoom out".

**Q3)** Write a script for 30 sec social advertisement on the following theme in the interview format. **[10]**

"Importance of voting in elections".

**P.T.O.**

OR

Write a script for 30 sec social advertisement on the following theme in the documentary format. [10]

"Importance of voting in elections".

**Q4)** Write short notes on two of the following. [10]

- a) Docu-Drama format
- b) Storyboarding
- c) Camera movements



Total No. of Questions : 4]

SEAT No. :

**P798**

[Total No. of Pages : 2

[5315] - 392

**T.Y. B.Sc. (Vocational)**

**ELECTRONIC EQUIPMENT MAINTENANCE**

**Electronic Instrumentation**

**(2013 Pattern) (Semester-III) (Paper-VI) (New)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

**Q1) a) Answer the following: [4×1=4]**

- i) What is event sequence?
- ii) What is LDR?
- iii) What do you mean by active sensor?
- iv) Give one example of null type instruments.

**b) Answer the following: [2×2=4]**

- i) Classify- Mercury Thermometer.
- ii) Explain the term 'internal relay'

**c) Answer the following: [2×2=4]**

- i) Why are null-type instruments more accurate than deflection-type?
- ii) Define accuracy as % of true value.

**Q2) Answer the following - (any 2). [2×4=8]**

- a) Discuss commissioning of PLC system and testing its inputs and outputs.
- b) Explain the DSP with the help of block diagram.
- c) Discuss the advantages of digital transducers.

**P.T.O.**

**Q3) Answer any 2:** **[2×4=8]**

- a) What is ladder diagram? Give the rungs for AND gate and OR gate.
- b) Explain optical encoder.
- c) Discuss relative and absolute motion devices.

**Q4) Answer any 2:** **[2×6=12]**

- a) Discuss architecture of a PLC processor.
- b) Explain basic spectrum analyzer.
- c) Write a note on pneumatic load cell.

OR

**Q4) Answer the following:** **[3×4=12]**

- a)  $R=100\ \Omega$ ,  $L=10\text{mH}$ ;  $f=1\text{kHz}$ . Evaluate the branch impedance in complex and polar form.
- b) Discuss logic analyzer.
- c) Explain the term distortion.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P799**

**[5315] - 393**

**T.Y. B.Sc.**

**INDUSTRIAL MICROBIOLOGY (Vocational)**

**VOC-IND-MIC-336 : Animal and Plant Tissue culture**

**(2013 Pattern) (Semester-III) (Paper-VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

**Q1)** Answer the following:

**[10]**

- a) What is RAM with respect to PTC?
- b) Name any two compounds required for adherence of cells in culture flask.
- c) What are plantibodies?
- d) Define histotypic culture.
- e) Which genes are responsible for maintaining size of plant stem niche?
- f) How are animal tissue culture medium sterilized?
- g) What is differentiation?
- h) State examples of continuous cell lines.
- i) In callus formation high concentration of \_\_\_\_\_ promotes shooting.
- j) List examples of primary and secondary metabolites produced from plant tissue culture.

**Q2)** Attempt any two of the following:

**[10]**

- a) Comment of callus culture.
- b) Explain the concept of synseeds.
- c) What is the role of serum in the culture medium used for animal cell culture?

**P.T.O.**

**Q3)** Comment on (Any two of the following):

**[10]**

- a) Generation of haploid plants.
- b) Hollow fibre reactor.
- c) Role of sodium bicarbonate in ATC medium.

**Q4)** Attempt any one of the following:

**[10]**

- a) Explain vector mediated gene transfer method for plants. Draw diagrams wherever required.
- b) Discuss in detail the method involved for production of monoclonal antibody production.



Total No. of Questions : 4]

SEAT No. :

**P800**

[Total No. of Pages : 2

[5315] - 395

**T.Y. B.Sc.**

**SEED TECHNOLOGY (Vocational)**  
**Seed Farm Management, Processing & Storage**  
**(2013 Pattern) (Semester-III) (New)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following:

**[10]**

- a) Define seed grading.
- b) Give any one objective of farm management.
- c) What is capital limitation.
- d) Define seed processing.
- e) What is seed marketing.
- f) Draw a basic flow pattern in seed processing plant.
- g) What is seed conditioning?
- h) Enlist methods of seed storage.
- i) What is seed cleaning?
- j) Give the name of any one equipment used in seed treatment.

**Q2)** Answer any two of the following:

**[10]**

- a) Describe in detail fundamentals of farm management.
- b) Write an account on major components of seed marketing.
- c) What is seed treatment? Write in detail any one method of seed treatment.

**P.T.O.**

**Q3) Write notes on (any two):** **[10]**

- a) Maintenance management of seed processing unit.
- b) Scope of farm management.
- c) Factors involved in the selection of a farm business.

**Q4) What is seed drying? Explain in detail methods of seed drying.** **[10]**

OR

What is seed storages ? Explain in detail factors affecting storability of seeds.



Total No. of Questions : 4]

SEAT No. :

P801

[Total No. of Pages : 3

[5315]-401

T.Y. B.Sc. (Semester - IV)

MATHEMATICS

MT - 341 : Complex Analysis

(2013 Pattern) (Semester - IV) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following :

[10]

- a) Find the principal argument  $\text{Arg } z$  when  $z = (\sqrt{3} - i)^6$ .
- b) Show that limit of the function  $f(z) = \left(\frac{z}{z}\right)^2$  as  $z$  tends to 0 does not exist.
- c) Find singular points for the function  $f(z) = \frac{z^2 + 1}{(z + 2)(z^2 + 2z + 2)}$ .
- d) Show that when  $n = 0, \pm 1, \pm 2, \dots$ ,  $(-1)^{\frac{1}{\pi}} = e^{(2n+1)i}$
- e) Evaluate  $\int_C f(z) dz$  where  $f(z) = \frac{z+2}{z}$  and  $C$  is the semicircle  $z = 2e^{i\theta} (0 \leq \theta \leq \pi)$ .
- f) Find  $\int_C f(z) dz$  where  $f(z) = \frac{z}{e^z}$  and  $C$  is the circle  $|z| = 1$  in the positive sense.
- g) Show that the singular point of the function  $f(z) = \frac{1 - \cosh z}{z^3}$  is a pole. Determine the order  $m$  of the pole and corresponding residue  $B$ .

P.T.O.

**Q2)** Attempt any two of the following :

[10]

- a) Suppose that  $f(z) = u(x, y) + iv(x, y)$  and that  $f'(z)$  exists at a point  $z_0 = x_0 + iy_0$ . Then, show that the first order partial derivatives of  $u$  and  $v$  must exist at  $(x_0, y_0)$  and they must satisfy the Cauchy Riemann equations  $u_x = v_y, u_y = -v_x$  there. Also, show that  $f'(z_0) = u_x + iv_x$  where the partial derivatives are calculated at  $(x_0, y_0)$ .
- b) Let  $f(z)$  be an analytic function in a domain  $D$  such that  $|f(z)|$  is constant throughout  $D$ . Prove that  $f(z)$  must be constant throughout  $D$ .
- c) Find the four roots of the equation  $z^4 + 4 = 0$  and use them to factor  $z^4 + 4$  into quadratic factors with real coefficients.

**Q3)** Attempt any two of the following :

[10]

- a) Show that  $u(x, y) = \sinh x \sin y$  is harmonic in some domain and find its harmonic conjugate  $v(x, y)$ .
- b) Show that for all  $z$     a)  $\overline{\sin z} = \sin \bar{z}$     b)  $\overline{\cos z} = \cos \bar{z}$ .
- c) Write the two Laurent series in powers of  $z$  that represent the function

$$f(z) = \frac{1}{z(1+z^2)} \text{ in certain domain and specify those domains.}$$

**Q4)** Attempt any one of the following :

[10]

- a)
  - i) State and prove the Cauchy integral formula.
  - ii) Show that if  $C$  is the boundary of the triangle with vertices at the points  $0, 3i$  and  $-4$  oriented in the counterclockwise direction then

$$\left| \int_C (e^z - \bar{z}) dz \right| \leq 60.$$

- b) i) Let  $f$  be continuous in a domain  $D$ . If  $\int_C f(z) dz = 0$  for every closed contour lying in  $D$ , then show that  $f$  is analytic throughout  $D$ .
- ii) Using the Cauchy's residue theorem evaluate the integral of  $f(z) = \frac{z+1}{z^2-2z}$  around the circle  $|z|=3$  in the positive sense.



Total No. of Questions : 4]

SEAT No. :

P802

[Total No. of Pages : 3

[5315]-402

T.Y. B.Sc. (Semester - IV)

MATHEMATICS

MT - 342 : Real Analysis - II

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following : [10]

a) Let  $f(x) = x^2$  ( $0 \leq x \leq 1$ ). for each  $n \in I$ , let  $\sigma_n$  be the subdivision

$\left\{0, \frac{1}{n}, \frac{2}{n}, \dots, \frac{n}{n}\right\}$  of  $[0, 1]$ . Compute  $\lim_{n \rightarrow \infty} \bigcup [f; \sigma_n]$ .

b) True or false? If  $f \in R[a, b]$  and if  $f(x) = g(x)$  except for a finite number of points  $x \in [a, b]$ , then  $g \in R[a, b]$ . Justify your answer.

c) Give an example of a sequence of real valued functions that converges pointwise but not uniformly justify.

d) Show that the series  $\sum_{n=1}^{\infty} e^{-nx} x^n$  ( $0 \leq x \leq 10$ ) is uniformly convergent on  $[0, 10]$ .

e) If  $F$  is continuous on  $[a, b]$  such that  $f(x) > 0, a \leq x \leq b$  and if

$f(x) = \int_a^x f(t) dt, a \leq x \leq b$ , then prove that  $F$  is strictly increasing on  $[a, b]$ .

f) Show that  $\int_1^{\infty} \frac{1}{\sqrt{x}} dx$  is divergent.

g) Prove that  $\int_0^1 \frac{dx}{x^2 + x^{1/2}}$  is convergent.

P.T.O.

**Q2)** Attempt any two of the following :

**[10]**

- a) If  $a < b$ , prove that  $[a, b]$  can not be covered by a finite number of open intervals whose lengths add upto less than  $b-a$ . Hence deduce that  $[a, b]$  is not of measure zero.
- b) Let  $f$  be a bounded function on the closed bounded interval  $[a, b]$ . Then prove that  $f \in R[a, b]$  if and only if for each  $\epsilon > 0$ , there exists a subdivision  $\sigma$  of  $[a, b]$  such that  $U[f; \sigma] < L[f; \sigma] + \epsilon$ .
- c) Let  $\{f_n\}_{n=1}^{\infty}$  be a sequence of real-valued functions on a metric space  $M$  which converges uniformly to the function  $f$  on  $M$ . If each  $f_n$  is continuous at  $a \in M$ , then prove that  $f$  is also continuous at  $a$ .

**Q3)** Attempt any two of the following :

**[10]**

- a) Let  $f$  be a non-increasing function on  $[1, \infty]$  such that  $f(x) \geq 0$  for  $1 \leq x < \infty$ . Prove that  $\sum_{n=1}^{\infty} f(n)$  will converge if  $\int_1^{\infty} f(x) dx$  converges and  $\sum_{n=1}^{\infty} f(n)$  will diverge if  $\int_1^{\infty} f(x) dx$  diverges.
- b) Let  $\sum_{k=1}^{\infty} u_k$  be a series of functions in  $R[a, b]$  which converges uniformly to  $f$  on  $[a, b]$ . Then prove that  $f \in R[a, b]$  and  $\int_a^b f(x) dx = \sum_{k=1}^{\infty} \int_a^b u_k(x) dx$ .
- c) Prove that  $\frac{2\pi^2}{9} \leq \int_{\pi/6}^{\pi/2} \frac{2x}{\sin x} dx \leq \frac{4\pi^2}{9}$ .

**Q4)** Attempt any one of the following :

**[10]**

- a) i) State and prove the second fundamental theorem of calculus.
- ii) If  $f$  is continuous on  $[a, b]$ , prove that there exists  $c \in (a, b)$  such that  $\int_a^b f(x)dx = f(c).(b - a)$ .
- b) i) Let  $f$  be a uniformly continuous real-valued function on  $(-\infty, \infty)$  and for each  $n \in I$ , Let  $f_n(x) = f\left(x - \frac{1}{n}\right)$   $(-\infty < x < \infty)$ . Prove that  $\{f_n\}_{n=1}^{\infty}$  converges uniformly on  $(-\infty, \infty)$ .
- ii) Find the Cauchy principal value of  $I = \int_{-1}^4 \frac{dx}{(x-1)^3}$ .



Total No. of Questions : 4]

SEAT No. :

P803

[Total No. of Pages : 3

[5315]-403

T.Y. B.Sc. (Semester - IV)

MATHEMATICS

MT - 343 : Problem Course Based on MT 341 and MT 342

(2013 Pattern) (Paper - III)

Time : 2 Hour]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Answers to the two sections should be written in separate answer books.
- 4) The answer books of both sections tie together.

**SECTION - I**

**(Complex Analysis)**

**Q1) a)** Attempt any three of the following : **[6]**

i) If  $f(z) = \bar{z}$  then show that  $f'(z)$  does not exist at any point  $z$ .

ii) Show that  $f(z) = (3x + y) + i(3y - x)$  is an entire function.

iii) Show that  $\int_{|z|=1} \frac{z^2}{z-3} dz = 0$ .

iv) Find the residue at  $z = 1$  of the function  $f(z) = \frac{z}{(z-1)(z+1)^2}$ .

**b)** Attempt any one of the following : **[4]**

i) Evaluate  $\int_C (z-1) dz$  where  $C$  is the arc from  $z = 0$  to  $z = 2$  consisting of

A) the semicircle  $z = 1 + e^{i\theta}$  ( $\pi \leq \theta \leq 2\pi$ ).

B) The segment  $z = x$  ( $0 \leq x \leq 2$ ) of the real axis.

**P.T.O.**

ii) Give two Laurent series expansions in powers of  $z$  for the function

$f(z) = \frac{1}{z^2(1-z)}$  and specify the regions in which those expansions are valid.

**Q2)** Attempt any two of the following : **[10]**

- a) Show that  $u(x, y) = 2x(1 - y)$  is harmonic in some domain and find its harmonic conjugate  $v(x, y)$ .
- b) Find all roots of  $\sin z = \cosh 4$ .
- c) Evaluate the integral.

$$\int_C \frac{(3z + 2)^2}{z(z - 1)(2z + 5)} dz$$

When  $C$  is the circle  $|z| = 3$ , described in the positive sense.

### **SECTION - II**

#### **(Real Analysis - II)**

**Q3)** a) Attempt any three of the following : **[6]**

i) Compute  $w[f; x]$  for all  $x \in [0, 1]$  for the characteristic function  $f$  of the set of rationals in  $[0, 1]$ .

ii) If  $0 \leq x \leq 1$ , show that  $\frac{x^2}{\sqrt{2}} \leq \frac{x^2}{\sqrt{1+x}} \leq x^2$ .

iii) Prove that  $\int_2^{\infty} \frac{dx}{\sqrt{x^2 - 1}}$  diverges.

iv) Let  $f_n(x) = \frac{x^n}{n}$  ( $0 \leq x \leq 1$ )

show that  $\{f_n\}_{n=1}^{\infty}$  converges uniformly to 0 on  $[0, 1]$ .

b) Attempt any one of the following : [4]

i) If  $f \in R[0,1], \sigma_n = \left\{0, \frac{1}{n}, \frac{2}{n}, \dots, \frac{n}{n}\right\}$  and

$\lim_{n \rightarrow \infty} U[f; \sigma_n] = \lim_{n \rightarrow \infty} L[f; \sigma_n] = A$ , then prove that  $\int_0^1 f(x) dx = A$ .

ii) Discuss the uniform convergence of

$$h_n(x) = \frac{nx}{1+n^2x^2} \quad (-\infty < x < \infty)$$

**Q4)** Attempt any two of the following : [10]

a) For  $f(x) = \sin x \quad \left(0 \leq x \leq \frac{\pi}{2}\right)$  and  $\sigma_n = \left\{0, \frac{\pi}{2n}, \frac{2\pi}{2n}, \dots, \frac{n\pi}{2n}\right\}$ ,

compute  $U[f; \sigma_n]$  Hence find  $\lim_{n \rightarrow \infty} U[f; \sigma_n]$ .

b) Let  $g_n(x) = \frac{1}{n} e^{-nx} \quad (0 \leq x < \infty)$

Prove that  $\{g_n\}_{n=1}^{\infty}$  converges uniformly to 0 on  $[0, \infty)$ .

c) Discuss the convergence of the series  $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^\alpha}$  where  $\alpha > 0$ .



Total No. of Questions : 4]

SEAT No. :

P804

[Total No. of Pages : 2

[5315]-404

T.Y. B.Sc. (Semester - IV)

MATHEMATICS

MT - 344 : Ring Theory

(2013 Pattern) (Paper - IV)

*Time : 2 Hour]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any five of the following :

**[10]**

- a) Find all zeros of  $x^3 + 2x + 2$  in  $Z_7$ .
- b) Give an example of finite non-commutative ring.
- c) Define unit of a ring. find all units in  $Z$ .
- d) In  $Z[i]$ , show that 5 is not irreducible.
- e) Determine whether the polynomial  $8x^3 + 6x^2 - 9x + 24$  is irreducible over  $Q$ . Justify.
- f) Give an example to show that a factor ring of an integral domain may have divisors of zero.
- g) Find all prime ideals of  $Z_{12}$ .

**Q2)** Attempt any two of the following :

**[10]**

- a) If  $R$  is a ring with additive identity  $0$ , then prove that for any  $a, b \in R$  we have
  - i)  $0.a = a.0 = 0$
  - ii)  $a.(-b) = (-a).b = -(a.b)$

**P.T.O.**

- b) Let  $f(x) \in F[x]$ , and let  $f(x)$  be of degree 2 or 3. Then prove that  $f(x)$  is reducible over  $F$  if and only if it has zero in  $F$ .
- c) Using Fermat's theorem, find the remainder of  $3^{245}$  when it is divided by 7.

**Q3)** Attempt any two of the following : **[10]**

- a) Prove that a non zero ideal  $\langle p(x) \rangle$  of  $F[x]$  is maximal if and only if  $p(x)$  is irreducible over  $F$ .
- b) Let  $P$  be an ideal of a commutative ring  $R$  with unity. Prove that  $R/P$  is an integral domain if and only if  $P$  is prime.
- c) Let  $R = \{a + b\sqrt{2} \mid a, b \in \mathbb{Z}\}$  and let  $R'$  consist of all  $2 \times 2$  matrices of the form  $\begin{bmatrix} a & 2b \\ b & a \end{bmatrix}$  for  $a, b \in \mathbb{Z}$ . Then show that  $\phi: R \rightarrow R'$  where  $\phi(a + b\sqrt{2}) = \begin{bmatrix} a & 2b \\ b & a \end{bmatrix}$  is an isomorphism.

**Q4)** Attempt any one of the following : **[10]**

- a) i) If  $D$  is a UFD, then prove that a product of two primitive polynomials in  $D[x]$  is primitive.
- ii) If  $P$  is a prime, then show that  $\mathbb{Z}_p$  has no divisors of zero.
- b) i) Prove that every PID is a UFD.
- ii) Let  $R = \{0, 2, 4, 6, 8\}$  under addition and multiplication modulo 10. Write addition and multiplication table for  $R$ . Is  $R$  a field? Explain.



Total No. of Questions : 4]

SEAT No. :

P805

[Total No. of Pages : 2

[5315]-405

T.Y. B.Sc. (Semester - IV)

MATHEMATICS

MT - 345 : Partial Differential Equations

(2013 Pattern) (Paper - V)

Time : 2 Hour]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any Five of the following :

[10]

- a) Test the integrability of the following equation :  
 $(1 + yz)dx + x(z - x)dy - (1 + xy)dz = 0$ .
- b) Eliminate arbitrary function F from the equation  $z = F(xy / z)$  and find the corresponding partial differential equation.
- c) Define the term : 'The singular integral'.
- d) Find the integral curves of  $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$ .
- e) Find the general integral of  $xp + yq = z$ .
- f) Find the complete integral of  $z = px + qy + pq$ .
- g) Define the term : 'Integrating factor'.

Q2) Attempt any two of the following :

[10]

- a) Define homogeneous pfaffian differential equation in three variables. Also explain method of solving it.
- b) Verify that the equation  $(y + z)dx + (z + x)dy + (x + y)dz = 0$  is integrable and solve it.
- c) Find the orthogonal trajectories on the conicoid  $(x + y)z = 1$  of the conies in which it is cut by the system of planes  $x - y + z = k$  where  $k$  is parameter.

P.T.O.

**Q3)** Attempt any two of the following :

[10]

- a) State and prove a necessary and sufficient condition that there exists between two functions  $u(x, y)$  and  $v(x, y)$  a relation  $F(u, v) = 0$ , not involving  $x$  or  $y$  explicitly is that  $\frac{\partial(u, v)}{\partial(x, y)} = 0$ .
- b) Find integral curves of the equation.

$$\frac{dx}{xz - y} = \frac{dy}{yz - x} = \frac{dz}{1 - z^2}.$$

- c) Find complete integral of  $z(p^2 + q^2) + px + qy = 0$ .

**Q4)** Attempt any one of the following :

[10]

- a) i) Show that there always exists an integrating factor for a pfaffian differential equation in two variables.
- ii) Explain Charpit's method of finding complete integral of first order partial differential equation.
- b) i) Solve  $x^2 u_x - u_y^2 - \alpha u_z^2 = 0$  by Jacobi's method.
- ii) Show that the equations.

$$f = p^2 + q^2 - 1 = 0$$

$$g = (p^2 + q^2)x - pz = 0$$

are compatible and find the one-parameter family of common solutions.



Total No. of Questions : 4]

SEAT No. :

P806

[Total No. of Pages : 2

[5315]-406

T.Y. B.Sc.

MATHEMATICS

MT - 346 : Problem Course Based on MT - 344 and MT - 345  
(2013 Pattern) (Paper - VI) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Answer to the two sections should be written in separate answer books.
- 4) Tie answer books of both sections together.

**SECTION - I**

(Ring Theory)

**Q1) a)** Attempt any three of the following : **[6]**

- i) Find all solution of the congruence  $2x = 6 \pmod{4}$ .
- ii) State the characteristics of  $Z_5$  and  $5Z$ .
- iii) Does there exist an integral domain of characteristic 6? if so, give an example.
- iv) List all polynomials of degree 3 in  $Z_2[x]$

**b)** Attempt any one of the following : **[4]**

- i) Find the sum and product of the polynomials  
 $f(x) = 4x-5$ ,  $g(x) = 2x^2 - 4x + 2$  in  $Z_8[x]$ .
- ii) Prove that if  $p$  is a prime in an integral domain  $D$ , then  $p$  is an irreducible.

**Q2)** Attempt any two of the following : **[10]**

- a) Show that the boolean ring is commutative.
- b) Find the remainder of  $49!$  modulo 53
- c) Let  $D$  be a Euclidean domain and let  $v$  be a euclidean norm on  $D$ . Show that if  $a$  and  $b$  are associates in  $D$ , then  $v(a) = v(b)$ .

**P.T.O.**

**SECTION - II**  
(Partial Differential Equations)

**Q3) a)** Attempt any three of the following : **[6]**

i) Find the integral curves of the equations

$$\frac{dx}{z-y} = \frac{dy}{x-z} = \frac{dz}{y-x}$$

ii) Solve the differential equation

$$a^2 y^2 z^2 dx + b^2 x^2 z^2 dy + c^2 x^2 y^2 dz = 0$$

by variable separable method.

iii) Find the general integral of

$$yzp + xzq = xy$$

iv) Find a complete integral of Clairaut's partial differential equation.

$$z = px + qy + pq$$

v) Show that the differential equation

$$(2x + y^2 + 2xz) dx + 2xy dy + x^2 dz = 0$$

is integrable.

**b)** Attempt any one of the following : **[4]**

i) Show that the differential equation

$$zydx - zxdy - y^2 dz = 0$$
 is integrable and find its primitive.

ii) Find the general solution of

$$y^2 p - xyq = x(z - 2y)$$

**Q4)** Attempt any two of the following: **[10]**

i) Find the complete integral by Jacobi's method

$$P_1 P_2 P_3 = z^3 x_1 x_2 x_3$$

ii) Find the complete integral of

$$p = (z + qy)^2$$

by using Charpit's method.

iii) Find the orthogonal trajectories of the family of parabola with vertices at origin and foci on y – axis.

$$x^2 = 4by, \text{ where } b \text{ is parameter.}$$



Total No. of Questions : 4]

SEAT No. :

P807

[Total No. of Pages : 3

[5315]-407

T.Y. B.Sc.

MATHEMATICS (Semester - IV)

MT - 347 (A) : Optimization Techniques

(2013 Pattern) (Paper - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following :

[10]

- a) Define the term Game.
- b) What are the type of failure in the replacement problem.
- c) In a game of matching coins, player A wins Rs.2 if there are two heads, nothing if there are two tails and losses Rs. 1 when there is one head and one tail. Determine the pay-offmatrix.
- d) Examine the following functions for extreme point.  
 $f(x) = x^4 + x^2$
- e) Draw the network for the following relationship.  
Event number : 0                      1    2,3    4    5    6  
Preceded by : start event      0    1    2,3    3    4,5
- f) Give any two characteristics of two person zero sum game.
- g) What do you mean by no passing rule in sequencing problem?

Q2) Attempt any two of the following :

[10]

- a) We have a nine jobs each of which has to go through the machines  $M_1$  and  $M_2$  in the order  $M_1 - M_2$ . Processing time (in hours) are given as:

| Jobs :          | $J_1$ | $J_2$ | $J_3$ | $J_4$ | $J_5$ | $J_6$ | $J_7$ | $J_8$ | $J_9$ |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Mahine $M_1$ :  | 2     | 5     | 4     | 9     | 6     | 8     | 7     | 5     | 4     |
| Machine $M_2$ : | 6     | 8     | 7     | 4     | 2     | 9     | 3     | 8     | 11    |

Determine a sequence of these jobs that will minimize the total elapsed time.

Also find the idle time for machine  $M_2$ .

P.T.O.

- b) A fleet owner finds from his past records that the cost per year of an auto whose purchase price is Rs. 10,000 are given below.

|                      |       |      |      |      |      |      |      |   |
|----------------------|-------|------|------|------|------|------|------|---|
| Year :               | 1     | 2    | 3    | 4    | 5    | 6    | 7    | 8 |
| Running Cost(Rs.) :  | 15,00 | 1900 | 2300 | 2900 | 3600 | 4500 | 5500 |   |
| Resale Value (Rs.) : | 5000  | 2500 | 1250 | 600  | 400  | 400  | 400  |   |

Determine the optimum period of replacement

- c) Solve the following non-linear programming problem by lagranges method.

$$f(x) = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3 + 200$$

**Q3) a)** Attempt any two of the following : **[10]**

Solve the following game using graphical method and find the value of the game.

|   |                |                |                |                |                |
|---|----------------|----------------|----------------|----------------|----------------|
|   |                | B              |                |                |                |
|   |                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> |
| A | A <sub>1</sub> | 1              | 4              | -2             | -3             |
|   | A <sub>2</sub> | 2              | 1              | 4              | 5              |

- b) Construct a network of project whose activities and their precedence relationship are as given below.

|             |   |   |   |   |   |     |
|-------------|---|---|---|---|---|-----|
| Activity    | A | B | C | D | E | F   |
| Predecessor | - | A | A | B | C | D,E |

- c) Using dominance rule. Find the optimal strategies for player A and player B in the following game. Also determine the value of game.

|          |                |                |                |                |                |
|----------|----------------|----------------|----------------|----------------|----------------|
|          |                | Player B       |                |                |                |
|          |                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> |
| Player A | A <sub>1</sub> | 19             | 6              | 7              | 5              |
|          | A <sub>2</sub> | 7              | 3              | 14             | 6              |
|          | A <sub>3</sub> | 12             | 8              | 18             | 4              |
|          | A <sub>4</sub> | 8              | 7              | 13             | -1             |

**Q4)** Attempt any one of the following : **[10]**

- a) A project consist of a series of tasks labeled A,B,C, --- H, I in the following relationships (constraints)  $A < D, E; B, D < F; C < G; B < H; F, G < I$ .

The time (in days) for each task is given below

|                 |   |    |   |    |    |    |    |    |   |    |
|-----------------|---|----|---|----|----|----|----|----|---|----|
| Task            | : | A  | B | C  | D  | E  | F  | G  | H | I  |
| Time (in days): | : | 23 | 8 | 20 | 16 | 24 | 18 | 19 | 4 | 10 |

- a) Draw a network diagram for the project  
 b) Find a critical path and project completion time.
- b) The data for a PERT network is given in the following table.

| Predecessors<br>event i | - | Successors<br>event j | Time estimates |           |           |
|-------------------------|---|-----------------------|----------------|-----------|-----------|
|                         |   |                       | <u>to</u>      | <u>tm</u> | <u>tp</u> |
| 10                      | - | 20                    | 6              | 9         | 12        |
| 10                      | - | 50                    | 4              | 7         | 8         |
| 20                      | - | 30                    | 14             | 17        | 20        |
| 20                      | - | 40                    | 7              | 10        | 13        |
| 20                      | - | 50                    | 3              | 5         | 9         |
| 30                      | - | 70                    | 13             | 18        | 25        |
| 40                      | - | 60                    | 10             | 14        | 16        |
| 40                      | - | 70                    | 12             | 15        | 18        |
| 50                      | - | 60                    | 9              | 11        | 12        |
| 60                      | - | 70                    | 17             | 20        | 25        |

- i) Draw a network for the project  
 ii) Compute the expected project completion time.



Total No. of Questions : 4]

SEAT No. :

P808

[Total No. of Pages : 2

[5315]-408

T.Y. B.Sc. (Semester - IV)

MATHEMATICS (Paper - VII)

MT - 347 (B) : Differential Geometry

(New Course 2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following :

[10]

- a) Find a parametrisation of the level curve  $y^2 - x^2 = 1$ .
- b) Define curvature of a curve in  $\mathbb{R}^3$ .
- c) Show that the curve  $\bar{r}(t) = \left( \frac{1+t^2}{t}, t+1, \frac{1-t}{t} \right)$  is a plane curve.
- d) State frenet servet equation.
- e) Show that second fundamental form of a plane is zero.
- f) State isoperimetric inequality.
- g) Define geodesics.

Q2) Attempt any two of the following :

[10]

- a) Find the equation of the tangent plane of the following surface patch at  $(1,0,1)$   
 $\sigma(r,\theta) = (r \cosh\theta, r \sinh\theta, r^2)$
- b) Show that the quadric  $x^2 + 2y^2 + 6x - 4y + 3z = 7$  is a smooth surface with an atlas consisting of the single surface patch.
- c) Find the torsion of the circular helix  $r(\theta) = (a \cos\theta, a \sin\theta, b\theta)$ .

P.T.O.

**Q3)** Attempt any two of the following : **[10]**

- a) State and prove meusniers theorem
- b) Find the area of the interior of the ellipse  $\gamma(t) = (a\cos t, b\sin t)$ , where  $a$  and  $b$  are positive constants.
- c) Find the arc-length along the cycloid  $\gamma(t) = a(t - \sin t, 1 - \cos t)$ ,  $0 \leq t \leq 2\pi$ .

**Q4)** Attempt any one of the following : **[10]**

- a)
  - i) Show that every isometry is a conformal map. Give an example of a conformal map that is not an isometry.
  - ii) Define a reparametrization of a parametrized curve  $\gamma : (\alpha, \beta) \rightarrow \mathbb{R}^n$ . When you say that a point  $\gamma(t)$  of the curve  $\gamma$  is a regular point. Prove that any reparametrization of a regular curve is regular.
- b)
  - i) With usual notation, show that  $\|\sigma_u \times \sigma_v\| = (EG - F^2)^{1/2}$ .
  - ii) Prove that transition maps of a smooth surface are smooth.



Total No. of Questions : 4]

SEAT No. :

**P809**

[Total No. of Pages : 3

**[5315]-409**

**T.Y. B.Sc.**

**MATHEMATICS**

**MT - 347 (C) : C - Programming - II**

**(2013 Pattern) (Semester - IV) (Paper - VII)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any five of the following.

**[10]**

- a) Name the four storage class specifications included in C.
- b) What kind of information is represented by a pointer variable?
- c) Explain the meaning of the following declaration  
  
`char *x[10];`
- d) Declare a one-dimensional floating-point array using pointer notation.
- e) Define a structure that contains an integer quantity called 'marks' and a floating point quantity called 'percentage'. Also include the user defined data type name within the definition.
- f) Associate the stream pointer 'fpt' with a new stream oriented data file called teacher.dat.' open the data file for writing only.
- g) What is the purpose of fclose() function?

***P.T.O.***

**Q2)** Attempt any two of the following.

**[10]**

- a) Write a short note on a structure.
- b) Explain automatic and external variables.
- c) The skeletal structure of a C-program is shown below.

```
void funct (int *p);

main ()
{
 Static int x[5] = {10, 20, 30, 40, 50};

 funct (x);

}

void funct (int *p)
{ int i, sum = 0;
 for (i = 0; i<5; ++i)
 sum += *(p+i);
 printf ("sum = %d", sum);
 return;
}
```

- i) What kind of argument is passed to funct?
- ii) What kind of information is returned by funct?
- iii) What kind of formal argument is defined within funct?
- iv) What is the purpose of the for loop that appears within funct?
- v) What value is displayed by the printf statement within funct?

**Q3)** Attempt any two of the following :

**[10]**

- a) Write a short note on `fprintf( )` function
- b) Explain union with an example
- c) Write a C Program to generate successive fibonacci numbers.

**Q4)** Attempt any one of the following :

**[10]**

- a)
  - i) Describe the three bitwise operators. What is the purpose of each?
  - ii) Write a C program to read a line of lower case text and store in uppercase within a data file.
- b)
  - i) Explain passing structures to functions
  - ii) A C program contains the following declaration `static int x[5] = {20, 40, 60, 80, 100};`
    - a) What is the meaning of  $x$ ?
    - b) What is the meaning of  $(x + 2)$ ?
    - c) What is the value of  $*x$ ?
    - d) What is the value of  $(*x + 2)$ ?
    - e) What is the value of  $*(x+2)$ ?



Total No. of Questions : 4]

SEAT No. :

P810

[Total No. of Pages : 3

**[5315]-410**  
**T.Y. B.Sc.**  
**MATHEMATICS**  
**MT - 347 (D) : Graph Theory**  
**(2013 Pattern) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

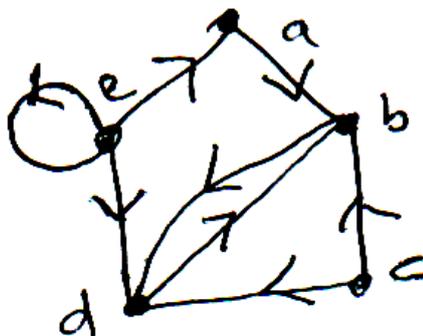
*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt any five of the following.

**[10]**

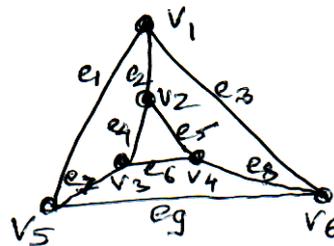
- a) Define bipartite graph and complete bipartite graph.
- b) Draw a self complementary graph with 5 vertices.
- c) Draw all trees with atmost 4 vertices.
- d) Prove that any tree with atleast two vertices is a bipartite graph.
- e) Give an example of a graph which is Eulerian but not Hamiltonian.
- f) Define randomly traceable Euler graph. Give one example of it.
- g) Find  $od(v)$  and  $id(v)$  for each of the vertex in the following graph.



*P.T.O.*

**Q2)** Attempt any two of the following. [10]

- a) For any graph  $G$  with  $e$  edges and  $n$  vertices,  $v_1, v_2, \dots, v_n$ , prove that  $\sum_{i=1}^n d(v_i) = 2e$ . Also prove that in any graph  $G$ , there is an even number of odd vertices.
- b) Let  $G$  be a simple graph. Show that, if  $G$  is not connected then its complement  $\bar{G}$  is connected.
- c) Write down the adjacency matrix and incidence matrix for the following graph.

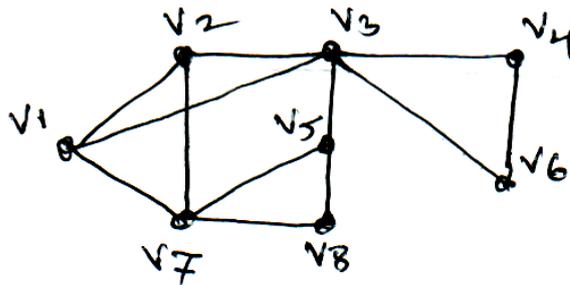


**Q3)** Attempt any two of the following : [10]

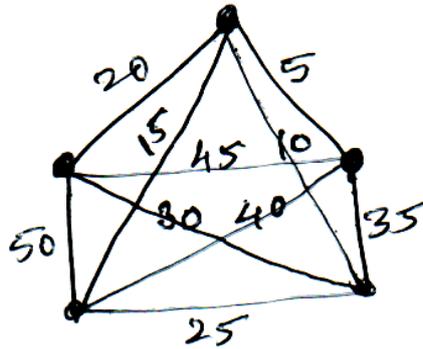
- a) Prove that, if  $T$  is a tree with  $n$  vertices then it has precisely  $n - 1$  edges.
- b) Prove that a graph is connected if and only if it has a spanning tree.
- c) Prove that a vertex  $v$  of a tree  $T$  is a cut vertex if and only if  $d(v) > 1$ .

**Q4)** Attempt any one of the following : [10]

- a) i) Let  $G$  be a graph in which the degree of every vertex is at least two. Prove that  $G$  contains a cycle.
- ii) Using the Hopcroft and Tarjan algorithm, find strongly connected orientation for the following graph.



- b) i) Carry out the two optimal method for the Travelling salesman problem for the following complete weighted graph.



- ii) Prove that every tournament  $T$  has a directed Hamiltonian path.



Total No. of Questions : 4]

SEAT No. :

P811

[Total No. of Pages : 2

[5315]-411

T.Y. B.Sc.

MATHEMATICS

MT - 347 (E) : Lebesgue Integration (Paper - VII)  
(2013 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following: [10]

- a) Define length of an open set  $G$  of  $[a, b]$ .
- b) Is the following statement true or false :  
If  $F$  is a closed subset of  $[a, b]$ ; and  $|F| = 0$ , then  $F = \phi$ .
- c) If  $E_1$  and  $E_2$  are measurable subsets of  $[0, 1]$  and if  $mE_1 = 1$ , Prove that  $m(E_1 \cap E_2) = mE_2$ .
- d) Let  $f$  be a function on  $[a, b]$  and  $P$  is a measurable partition of  $[a, b]$  such that  $U(f, P) = L(f, P)$ . Prove that  $f$  is Lebesgue integrable on  $[a, b]$ .
- e) If  $f(x) = \frac{1}{2} + \sin x$  ( $0 \leq x < 2\pi$ ) find  $f^+$ .
- f) If  $f(x) = \text{Log} \frac{1}{x}$  ( $0 < x \leq 1$ ) find  $\int f$ .
- g) Show that if  $f$  is an even function on  $[-\pi, \pi]$  and  $g$  is an odd function on  $[-\pi, \pi]$  then  $fg$  is an odd function on  $[-\pi, \pi]$ .

Q2) Attempt any two of the following: [10]

- a) If  $G$  is an open subset of  $[a, b]$ , then prove that  $G$  is measurable and  $mG = |G|$ .

P.T.O.

- b) If  $E_1$  and  $E_2$  are measurable subsets of  $[a, b]$ , then prove that  $E_1 \cup E_2$  and  $E_1 \cap E_2$  are also measurable. Also prove

$$mE_1 + mE_2 = m(E_1 \cup E_2) + m(E_1 \cap E_2)$$

- c) Prove that the characteristic function of Cantor set is in  $R[0, 1]$ .

**Q3)** Attempt any two of the following : **[10]**

- a) If  $f$  and  $g$  are measurable functions on  $[a, b]$ , then prove that  $f + g$  is also measurable function on  $[a, b]$ .

- b) Let  $f$  be a bounded function on  $[a, b]$ . If  $f \in R[a, b]$  then prove that

$$f \in L[a, b] \text{ and } R \int_a^b f = L \int_a^b f$$

- c) If  $f \in L[a, b]$ , if  $E \subset [a, b]$  and  $mE=0$ , show that  $\int_E f = 0$ .

**Q4)** Attempt any one of the following: **[10]**

- a) i) Find the Fourier series for  $f(x) = |x| (-\pi \leq x \leq \pi)$ .

- ii) Let  $E$  be any measurable subset of  $[a, b]$ .

If  $f \in L[a, b]$ ,  $g \in L[a, b]$  and if  $f(x)=g(x)$  almost every where ( $x \in E$ ),

then prove that  $\int_E g = \int_E f$ .

- b) i) If  $E$  is a measurable subset of  $[a, b]$  than prove that  $\int_E 1 = mE$ .

- ii) If  $f$  is a non-negative valued measurable function on  $[a, b]$  and if  $f(x) \leq g(x)$  ( $a \leq x \leq b$ ) where  $g \in L[a, b]$ , prove that  $f \in L[a, b]$ .



Total No. of Questions : 4]

SEAT No. :

P812

[Total No. of Pages : 2

[5315]-412

T.Y. B.Sc.

MATHEMATICS

MT - 347 (F) : Computational Geometry  
(2013 Pattern) (Semester IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any five of the following: [10]

- a) Write the transformation matrix for reflection through the origin.
- b) Find the combined transformation matrix to create top view of an object.
- c) Write the transformation matrix for scaling in x, y and z coordinates by factors  $\frac{1}{2}$ ,  $\frac{1}{3}$  and 1 respectively.
- d) Find the value of  $\delta\theta$  to generate 10 points on the parabola  $x = \theta^2$ ,  $y = 2\theta$  in the first quadrant for  $1 \leq x \leq 4$ .
- e) If a square with sides 2cm is reflected through y axis then what is the area of transformed figure?
- f) Determine fore shortening factor  $f_x$  and  $f_y$  for the matrix

$$[T] = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{\sqrt{2}}{4} & 0 & 1 \\ \frac{\sqrt{2}}{2} & 0 & 0 & 1 \\ \frac{1}{2} & -\frac{\sqrt{6}}{4} & 0 & 1 \end{bmatrix}$$

- g) Write the parametric equation of Be'zier curve with two control points.

P.T.O.

**Q2)** Attempt any two of the following: **[10]**

- a) Prove that the mid point of the line AB transform into the mid point of the line  $A^*B^*$  under any  $2 \times 2$  transformation matrix  $[T]$ .
- b) Find the concatenated transformation matrix for the following sequence of transformation
  - i) Translation in x, y and z direction by  $-1, 2, 1$  units respectively.
  - ii) Scaling x and z coordinate by factor  $\frac{1}{3}$  and 2 units respectively.
  - iii) Reflection through the yz plane.
- c) Obtain the dimetric projection if a fore - shortening factor along z-direction is  $\frac{1}{2}$ .

**Q3)** Attempt any two of the following : **[10]**

- a) Find the cavalier and cabinet projection for  $\alpha = 25^\circ$  of the object

$$X = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 2 & 1 \end{bmatrix}$$

- b) The plane  $x + 2y + 2z = 0$  is to be rotated so that it coincides with the  $z=0$  plane. Determine the required angles of rotation about the x-axis and y-axis.

- c) Write an algorithm to generate equispaced n points of ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

**Q4)** Attempt any one of the following: **[10]**

- a) i) Consider the Be'zier curve determined by the control points  $B_0[4 \ 3]$ ,  $B_1[0 \ 1]$  and  $B_2[2 \ -1]$ . Find the first and second derivative of the curve at  $t = 0.3$ .

- ii) Generate uniformly spaced 5 points on the circumference of the circle  $(x-2)^2+(y+1)^2=9$ .

- b) Reflect the triangle ABC with position vector  $[2 \ 4 \ 1]$ ,  $[4 \ 6 \ 1]$  and  $[2 \ 6 \ 1]$

through the line  $y = \frac{1}{2}x + 2$



Total No. of Questions : 4]

SEAT No. :

P813

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[5315]-413

T.Y. B.Sc.

PHYSICS

**PH - 341 : Classical Electrodynamics  
(2013 Pattern) (Semester IV) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All the questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator & Log-table is allowed.*

**Q1)** Attempt all of the following (ONE mark each) **[10]**

- a) Define the term : current density. Give its S.I. unit.
- b) What is meant by electric potential at a point?
- c) Write the equation of continuity in magnetostatics.
- d) What is a dielectric material?
- e) Define : Volume charge density. Give its S.I. unit.
- f) What is a polar molecule?
- g) State Ampere's circuital law.
- h) Define the term - magnetic vector potential.
- i) State Faraday's law in electromagnetic induction.
- j) Give the physical interpretation of 'poynting vector ( $\vec{P}$ )'.

**Q2)** Attempt any two of the following (5 marks each) **[10]**

- a) Using Biot-Savart's law, derive an expression for magnetic induction due to a straight conductor, carrying a current 'I'; at a point near the conductor.

**P.T.O.**

- b) Show that  $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$
- c) State Ampere's force law. Show that force between two current loops due to their mutual interaction is equal in magnitude and opposite in direction.

**Q3)** Attempt any two of the following (5 marks each) **[10]**

- a) Find the Magnitudes of vectors  $\vec{D}$  and  $\vec{P}$  for a dielectric material placed in an electric field of  $4 \times 10^5$  V/m.

[Given :  $\chi_e = 8, \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$ ]

- b) An electric field is given by  $E = E_0 \sin B_z \cos \omega t \hat{a}_z$ ; spread over in free space. Determine the corresponding charge density.
- c) Two long, parallel wires, separated by 3.5 cm in air carry currents of 0.8 A and 2.5 A in the same direction. Find the force per unit length of the wire. Also comment on nature of the force.

**Q4) A)** Attempt any one of the following (8 marks) **[8]**

- a) A dielectric material is kept in external electric field of intensity  $\vec{E}$ . Deduce an expression for electric potential at a point located outside the material.
- b) Show that, for a charge free, non-conducting medium, Maxwell's

equations lead to  $\nabla^2 \vec{E} = \frac{1}{C^2} \cdot \frac{\partial^2 \vec{E}}{\partial t^2}$  and  $\nabla^2 \vec{H} = \frac{1}{C^2} \cdot \frac{\partial^2 \vec{B}}{\partial t^2}$

**B)** Attempt any one of the following (2 marks) **[2]**

- a) Two point charges interact with a force of  $4 \times 10^{-3}$  N in a medium of dielectric constant 2. What would be the force, if the medium is changed to air, keeping other conditions same?
- b) Two straight conductors carry the same current of 0.5 A, and are separated by 2 mm, in air. Determine the force per unit length experienced by them.



Total No. of Questions : 4]

SEAT No. :

P814

[Total No. of Pages : 2

[5315]-414

T.Y. B.Sc.

PHYSICS

**PH - 342 : Quantum Mechanics  
(2013 Pattern) (Semester - IV) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All the questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator & Log-table is allowed.*

**Q1)** Attempt all of the following (one mark each)

**[10]**

- a) Write the formula for expectation value of momentum.
- b) Define raising and lowering operator.
- c) What is wave group?
- d) What is a free particle?
- e) Define degeneracy.
- f) Write the time-energy uncertainty relation.
- g) Define Hamiltonian operator.
- h) Write the Schrodinger's steady state equation.
- i) Represent infinite one dimensional potential well graphically.
- j) What is rigid rotator?

**Q2)** Attempt any two of the following (5 marks each)

**[10]**

- a) A ruby laser emits light of wavelength 693.4 nm. If this light is due to transition from  $n=2$  to  $n=1$  state of an electron in a one-dimensional box, find the width of the box

[Given :  $h = 6.625 \times 10^{-34}$  J -sec;  $c = 3 \times 10^8$  m/sec,  $m = 9.1 \times 10^{-31}$  kg]

**P.T.O.**

- b) The moment of inertia of HCl molecule is  $2.7 \times 10^{-40}$  gm-cm<sup>2</sup>. What would be the separation between  $l = 0$  and  $l = 1$  energy levels.
- c) Normalise the wave function

$$\psi(x) = Ae^{\frac{-x^2}{2a^2} + ikx}$$

Where A is normalisation constant. The range of x is from  $-\infty$  to  $+\infty$ .

**Q3)** Attempt any two of the following (5 marks each) **[10]**

- a) Show that the momentum operator  $-i\hbar \frac{\partial}{\partial x}$  is hermitian operator.
- b) Discuss a thought experiment of  $\gamma$  ray microscope to illustrate uncertainty relation.
- c) Show that the ladder operator  $L_+$  increases the eigen value of operator  $L_z$  by  $\hbar$ .

**Q4)** a) Attempt any one of the following **[8]**

- i) Using Schrodinger's steady state equation, obtain the energy eigen values and eigen functions for a particle in one-dimensional infinitely deep potential well.
- ii) Obtain equation of continuity and give its physical significance.

b) Attempt any one of the following **[2]**

- i) What is tunneling effect? Give any two applications of tunneling effect.
- ii) Calculate the de Broglie wavelength of an electron having momentum  $2.73 \times 10^{-23}$  kg-m/sec.



Total No. of Questions : 4]

SEAT No. :

P815

[Total No. of Pages : 3

[5315]-415

T.Y.B.Sc.

PHYSICS (Paper - III)

PH - 343 : Thermodynamics and Statistical Physics

(2013 Pattern) (Semester IV)

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All the questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Use of logtables and calculator is allowed.*

**Q1)** Attempt All of the following (One mark each):

**[10]**

- a) What are transport phenomena in gases?
- b) What is Binomial distribution?
- c) Define temperature of Inversion.
- d) What do you mean by microstate of a system.
- e) Define the term canonical ensemble.
- f) What are Fermions?
- g) Define probability of an event.
- h) What is partition function?
- i) What are symmetric wave functions?
- j) What is meant by thermodynamic probability of macrostate?

**P.T.O.**

**Q2)** Attempt any two of the following (Five marks each) **[10]**

- a) Derive an expression for the coefficient of viscosity ( $\eta$ ) of a gas in terms of mean free path of its molecules and discuss the effect of temperature on coefficient of viscosity.
- b) What is Jonle Thomson effect? Prove that Jonle Thomson coefficient

$$\mu = \frac{1}{C_p} \left[ T \left( \frac{\partial V}{\partial T} \right)_p - V \right]$$

- c) Derive Ganssian probability distribution equation.

**Q3)** Attempt any two of the following (Five marks each): **[10]**

- a) Consider the case of  $N = 100$  steps, where  $p = q = \frac{1}{2}$ . Find mean value of  $n_1$ , mean displacement and Root mean square deviation.
- b) In a system in thermal equilibrium at Temperature  $T$ , two states with energy difference  $5.52 \times 10^{-14}$  erg occur with relative probability 'e<sup>2</sup>' erg deg<sup>-1</sup>. Calculate the temperature. Given  $K = 1.38 \times 10^{-16}$  erg/deg.
- c) Three particles are to be distributed in four energy levels a, b, c and d. Calculate all possible whys of this distribution when particles are
- i) Classical particles and
  - ii) Fermions.

**Q4)** a) Attempt any one [Eight marks]: **[8]**

- i) Prove that for a homogeneous fluid,  $C_p - C_v = T \left( \frac{\partial P}{\partial T} \right)_v \left( \frac{\partial V}{\partial T} \right)_T$  and hence prove that for a perfect gas  $C_p - C_v = R$ . Where symbols have their usual meanings.
- ii) Compare M.B., B.E. and F.D. statistics.

b) Attempt any one [Two marks]: [2]

i) A bag contains 7 red balls, 9 white balls and 12 black balls. If a ball is drawn from the bag, what is the probability that it is either white or black?

ii) Establish the Gibbs - Helmholtz equation  $U = F - T \left( \frac{\partial F}{\partial T} \right)_v$ .



Total No. of Questions : 4]

SEAT No. :

P 816

[Total No. of Pages : 2

[5315]- 416

T.Y. B.Sc. (Semester - IV)

PHYSICS

PH - 344 : Nuclear physics (Paper - IV)

(2013 Pattern)

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following (1 mark each):

**[10]**

- a) State law of radioactive disintegration.
- b) What are hadrons?
- c) Define even parity.
- d) What is nuclear reaction?
- e) What is threshold voltage?
- f) List different types of particle accelerators.
- g) What are elementary Particles?
- h) What is nuclear reactor?
- i) Give the structure of neutron using Quark model.
- j) Radon has half life 3.8 days. Calculate its decay constant.

**Q2)** Attempt any two of the following :

- a) Determine the time required for 20% of uranium sample to disintegrate.  
Half life of uranium is  $4.51 \times 10^9$  years. **[5]**

**P.T.O**

- b) Calculate the energy released in the nuclear reaction.



Give : mass of  $1^{\text{H}^3} = 3.016049$  a.m.u.

Mass of  $1^{\text{H}^2} = 2.014102$  a.m.u.

Mass of  $2^{\text{He}^4} = 4.002603$  a.m.u.

Mass of  $0^{\text{n}^1} = 1.008665$  a.m.u. [5]

- c) The mass of deuteron ( $1^{\text{H}^2}$ ) nucleus is 2.013553 a.m.u. calculate the mass defect, packing fraction, binding energy and binding energy per nucleon.

Given : Mass of proton = 1.007825 a.m.u.

and mass of neutron = 1.008665 a.m.u. [5]

**Q3)** Attempt any two of the following :

- a) Explain in brief meson theory of nuclear forces. [5]
- b) What is linear accelerator? Describe with neat diagram principle and working of linear accelerator [5]
- c) Draw binding energy curve per nucleon against the mass number and write the conclusions that can be drawn from the curve. [5]

**Q4)** a) Attempt any one of the following :

- i) Draw a sketch of G.M. Counter. Explain its construction and working in detail. [8]
- ii) What is nuclear reactor? State the essential components of the reactor. With neat diagram describe power reactor. [8]
- b) Attempt any one of the following.
- i) Define specific activity and give its unit. [2]
- ii) Compute the mass of 1 curie of  $\text{C}^{14}$ . The half life of  $\text{C}^{14}$  is 5,700 years. [2]



Total No. of Questions : 4]

SEAT No. :

P 817

[Total No. of Pages : 4

[5315] - 417

T.Y. B.Sc.

PHYSICS

PH : 345 (A) : Electronics

(2013 Pattern) (Paper - V) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 40

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt all (One mark each)

**[10]**

- a) State any two features of Ic 78xx.
- b) What do you mean by karnaugh map.
- c) Draw symbol of R-S flipflop.
- d) State any four parameters of an Ideal OPAMP.
- e) Define trip point.
- f) Draw symbol of P-channel JFET.
- g) State materials used for LED.
- h) Define duty cycle and conduction angle.
- i) What is mean by virtual ground?
- j) State schockly's equation.

**Q2)** Attempt any two

**[10]**

- a) Explain Ic 555 as an astable multivibrator. Derive necessary formula for frequency obtained at it's out put.
- b) What is multiplexure and de-multiplexure? Draw circuit diagram for 4 : 1 multiplexure
- c) Explain working of a 4-bit ripple / Asynchronous counter with suitable diagram.

**P.T.O.**

- Q3)** Attempt any two **[10]**
- a) Explain basic low voltage regulator using Ic 723. Draw suitable circuit diagram. Explain designing of low voltage regulator.
  - b) Explain construction of N-channel MOSFET. Draw it's transfer characteristics curves.
  - c) Explain OPAMP as differentiator. Derive necessary formula for it's output.

- Q4)** A) Attempt any one **[8]**
- a) What is register? State four possible modes of operation. Explain parallel in serial out mode (PISO) in detail with necessary diagram.
  - b) What is cross over distortion in Push Pull amplifier. draw the circuit diagram for class B push pull amplifier. How cross over distortion can be eliminated?

- B) Attempt any one **[2]**
- a) Define optocoupler and draw it's symbol
  - b) Draw block diagram of Ic555.



Total No. of Questions : 4]

P 817

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T.Y. B.Sc. (PHYSICS)

**PH-345 (B) : Advanced Electronics  
(2013 Pattern) (Paper - V) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary*
- 4) *Use of logtables and calculators is allowed.*

**Q1)** Attempt all of the following (1 Mark each) **[10]**

- a) State the principle of liquid expansion thermo meters.
- b) What do you mean by linearization of a signal?
- c) State the seebeck effect in thermocouple.
- d) List the applications of laser
- e) What are the disadvantages of photovoltaic cell?
- f) How population inversion is achieved in laser?
- g) State any two features of instrumentation amplifier
- h) What do you mean by demultiplexer?
- i) Define the term resolution in DAC.
- j) What is discrete state control system?

**Q2)** Attempt any two of the following

- a) Explain the construction and working of narrow band pyrometer. **[5]**
- b) Describe principle, construction and working of photoemissive detector. **[5]**
- c) Explain opamp as a differentiator with the help of a neat diagram. **[5]**

**Q3)** Answer any two of the following .

- a) An Accelerometer has a seismic mass of 0.05 kg and a spring constant of  $3 \times 10^3$  N/m. Calculate the maximum measurable acceleration in 'g' and the natural frequency if maximum mass displacement is  $\neq 0.02$ m. **[5]**
- b) Explain various performance parameters of DAC. **[5]**
- c) Estimate the binary, octal and hex equivalents of  $0.3125_{10}$ . **[5]**

**Q4)** a) Attempt any one of the following

- i) What are filter circuits? Discuss the RC filters with reference to their frequency response. **[8]**
  - ii) Draw the block diagram of process control system. Explain each block in brief. **[8]**
- b) Attempt any one of the following
- i) Germanium has band gap of 0.67 ev. estimate the maximum wavelength for resistance change by photon absorption. **[2]**
  - ii) State the objectives of control system. **[2]**



Total No. of Questions : 4]

SEAT No. :

P 818

[Total No. of Pages : 12

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T.Y. B.Sc. (Semester - IV)

PHYSICS

PH - 346 (G) : Medical Electronics

(2013 Pattern) (Paper - VI)

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

**Q1)** Attempt all of the following :

**[10]**

- a) What do you mean by EMG?
- b) Define the term 'Diastole'.
- c) State the principle of spectrophotometry.
- d) Define CMRR.
- e) Give any two characteristics of medical instruments.
- f) What do you mean by EEG?
- g) State the two requirements of bioamplifiers.
- h) Define sensors.
- i) State disadvantages of flame photometer.
- j) State the principle of radiation sensor.

**Q2)** Attempt any two of the following :

**[10]**

- a) Explain the electrode- electrolyte interface with suitable examples.
- b) Explain the principle, construction and working of resistive sensors.
- c) Describe in detail isolation amplifier with circuit diagram.

**P.T.O.**

**Q3)** Attempt any two of the following : **[10]**

- a) Describe the basic medical instrumentation system with suitable examples.
- b) Describe in detail heart sound with suitable examples.
- c) Describe in detail the electrodes of ECG in brief.

**Q4)** a) Attempt any one of the following. **[8]**

- i) Describe in detail the direct method of B.P. measurement.
- ii) Describe in detail construction and working of calorimeter with suitable examples.

b) Attempt any one of the following : **[2]**

- i) Find the heart rate of patient if the distance between two consecutive peak is 10mm and chart speed of machine is 25 mm/s.
- ii) What do you mean by inductive sensor.



Total No. of Questions : 4]

**P 818**

**[5315]-418**

**T.Y. B.Sc. (Semester - IV)**

**PHYSICS**

**PH - 346 (H) : Physics of Nanomaterials**

**(2013 Pattern) (Elective - II) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following (One mark each) : **[10]**

- a) Name of the scientist who delivered the historical talk there is plenty of room at the bottom.
- b) State the classification of nanostructured materials.
- c) What is bottom-up approach?
- d) What are colloids?
- e) State any two types of sputter deposition.
- f) What is use of transmission electron microscope?
- g) What is mean by exciton?
- h) Define carbon nanotube.
- i) Define 'Quantum - dots'.
- j) State any two nanomaterial prominently used in cosmetics.

**Q2)** Attempt any two (Five marks each) : **[10]**

- a) Explain bottom up and top down approaches in nanomaterial synthesis.
- b) Describe construction and working of UV-Vis-NIR spectrometer.
- c) What are carbon nanotubes? How they are synthesized by electric arc discharge.

**Q3) Attempt any two (Five marks each) : [10]**

- a) Explain sol-gel methods of synthesis of nanomaterials.
- b) Explain Mechanical and Electrical properties of nanomaterials.
- c) Explain the applications of nanomaterials on cosmetic, space and defense.

**Q4) a) Attempt any one (Eight marks): [8]**

- i) Describe the brief history of nanomaterials and challenges in nanotechnology. Give its significance.
- ii) Explain in details :
  - 1) Scanning Electron Microscope
  - 2) Transmission Electron Microscope

**b) Attempt any one (Two marks) : [2]**

- i) Name of any two milestones in the development of nanotechnology.
- ii) State different types of colloids with its shape.



Total No. of Questions : 4]

**P 818**

**[5315]-418**

**T.Y. B.Sc. (Semester - IV)**

**PHYSICS**

**PH - 346 (I) : Microcontrollers  
(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following. (One mark each) :

**[10]**

- a) How (-56) is represented in 8051 microcontroller?
- b) What is meant by half duplex data transfer?
- c) What is the function of stack pointer register?
- d) State the function of ALE pin of 8051 microcontroller.
- e) Define 'baud rate'.
- f) Compare the instruction LJMP with SJMP.
- g) What is meant by an assembly language?
- h) What is the length of memory address used in 8051?
- i) Explain the meaning of instruction CLRA of 8051.
- j) State the function of assembler directive ORG.

**Q2)** Attempt any two of the following:

**[10]**

- a) Explain with suitable example the different addressing modes of 8051 microcontroller.
- b) What is stack? Explain the operation of stack in 8051 microcontroller.
- c) Explain the interfacing of (2 line × 16) LCD to 8051 microcontroller with neat diagram.

**Q3)** Attempt any two of the following : **[10]**

- a) Write an 8051 assembly language program to multiply two numbers (8 bit) without using MUL instruction, such that these two numbers are in memory at 40H and 41H and store the result of lower byte in R2 register and higher byte in R3 register.
- b) Explain the various flags of 8051 microcontroller and their function.
- c) Write an 8051 assembly language program to subtract 67H from 89H using 2's complement of 67H. Store the result in R3 register.

**Q4)** a) Attempt any one of the following : **[8]**

- i) Draw the architecture of 8051 microcontroller. Explain the on-chip memory of 8051 microcontroller.
- ii)
  - 1) Explain the interrupts of 8051 microcontroller in brief.
  - 2) Explain the different logical instructions of 8051 microcontroller.

b) Attempt any one of the following : **[2]**

- i) Explain the instruction DA of 8051 microcontroller.
- ii) State the function of register data pointer (DPTR).



Total No. of Questions : 4]

P 818

[5315]-418

T.Y. B.Sc. (Semester - IV)

PHYSICS

PH - 346 (J) : Electro - Acoustics and Entertainment Electronics  
(2013 Pattern) (Paper - VI) (Elective - II)

Time : 2 Hours]

[Max. Marks : 40

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following (One mark each) : **[10]**

- a) Sketch intensity level versus frequency curves representing threshold of audibility and threshold of feeling.
- b) Give the frequency theory of hearing.
- c) What is the significance of cut - off frequency in case of an exponential horn?
- d) What is meant by Hi-Fi?
- e) What is volume compressor?
- f) What is meant by directivity index of a microphone?
- g) What is a folded horn?
- h) Give typical frequency response of a carbon microphone.
- i) What is reverberation?
- j) What is coefficient of reflection?

**Q2)** Attempt any two (Five marks each) : **[10]**

- a) Write a short note on bass reflex cabinet.
- b) Distinguish between monophonic and stereophonic sound reproducing systems.
- c) Write a note on Digital Audio Tape.

**Q3) Attempt any two (Five marks each) : [10]**

- a) Draw a diagram showing construction of a moving coil microphone. Discuss the role of tubular vent at the lower chamber of a moving coil microphone.
- b) The frequency of mechanical response of a cone speaker is 60Hz. The stiffness of the cone system is  $1.85 \times 10^3$  N/m. Determine radiation reactance if total mass of the diaphragm and voice - coil is 11 gm.
- c) Find the reverberation time of an office which has a volume of 1600 m<sup>3</sup> and a total sound absorption of 100 metric sabines. What sound absorption will be required for an optimum reverberation time of 1.2 sec?

**Q4) a) Attempt any one : [8]**

- i) Explain the effect of voice - coil parameters on the acoustic output of direct radiator loudspeakers.
- ii) Discuss the digital audio CD parameters.

**b) Attempt any one : [2]**

- i) Distinguish between voiced and unvoiced sounds.
- ii) Write a note on equalizer.



Total No. of Questions : 4]

**P 818**

**[5315]-418**

**T.Y. B.Sc. (Semester - IV)**

**PHYSICS**

**PH - 346 (K) : Lasers**

**(2013 Pattern) (Elective - II) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following (One mark each) : **[10]**

- a) Define metastable state.
- b) What is difference between laser light and normal light?
- c) State any two types of lasers.
- d) What is population of inversion?
- e) Give two types of liquid lasers.
- f) What is holography?
- g) Define spontaneous emission.
- h) Define active medium in laser.
- i) What is pumping?
- j) Give applications of lasers in defence.

**Q2)** Attempt any two of the following : **[10]**

- a) Write a short note on optical feedback.
- b) Explain the characteristics / properties of a laser beam.
- c) Give two techniques of pumping and explain three - level pumping scheme.

**Q3)** Attempt any two of the following : **[10]**

- a) Light from a sodium lamp, which is the traditional monochromatic source, has coherence length of about 0.3mm and bandwidth of about  $6\text{\AA}$ . Calculate wavelength of sodium light.
- b) What will be the reflectivity of other cavity mirror if the reflectance of first mirror is 100%? The length of the cavity is 15cm and gain factor of laser material is 0.0005 per cm.
- c) Find the ratio of population of the two states in a He - Ne lasers that produces light of wavelength  $6328\text{\AA}$  at  $27^\circ\text{C}$ .

**Q4)** a) Attempt any one of the following : **[8]**

- i) Explain the applications of lasers in mechanical industry.
- ii) Explain with neat diagram construction and working of  $\text{CO}_2$  laser . Also give its applications.

b) Attempt any one of the following : **[2]**

- i) Draw diagram of He-Ne laser.
- ii) What is stimulated emission.



Total No. of Questions : 4]

**P 818**

**[5315]-418**

**T.Y. B.Sc. (Semester - IV)**

**PHYSICS**

**PH - 346 (L) : Radiation Physics**

**(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt all of the following :

**[10]**

- a) What are X - rays?
- b) What is meant by Radioactive Isotopes?
- c) What are Radio waves?
- d) Define I - rad dose.
- e) State the materials used for radiation shielding.
- f) What are cosmic radiation?
- g) Define one mega electron voltage energy.
- h) Define attenuation coefficient.
- i) What is Fricke Dosimeter?
- j) Define lifetime of radioactive sources.

**Q2)** Attempt any two of the following :

**[10]**

- a) Explain the use of gamma rays in sterilization of medical instruments.
- b) Explain Interaction of UV & microwave radiation with matter.
- c) Explain various applications of X-rays in medical fields.

**Q3)** Attempt any two of the following : **[10]**

- a) Write a note on radioactive pharmaceuticals & labeled compounds.
- b) What do you mean by microwave & radio waves? Explain any one method for detection for microwave & radio waves.
- c) Explain the production of radioactive nuclides in nuclear reactors.

**Q4)** a) Attempt any one of the following : **[8]**

- i) Explain various laboratory sources of Infrared & UV- Visible radiation with details of energy spectrum.
- ii) What are different types of neutron sources based on radioactive sources? Explain any-one in detail.

b) Attempt any one of the following : **[2]**

- i) How gamma - rays are used for preservation of food.
- ii) Give any two applications of microwave in medical field.



Total No. of Questions : 4]

SEAT No. :

P819

[Total No. of Pages : 2

[5315]-419

T.Y. B.Sc

CHEMISTRY

CH-341: Physical Chemistry

(2013 Pattern) (Paper - I) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Use of calculator and logarithmic table is allowed.
- 5) Actual calculation must be shown while solving the problems.

Q1) Answer the following:

[10]

- a) Define plane of symmetry.
- b) State Heisenberg's uncertainty Principle.
- c) What is packing Fraction?
- d) What is anisotropic solid?
- e) What do you mean by temperature coefficient of emf?
- f)  ${}_{15}^{30}\text{P} \rightarrow {}_{14}^{30}\text{Si} + \dots\dots\dots$
- g) State the thermodynamics relationship of emf of a cell and  $\Delta G$ .
- h) The intercept by a crystal plane on the three crystallographic axes are 1,1,  $\infty$  What are the Miller indices of the plane?
- i) Write the Nernst equation for the following electrode reaction  $\text{Fe}^{2+} \rightleftharpoons \text{Fe}^{3+} + e^{-}$ .
- j) What is plateau voltage of G-M counter?

Q2) a) Answer any two of the following

[6]

- i) What is mean by wave function? State the condition for well behaved wave function.

P.T.O

- ii) Distinguish between reversible cell and irreversible cell.
- iii) Sketch 100, 110 and 111 planes in body centered cubic lattice.

b) Solve any one of the following. [4]

i) The emf of the cell



is 0.6753 volt at 25°C and 0.6915 at 0°C. Calculate  $\Delta G$ ,  $\Delta H$ , and  $\Delta S$  of the cell at 25°C. (F=96500 coulombs)

ii) Half life period of  $^{24}\text{Na}$  is 15 hours. In what time of period will a sample containing  $^{24}\text{Na}$  lose 75% of its radioactivity?

**Q3)** Attempt any two of the following: [10]

- a) What is crystallography? Explain law of constancy of interfacial angles and the law of elements of symmetry.
- b) Describe construction and working of standard hydrogen electrode.
- c) Derive the expression for the decay of radio element. Explain the term half life period.

**Q4)** a) What is tracers? Describe the use of tracers in structure determination and studying reaction mechanism. [6]

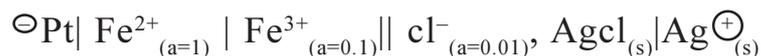
OR

Deduce the time independent Schrodinger wave equation.

b) Solve any one of the following. [4]

i) The element chromium exist as body-centered cubic lattice. The unit cell edge is 2.88Å. The density of chromium is 7.2 gcm<sup>-3</sup>. How many atoms does 52g of chromium contain.

ii) Calculate emf of the following cell at 25°C,



$$\text{Given } E^{\circ}_{\text{Fe}^{2+}|\text{Fe}^{3+}(\text{oxi})} = -0.7710\text{v}$$

$$E^{\circ}_{\text{Ag}|\text{Agcl}(\text{oxi.})} = -0.2330\text{v.}$$



Total No. of Questions : 4]

SEAT No. :

P820

[Total No. of Pages : 2

[5315]-420

T.Y. B.Sc

CHEMISTRY

CH-342: Inorganic Chemistry (Semester - IV)

(2013 Pattern) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Actual calculations must be shown while solving the problems.
- 5) Use of log table and calculator is allowed.

Q1) Answer the following:

[10]

- a) Which catalyst is used in synthesis of acetic acid by monsanto process?
- b) Define 'unit cell'.
- c) Give any two applications of superconductors.
- d) Give general electronic configuration of actinides.
- e) Complete the reaction:  ${}_{92}^{238}\text{U} + {}_1^2\text{D} \rightarrow ? + {}_0^1\text{n}$ .
- f) Define radius ratio effect.
- g) What are metalloenzymes?
- h) Draw N(E) v/s E curve for univalent metal.
- i) Which catalyst is used in synthesis of TPA from xylene?
- j) What is the function of myoglobin?

Q2) a) Answer any two of the following

[6]

- i) Explain why FeO shows p-type semiconductivity when heated.
- ii) Write short note on; iron-sulphur protein.
- iii) What are transuranic elements? Explain neutron bombardment method for synthesis of transuranic elements.

P.T.O

- b) Answer any two of the following. [4]
- Explain biological role of sodium and potassium.
  - What is the effect of increase in temperature on conductivity of metal?
  - Write short note on, 'oxidation states of lanthanides.

**Q3)** Answer any two of the following: [10]

- What is misch metal? How it is prepared? Give its properties and uses.
- Define radius ratio. Calculate limiting radius ratio for coordination number three and six.
- Explain the mechanism of polymerisation of ethylene by Zeigler-Natta catalyst.

**Q4)** a) What are extrinsic semiconductors? Explain n-type and p-type semiconductor with suitable example. [6]

OR

- Answer the following: [6]
  - Write mechanism of hydrogenation of alkene to alkane using Raney nickel catalyst.
  - Explain the structure of haem b.
- Calculate crystal radii of  $Mg^{2+}$  ion having univalent radius  $0.82A^\circ$  (Given Born exponent  $n = 7$ ) [4]

OR

- Answer the following: [4]
  - What are the properties of heterogeneous catalysis?
  - What is the IUPAC name and symbol of element having atomic number 134 and 967.



Total No. of Questions : 4]

SEAT No. :

P821

[Total No. of Pages : 5

[5315]-421

T.Y. B.Sc.

CHEMISTRY (Paper - III)

CH-343: Organic Chemistry (New) (Semester - IV)

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

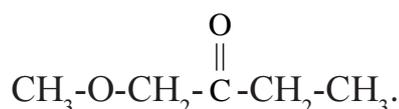
Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw structures and neat diagrams if necessary.
- 4) IR, NMR and UV spectroscopic data is given in Tables - 1, 2 and 3 respectively.

Q1) Answer the following:

[10]

- a) Calculate the fundamental modes of vibrations for H<sub>2</sub>O.
- b) How will you prove presence of  $\alpha$ ,  $\beta$ -unsaturated aldehyde group in citral.
- c) Express  $\lambda = 725$  nm in  $\text{cm}^{-1}$ .
- d) Write the stability order of carbanion.  
 $\overset{\ominus}{\text{C}}\text{H}_3$ ,  $\text{R}-\overset{\ominus}{\text{C}}\text{H}_2$ ,  $\text{R}-\overset{\ominus}{\text{C}}\text{H}-\text{Cl}$   $\text{R}-\overset{\ominus}{\text{C}}\text{H}-\text{NO}_2$
- e) Define the term synthon.
- f) How many sets of protons are present in



- g) In which rearrangement reaction ketone and peroxyacids are used.
- h) Give evidence for nature of nitrogen in ephedrine.
- i) Define bathochromic shift.
- j) Define chemical shift.

Q2) A) Attempt any two of the following:

[6]

- i) How will you prepare cyclopentane carboxylic acid from diethyl malonate.
- ii) Write retrosynthesis and synthesis of cyclohexenone.
- iii) Write a note on favorskii rearrangement.

P.T.O

B) Calculate  $\lambda_{\max}$  for the following. [4]



OR

- B) i) Explain the formation of 1,1-diphenylethane from benzophenone.  
ii) Aniline shows blue shift in acidic medium, Explain.

**Q3)** Attempt any two of the following: [10]

- A) i) Write Nagai synthesis of ephedrine. [3]  
ii) How will you distinguish following pair by IR spectroscopy. [2]



- B) i) Explain Curtius rearrangement with suitable example. [3]  
ii) How IR spectroscopy is useful in detection of impurity in a sample. [2]
- C) i) Define spin-spin coupling and write the rules of spin-spin coupling. [3]  
ii) How will you prove presence of carbon skeleton in citral. [2]

**Q4)** A) Propose structures for the compounds from the following spectroscopic data. Justify your answer (any two) [6]

- i) Molecular Formula:  $C_4H_5O_2N$   
IR: 2250, 1750  $cm^{-1}$   
NMR: i) singlet, 3.50  $\delta$  (2H)  
ii) singlet, 3.80  $\delta$  (3H)
- ii) Molecular Formula:  $C_4H_8Br_2$   
NMR: i) singlet, 1.90  $\delta$  (6H)  
ii) singlet, 3.87  $\delta$  (2H)

iii) Molecular Formula:  $C_9H_{10}O$

IR:  $1700\text{ cm}^{-1}$

NMR: i) triplet,  $1.20\ \delta$  (3H)

ii) quartet,  $2.50\ \delta$  (2H)

iii) singlet,  $6.70\ \delta$  (5H)

B) Write notes on any two of the following.

[4]

i) Claisen ester condensation

ii) Structure, source and uses of ephedrine

iii) Chemical shift

iv) Synthon and functional group interconversion



TABLE - 1  
Characteristic Infrared Absorptions of Functional Groups

| GROUP                                                                                                   | FREQUENCY RANGE $\text{cm}^{-1}$ | INTENSITY    |
|---------------------------------------------------------------------------------------------------------|----------------------------------|--------------|
| A. Alkyl                                                                                                |                                  |              |
| C-H (stretching)                                                                                        | 2853-2962                        | (m - s)      |
| Isopropyl - $\text{CH}(\text{CH}_3)_2$                                                                  | 1380 - 1385                      | (s)          |
|                                                                                                         | and 1365 - 1370                  | (s)          |
| tert - Butyl - $\text{C}(\text{CH}_3)_3$                                                                | 1385 - 1395                      | (m)          |
|                                                                                                         | and 1365                         | (s)          |
| B. Alkenyl                                                                                              |                                  |              |
| C-H (stretching)                                                                                        | 3010 - 3095                      | (m)          |
| C = C (stretching)                                                                                      | 1620 - 1680                      | (v)          |
| R-CH = CH <sub>2</sub>                                                                                  | 985 - 1000                       | (s)          |
|                                                                                                         | and 905 - 920                    | (s)          |
| R <sub>2</sub> C = CH <sub>2</sub>                                                                      | 880 - 900                        | (s)          |
| cis - RCH = CHR                                                                                         | 675 - 730                        | (s)          |
| trans - RCH = CHR                                                                                       | 960 - 975                        | (s)          |
|                                                                                                         | (out of plane C-H bendings)      |              |
| C. Alkynyl                                                                                              |                                  |              |
| $\equiv$ C-H (stretching)                                                                               | 3300                             | (s)          |
| C $\equiv$ C (stretching)                                                                               | 2100 - 2260                      | (v)          |
| D. Aromatic                                                                                             |                                  |              |
| Ar - H (stretching)                                                                                     | - 3030                           | (v)          |
| Aromatic substitution type<br>(C-H out-of-plane bendings)                                               |                                  |              |
| Monosubstituted                                                                                         | 690 - 710                        | (very s)     |
|                                                                                                         | and 730 - 770                    | (very s)     |
| o - Disubstituted                                                                                       | 735 - 770                        | (s)          |
| m - Disubstituted                                                                                       | 680 - 725                        | (s)          |
|                                                                                                         | and 750 - 810                    | (very s)     |
| p - Disubstituted                                                                                       | 800 - 840                        | (very s)     |
| E. Alcohols, Phenols, Carboxylic Acids                                                                  |                                  |              |
| OH (alcohols, phenols, dilute solutions)                                                                |                                  |              |
| OH (alcohols, phenols, hydrogen bonded)                                                                 | 3200 - 3550                      | (broad)      |
| OH (carboxylic acids, hydrogen bonded)                                                                  | 2500 - 3000                      | (very broad) |
| F. Aldehydes, Ketones, Esters and Carboxylic Acids                                                      |                                  |              |
| C = O stretch                                                                                           | 1630 - 1780                      | (s)          |
| aldehydes                                                                                               | 1690 - 1740                      | (s)          |
| ketones                                                                                                 | 1680 - 1750                      | (s)          |
| esters                                                                                                  | 1735 - 1750                      | (s)          |
| carboxylic acids                                                                                        | 1710 - 1780                      | (s)          |
| amides                                                                                                  | 1630 - 1690                      | (s)          |
| G. Amines                                                                                               |                                  |              |
| N - H                                                                                                   | 3300 - 3500                      | (m)          |
| H. Nitriles                                                                                             |                                  |              |
| C = N                                                                                                   | 2220 - 2260                      | (m)          |
| I. $\begin{array}{c}   \\ -\text{C}-\text{O} \text{ stretch (alcohol, ether, phenol)} \\   \end{array}$ | 1000 - 1300                      | (s)          |
| J. Nitro N = O                                                                                          | 1550 - 1350                      | (s)          |
| k. Halides                                                                                              |                                  |              |
|                                                                                                         | F                                | (s)          |
|                                                                                                         | Cl                               | (s)          |
|                                                                                                         | Br                               | < 667 (s)    |

TABLE - 2  
Approximate Proton Chemical Shifts in NMR

| TYPE OF PROTON                                        | CHEMICAL SHIFT, DELTA, PPM ( $\delta$ ) |                                    |              |
|-------------------------------------------------------|-----------------------------------------|------------------------------------|--------------|
| 1° Alkyl, RCH <sub>3</sub>                            | 0.8 - 1.0                               |                                    |              |
| 2° Alkyl, RCH <sub>2</sub> R                          | 1.2 - 1.4                               |                                    |              |
| 3° Alkyl R <sub>3</sub> CH                            | 1.4 - 1.7                               |                                    |              |
| Allylic, R <sub>2</sub> C=C-CH <sub>2</sub><br> <br>R | 1.6 - 1.9                               | Ester R-C(=O)-O-CH <sub>2</sub> -R | 4 to 4.5     |
| Benzylic, ArCH <sub>2</sub>                           | 2.2 - 2.5                               |                                    |              |
| Alkyl chloride, RCH <sub>2</sub> Cl                   | 3.6 - 3.8                               |                                    |              |
| Alkyl bromide, RCH <sub>2</sub> Br                    | 3.4 - 3.6                               |                                    |              |
| Alkyl iodide, RCH <sub>2</sub> I                      | 3.1 - 3.3                               |                                    |              |
| Ether, ROCH <sub>2</sub> R                            | 3.3 - 3.9                               |                                    |              |
| Alcohol, HOCH <sub>2</sub> R                          | 3.3 - 4.0                               |                                    |              |
| Ketone, RC(=O)CH <sub>2</sub> -                       | 2.1 - 2.6                               | R-C(=O)-CH <sub>2</sub> -          | 2.4 $\delta$ |
|                                                       |                                         | R-C(=O)-CH-                        | 2.5 $\delta$ |
| Aldehyde, RCH=O                                       | 9.5 - 9.0                               |                                    |              |
| Vinyl, R <sub>2</sub> C=CH <sub>2</sub>               | 4.6 - 5.0                               |                                    |              |
| Vinyl, R <sub>2</sub> C=CH-R                          | 5.2 - 5.7                               |                                    |              |
| Aromatic, ArH                                         | 6.0 - 9.5                               |                                    |              |
| Acetylenic, RC $\equiv$ CH                            | 2.5 - 3.1                               |                                    |              |
| Alcohol hydroxyl, ROH                                 | 0.5 - 6.0*                              |                                    |              |
| Carboxylic, RCOOH                                     | 10 - 13*                                |                                    |              |
| Phenolic, ArOH                                        | 4.5 - 7.7*                              |                                    |              |
| Amino R-NH <sub>2</sub>                               | 1.0 - 5.0                               |                                    |              |

\*The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3  
U.V. Absorption rules for diene chromophores

|                                                                         |        |                      |       |
|-------------------------------------------------------------------------|--------|----------------------|-------|
| 1) Parent                                                               | 215 nm | 6) - halogen         | 5 nm  |
| 2) Each extra conjugation                                               | 30 nm  | 7) - SR              | 30 nm |
| 3) Homoannular                                                          | 39 nm  | 8) - NR <sub>2</sub> | 60 nm |
| 4) Exocyclic double bond                                                | 05 nm  | 9) - OH, - OR        | 5 nm  |
| 5) Each alkyl (R) substituent directly attached to double bonded carbon | 05 nm  |                      |       |

U.V. Absorption rules for Enone System

|                                             |                                                            |                      |                |
|---------------------------------------------|------------------------------------------------------------|----------------------|----------------|
| 1) Parent                                   | 215 nm (207 nm for aldehyde) (202 nm for five member ring) |                      |                |
| 2) Each extra conjugation                   | 30 nm                                                      | 6) - Cl              | $\alpha$ 15 nm |
| 3) Homoannular                              | 39 nm                                                      | 7) - OH, -OR         | $\beta$ 12 nm  |
| 4) Substituents                             |                                                            | 8) - SR              | $\alpha$ 35 nm |
| a) Alkyl group at $\alpha$                  | 10 nm                                                      | 9) - NR <sub>2</sub> | $\beta$ 30 nm  |
| b) Alkyl group at $\beta$                   | 12 nm                                                      |                      | $\beta$ 85 nm  |
| c) Alkyl group at $\gamma, \delta$ & higher | 18 nm                                                      |                      | $\beta$ 95 nm  |
| 5) Exocyclic double bond                    | 05 nm                                                      |                      |                |

Total No. of Questions : 4]

SEAT No. :

**P822**

[Total No. of Pages : 2

**[5315]-422**

**T.Y. B.Sc**

**CHEMISTRY**

**CH- 344: Analytical Chemistry (Paper - IV)**

**(2013 Pattern) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicates full marks.*
- 3) Use of log table and calculator is allowed.*

**Q1)** Answer the following:

**[10]**

- a) Define Nernst Distribution Law.
- b) What do you mean by isoelectric point?
- c) What is demineralized water?
- d) What is HPLC?
- e) Name the Detector used in Gas chromatography.
- f) Which mobile phase is used in SFC?
- g) Give the principle of electrophoresis.
- h) What is eluent?
- i) Define the turbidance.
- j) Give any one application of electrophoresis.

**P.T.O**

- Q2) a)** Answer any two of the following: [6]
- Explain the principle of paper chromatography.
  - What are advantages of TLC.
  - Explain any one application of ion-exchange chromatography.
- b)** Answer any two of the following: [4]
- Draw a labeled diagram of electron capture detector used in GC.
  - Calculate the distribution ratio when concentration of solute in organic phase is 0.028 M. and in aqueous phase is 0.04M.
  - Calculate turbidance, if the transmittance is 0.7568.

- Q3)** Answer any two of the following: [10]
- Define the term Distribution coefficient. Derive relationship between distribution coefficient and distribution ratio.
  - Explain the principle and technique of column chromatography.
  - Explain principle and working of gas chromatography.

- Q4) a)** Draw a block diagram of HPLC. Explain the role of components involved in it. [6]

OR

- Explain in brief zone electrophoresis.
  - Explain the construction and working of Nephelometry.
- A metal chelate was extracted to the extent of 40% when equal volumes of aqueous and organic phases shaken together. What will be the percent extracted if volume of organic phase is doubled. [4]

OR

- In a paper chromatographic separation of 'A', 'B' and 'C', the solvent front was 30 cm, white front due to above components were 20, 18 and 10 cm. respectively. Calculate  $R_f$  values of A, B & C.



Total No. of Questions : 4]

SEAT No. :

**P823**

[Total No. of Pages : 2

**[5315]-423**

**T.Y. B.Sc**

**CHEMISTRY**

**CH-345: Industrial Chemistry (Semester - IV)**

**(2013 Pattern) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams and flowsheet wherever necessary.*

**Q1)** Answer the following.

**[10]**

- a) What is monomer?
- b) Explain the term biodegradable waste.
- c) Draw the structure of Alizarin dye.
- d) What is detergent?
- e) What are analgesics?
- f) What do you mean by molasses?
- g) Define the term fermentation.
- h) What is sunscreen?
- i) What are accelerators?
- j) What is pigment?

**Q2)** a) Attempt any two of the following.

**[6]**

- i) Write a note on anesthetics.
- ii) Write a note on surfactants.
- iii) What are basic requirements of fermentation process.

**P.T.O**

- b) Answer any two of the following. [4]
- i) Explain the term pharmacodynamic agent with suitable example.
  - ii) Give the preparation of nylon-6,6.
  - iii) What do you mean by organic process waste?

**Q3)** Answer any two of the following. [10]

- a) What are silicones? Explain the properties and applications of silicones.
- b) Draw the structures of fluorescein and naphthol yellow, state their applications.
- c) Give the synthesis and uses of paracetamol and aspirin.

**Q4)** a) Describe the manufacture of raw sugar from sugarcane with flowsheet and special reference to multiple effect evaporator. [6]

OR

What are conditioners? Explain different types of conditioners.

- b) Explain the characteristics and uses of [4]
- i) white lead
  - ii) Zinc oxide

OR

Write a note on

- i) Buna -N.
- ii) Treatment of waste containing inorganic impurities.



Total No. of Questions : 4]

SEAT No. :

**P824**

[Total No. of Pages : 2

**[5315]-424**

**T.Y. B.Sc**

**CHEMISTRY**

**CH-346 A: Nuclear Chemistry (Semester - IV)**

**(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*
- 4) *Use of log tables and calculator is allowed.*

**Q1)** Answer the following.

**[10]**

- a) What are prompt and delayed neutrons?
- b) Which coolant is used in nuclear reactors?
- c) State the names of electrostatic accelerators.
- d) What are charge carriers in a semiconductor.
- e) Mention the radioisotope of carbon and Hydrogen.
- f) State one example of cow and milk system.
- g) Give one application of radiometric titrations.
- h) Mention one biological effect of radiations.
- i) State one reaction of nuclear fission process.
- j) State an expression for design parameter F of nuclear reactors.

**Q2)** a) Attempt any two of the following.

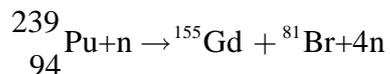
**[6]**

- i) Write a note on cockcroft-walton Accelerator.
- ii) Describe Indias nuclear energy programme.
- iii) Describe the properties required for the selection of ideal scintillators.

**P.T.O**

b) Attempt any two of the following. [4]

i) Compute the energy released in the following fission



Given: Atomic masses of:

$${}_{94}^{239}\text{Pu} = 239.0522 \text{amu}; {}^{155}\text{Gd} = 154.9220 \text{amu}$$

$${}^{81}\text{Br} = 80.9163 \text{amu}, m_n = 1.00897 \text{amu}$$

ii) Describe the fuel and moderator used in nuclear reactors.

iii) Why is semiconductor used as detectors?

**Q3)** Answer any two of the following. [10]

- Describe in detail the natural uranium reactor.
- Discuss the principle and working of isotope dilution analysis.
- Describe the discovery of nuclear fission with different experiments.

**Q4)** a) What are Breeder Reactors? Explain the principle of Breeding. [6]

OR

Explain photochemical processes in:

- Typical inorganic Scintillator.
  - General organic scintillator.
- b) Describe safety standards and safe working methods required in the study of radiation chemistry. [4]

OR

Explain Szilard - chalmers reaction.



Total No. of Questions : 4]

SEAT No. :

**P825**

[Total No. of Pages : 2

**[5315]-425**

**T.Y. B.Sc**

**CHEMISTRY**

**CH-346 B: Polymer Chemistry (Semester - IV)**

**(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Draw diagrams wherever necessary.*

**Q1)** Answer the following.

**[10]**

- a) Define homochain polymer.
- b) 'A synthetic garment yellowing after long use'. Explain.
- c) Give the important IR peaks of polystyrene.
- d) What is meant by biopolymers?
- e) Define the term: Compounding.
- f) Draw the correct structure of polytetrafluoro ethylene.
- g) Give two important uses of polyvinyl chloride (PVC).
- h) Explain the term: Calendering.
- i) What is meant by scouring.
- j) The acronym-GTT stands for \_\_\_\_\_ .

**Q2)** a) Attempt any two of the following.

**[6]**

- i) 'Molecular weight of polymer affects on glass transition temperature'. Explain.
- ii) Write a brief note on thermal degradation.
- iii) Comment on degree of crystallinity.

**P.T.O**

- b) Answer the following. (any two) [4]
- i) How will you distinguish polyacrylonitrile and polyvinyl acetate by using IR spectroscopy.
  - ii) 'T<sub>g</sub> of polyvinyl chloride is 81°C while T<sub>g</sub> of polyvinyl carbazole is 150°C'. Explain.
  - iii) Draw the correct structure of linear and branched polymers.

**Q3)** Attempt any two of the following. [10]

- a) Write a detailed note on polymer blends.
- b) Give method of preparation, properties and important uses of,
  - i) Polyester.
  - ii) Phenol-formaldehyde resin.
- c) Give detailed account of spectroscopic methods in structure determination of polymers.

**Q4)** a) Attempt any two of the following. [6]

- i) Explain the die casting process in polymer technology.
  - ii) Write a short note on sulphur-vulcanisation.
  - iii) Describe the lamination technique in brief.
- b) What is meant by fibre? Give a detailed account of wet spinning process in fibre technology. [4]



Total No. of Questions : 4]

SEAT No. :

P826

[Total No. of Pages : 2

[5315] - 426

T.Y. B.Sc.

CHEMISTRY (Semester - IV)

CH - 346 (C) : Introduction To Biochemistry & Molecular  
Biology  
(2013 Pattern) (Paper - VI)

Time :2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.

Q1) Answer the following:

[10]

- i) Give two significances of ATP.
- ii) Name the enzyme that converts pyruvate to lactate
- iii) List out three ketone bodies.
- iv) Which type of DNA polymerase in bacteria helps to remove RNA primer
- v) Give the significance of Initiation codon.
- vi) Name two inhibitors of Transcription
- vii) What is the role of Helicase?
- viii) Define Chimeric Vectors.
- ix) What are transamination reactions?
- x) Name two electron, carriers of ETC. in mitochondria.

Q2) a) Attempt Any Two of the following :

[4]

- i) Define Nucleosides and Nucleotides. Give examples.
- ii) Give the complementary sequence of this DNA fragment 5'AGTTGCACG3'
- iii) Why is TCA cycle referred as an amphibolic pathway.

P.T.O.

- b) Answer any two of the following : [6]
- i) List out the components of pyruvate dehydrogenase complex.
  - ii) Differentiate between DNA and RNA.
  - iii) Write note on uncouplers with suitable example.

**Q3)** Answer any two of the following : [10]

- i) Elaborate on experiments that proved DNA as genetic material.
- ii) Describe steps involved in  $\beta$  - Oxidation of fatty acids.
- iii) Explain the steps involved in gene cloning.

**Q4)** Answer the following : [6]

- i) Discuss the steps involved in DNA replication

OR

Describe the reactions of Urea cycle.

- ii) Write note on anaerobic glycolysis. [4]

OR

Give the features of genetic code.



Total No. of Questions : 4]

SEAT No. :

P 827

[Total No. of Pages : 2

[5315] - 427

**T.Y. B.Sc. CHEMISTRY (Semester - IV)**  
**CH - 346 (D) : Environmental And Green Chemistry**  
**(2013 Pattern) (Elective - II) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following:

**[10]**

- i) What is mean by 'Sludge Gas'.
- ii) What is mean by 'Soil Horizon'.
- iii) What is role of carrier gas in gaschromatography (GC)
- iv) Which is most commonly used detector in HPLC.
- v) Why carbon dioxide is I.R. active.
- vi) What is mean by 'Heat of Vaporisation'.
- vii) How much energy stored by C = O bond.
- viii) Define 'Screening'
- ix) Define 'Incineration'.
- x) Explain 'Green house effect'.

**Q2)** a) Explain any two of the following :

**[6]**

- i) Explain 'Green house gases'.
- ii) Explain in detal "Electrodialysis'.
- iii) Explain 'Mackereth oxygen cell'.

**P.T.O.**

- (b) Write short notes on (any two) [4]
- i) Wind energy
  - ii) Fizzy Water
  - iii) Sanitary Land fills

**Q3)** Answer any two of the following : [10]

- i) Explain in detail Secondary or biological waste water treatment.
- ii) Explain in detail principle and working of gas chromatography (GC)
- iii) Give an account on various chemical processes in water.

**Q4)** a) Explain Acid - base and Ionic reactions in soil and PH of soil. [6]

OR

What is Nuclear energy. Explain typical Nuclear fission power plant.

- b) Write note on any one of the following : [4]
- i) Global Warming and climate changes.
  - ii) Metals in water



Total No. of Questions : 4]

SEAT No. :

P828

[Total No. of Pages : 2

[5315]-428

T.Y. B.Sc. (Semester - IV)

CHEMISTRY (Paper - VI)

CH - 346 (E) : Dairy Chemistry

(2013 Pattern) (Elective - II)

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*

**Q1)** Answer the following :

**[10]**

- a) What is meant by developed / real acidity in milk?
- b) Which pigments are present in the milk?
- c) How is vacuum pasteurization of milk carried out?
- d) Define homogenization of milk.
- e) Define flavacired milk.
- f) Give advantages of sterilized milk.
- g) Draw the structure of Riboflavin.
- h) How is starch detected in the milk sample?
- i) Define ripening of cream.
- j) Give important uses of butter milk powder.

**Q2)** a) Answer any two of the following :

**[6]**

- i) Comment on density and specific gravity of milk.
- ii) Draw flow sheet of manufacture of sterilized milk.
- iii) Draw structure of Pyridoxal. Give uses of vitamin B<sub>6</sub>.

**P.T.O.**

- b) Answer any two of the following : [4]
- i) Define preservation. What are most commonly used chemicals for preserving milk?
  - ii) Define cheese. Give its food and nutritive value.
  - iii) What are the difficulties observed in the drying and storage of butter milk powder.

**Q3) a)** Define whey powder. Give flow sheet diagram for the manufacture of whey powder and give its keeping quality. [5]

OR

State the factors which influence the growth of micro-organisms in milk.

- b) What are carbohydrates? How are they classified? Give uses of lactose. [5]

OR

Define Ice-cream. Give flow sheet diagram of manufacture of ice-cream. Give its food and nutritive value.

**Q4) a)** Attempt any Two : [6]

- i) Milk is almost an ideal food. Explain.
- ii) Give composition and flow sheet diagram for manufacture of cheese powder.
- iii) Define adulterant. Give different methods of detection of adulterants.

b) Answer any two of the following : [4]

- i) Give properties and uses of globulin.
- ii) How will you test the presence of
  - A)  $\beta$ -naphthol
  - B) Salicylic acid in milk sample
- iii) Define fermented milk. Give its advantages.



Total No. of Questions : 4]

SEAT No. :

**P829**

[Total No. of Pages : 2

**[5315] - 429**

**T.Y. B.Sc. (BOTANY) (Semester - IV)**  
**BO - 341 : Plant Physiology And Biochemistry**  
**(2013 Pattern) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw Neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the following:

**[10]**

- a) Define photosynthetic unit.
- b) Write any two examples of respiratory substrates?
- c) What is loading of solutes?
- d) What is Xenobiotic stress?
- e) Define polysaccharides.
- f) What is  $\beta$  - oxidation?
- g) Give first stable product of C<sub>4</sub> Pathway.
- h) Enlist any two pathways of secondary Metabolites.
  - i) What are enzyme inhibitors?
  - ii) Write the name of any two plant physiologist.

**Q2)** Attempt Any Two of the following:

**[10]**

- a) Write the mechanism of non - cyclic photophosphorylation.
- b) Give properties and functions of carbohydrates.

**P.T.O.**

c) Describe the effect of stress on plant growth.

**Q3)** Write short notes on Any Two of the following. **[10]**

- a) Factors affecting the enzymes activity
- b) Classification and functions of Lipids
- c) CAM Pathway for CO<sub>2</sub> fixation.

**Q4)** What is Glycolysis ? Explain steps in details with energy output. **[10]**

OR

What are proteins ? Give properties and functions of proteins.



Total No. of Questions : 4]

SEAT No. :

**P830**

[Total No. of Pages : 2

**[5315] - 430**

**T.Y. B.Sc. (BOTANY) (Semester - IV)  
BO - 342 : Plant Ecology & Biodiversity  
(2013 Pattern) (Paper - II)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following:

**[10]**

- a) Give long form of MAB.
- b) Define Biodiversity.
- c) What is mean by Genetic Diversity?
- d) Define Alpha Diversity.
- e) What is 'Sthalvrikshas'?
- f) Give any two steps involved in personnel Environmental Audit.
- g) What is Eutrophication?
- h) Write principle of Remote sensing.
- i) Enlist any two Botanical Gardens in India.
- j) What is ecological succession?

**Q2)** Answer any two of the following:

**[10]**

- a) Explain the process of Environmental Audit.
- b) Give applications of Remote sensing in ecology.

**P.T.O.**

c) Write factors causing loss of species & Genetic Diversity.

**Q3)** Write short notes on any two of the following: **[10]**

a) Ozone depletion.

b) Process of EIA

c) Necessity of Inventoring & Monitoring of Biodiversity.

**Q4)** Explain the impact of human activities on Environment with respect to water. Give its causes, prevention measures & control. **[10]**

OR

What is **In-situ** conservation? Explain the concept of Biosphere Reserves & National Parks.



Total No. of Questions : 4]

SEAT No. :

**P831**

[Total No. of Pages : 2

**[5315]-431**

**T.Y. B.Sc. (Semester - IV)**

**BOTANY**

**BO-343: Plant Pathology  
(2013 Pattern) (Paper - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Answer the following :

**[10]**

- a) Define host.
- b) What is penetration.
- c) Define resistance.
- d) What is active dissemination?
- e) What is IPM?
- f) Define cultural control of disease.
- g) Give the names of any two fungal diseases.
- h) Give any two cause of Tip burn of paddy.
- i) Define antibodies.
- j) What is crop rotation?

**P.T.O.**

**Q2)** Attempt any two of the following : **[10]**

- a) Describe structural defence.
- b) Explain economic importance of plant diseases.
- c) Describe virus as plant pathogen.

**Q3)** Write notes on any two of the following : **[10]**

- a) Chemical control of plant disease.
- b) Serial dilution.
- c) Mineral deficiency.

**Q4)** Give an account of downy mildew of grapes and citrus canker with reference to causal organism, symptoms and control measures. **[10]**

OR

What is disease cycle? Describe in detail stages involved in the development of a disease.



Total No. of Questions : 4]

SEAT No. :

P832

[Total No. of Pages : 2

[5315]-432

T.Y. B.Sc. (Semester - IV)

BOTANY

**BO-344: Medicinal and Economic Botany**

**(2013 Pattern) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the following :

**[10]**

- a) Define Pharmacognosy.
- b) Give any two methods of classification of drugs.
- c) What is Kapha?
- d) Define garbling.
- e) Mention any two uses of Amala.
- f) What is pharmacokinetics?
- g) Define ethanobotany.
- h) What are economic plants?
- i) Give any two uses of Dioscorea.
- j) Define ethanoagriculture.

**P.T.O.**

**Q2)** Attempt any two of the following : **[10]**

- a) Give methods of preparation of Asawa and Churna.
- b) Describe hot continuous extraction of drugs by Soxhlet methods.
- c) Explain methods of cultivation and uses of Adhatoda.

**Q3)** Write notes on any Two of the following : **[10]**

- a) Storage of crude drugs.
- b) Macroscopic and microscopic characters of Strychnos nux-vomica.
- c) Botanical resources of paper.

**Q4)** Give distribution, cultivation, microscopic characters and uses of clove. **[10]**

OR

Give evolution origin, sources and uses of sugarcane.



Total No. of Questions : 4]

SEAT No. :

**P833**

[Total No. of Pages : 2

**[5315]-433**

**T.Y. B.Sc. (Semester - IV)**

**BOTANY**

**BO-345: Plant Biotechnology (Theory)**

**(2013 Pattern) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagram wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the following :

**[10]**

- a) What is Bioinformatics?
- b) What is plant protection?
- c) Enlist two examples of therapeutic drugs by r-DNA technology.
- d) Enlist two GMO plants.
- e) What are biofertilizers?
- f) Enlist any two cases of patenting in India.
- g) What is NCBI?
- h) What is genomics?
- i) What are Nif genes?
- j) What is somatic hybridization?

**P.T.O.**

**Q2)** Attempt any two of the following : **[10]**

- a) Explain methods of haploid production.
- b) Explain the types of Proteomics.
- c) Describe the use of Biotechnology in human health care.

**Q3)** Write short notes on any two of the following : **[10]**

- a) Steps of Patenting.
- b) Bioplastic.
- c) Data Retrieval tools.

**Q4)** What is plant tissue culture? Describe the concept, technique and applications of cell suspension culture. **[10]**

OR

What is Nitrogen fixation? Explain in detail mechanism of symbiotic Nitrogen fixation.



Total No. of Questions : 4]

SEAT No. :

**P834**

[Total No. of Pages : 2

**[5315]-434**

**T.Y. B.Sc. (Semester - IV)**

**BOTANY**

**BO-346: Plant Breeding and Seed Technology  
(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Draw neat labelled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Answer the following :

**[10]**

- a) What is Plant breeding?
- b) Write any two applications of Heterosis.
- c) What is Back cross?
- d) Define plant introduction.
- e) What are induced mutations?
- f) Mention any two seed purity components.
- g) What is seed?
- h) Give any two duties of seed inspector.
- i) What is Seed processing?
- j) What is Seed Marketing?

**P.T.O.**

**Q2)** Attempt any Two of the following : **[10]**

- a) What is Mass selection? Explain its procedure.
- b) Define germination testing? Give its objectives.
- c) What are polyploids? Describe any two methods of obtaining polyploids.

**Q3)** Write notes on any Two of the following : **[10]**

- a) Gamma garden.
- b) Seed Markets in India.
- c) Moisture Meter.

**Q4)** What is hybridization? Explain general procedure of hybridization. **[10]**

OR

Define seed sampling. Explain various factors affecting seed storage. Add a note on need of seed storage.



Total No. of Questions : 4]

SEAT No. :

**P835**

[Total No. of Pages : 2

**[5315]-435**

**T.Y. B.Sc. (Semester - IV)**

**ZOOLOGY**

**ZY-341: Biological Techniques**

**(2013 Pattern) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) What is electrophoresis?
- b) Define Osmolarity.
- c) What is fixation of tissue?
- d) State any four names of WBCS.
- e) Enlist the types of microtomes.
- f) Define vital stain.
- g) What is Feulgen reaction?
- h) What is camera lucida?
- i) What is ocular micrometer?
- j) Define ultra centrifugation.

***P.T.O.***

**Q2)** Attempt any Two of the following : **[10]**

- a) Explain the principle and working of compound microscope.
- b) What is colorimetry? Explain principle and working of colorimeter.
- c) What is microtome? Describe any two types of microtome knives.

**Q3)** Write notes on any Two of the following : **[10]**

- a) PAS techniques.
- b) Total count of RBCs.
- c) Mounting media.

**Q4)** What is chromatography? Describe in detail principle and applications of Ion exchange chromatography. **[10]**

OR

What is embedding? Describe in detail methods of embedding.



Total No. of Questions : 4]

SEAT No. :

**P836**

[Total No. of Pages : 2

**[5315]-436**

**T.Y. B.Sc. (Semester - IV)**

**ZOOLOGY**

**ZY - 342 : Mammalian Physiology and Endocrinology**

**(2013 Pattern) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) Define cardiac cycle.
- b) State clinical significance of dialysis.
- c) Define striated muscle.
- d) What is saltatory conduction?
- e) Define pregnancy.
- f) State any two characters of crinism.
- g) What is electro cardiogram?
- h) What is oxyhaemoglobin?
- i) State the role of liver in physiology of digestion.
- j) What is angina pectoris.

**Q2)** Attempt any two of the following :

**[10]**

- a) Describe the role of pancreas in physiology of digestion.
- b) Describe the process of tubular secretion during urine formation.
- c) Describe sliding filament theory of muscle contraction.

**P.T.O.**

**Q3)** Write notes on any two of the following :

**[10]**

- a) Cardiac output
- b) Endocrinology
- c) Hormonal control of male reproduction.

**Q4)** What is respiration? Describe mechanism of transport of carbon dioxide during respiration.

**[10]**

OR

Define impulse. Describe origin and conduction of impulse in a non-myelinated nerve fibre.



Total No. of Questions : 4]

SEAT No. :

P837

[Total No. of Pages : 2

[5315]-437

T.Y. B.Sc. (Semester - IV)

ZOOLOGY

ZY - 343 : GENETICS AND MOLECULAR BIOLOGY

(2013 Pattern) (Paper - III)

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) What is Chiasma?
- b) Define gene frequency.
- c) Elaborate TMV
- d) What are histones?
- e) Define the term 'replication'.
- f) What are Okazaki fragments?
- g) What is triplet?
- h) Give role of helicase enzyme.
- i) What is nucleotide?
- j) Define reverse transcription.

**Q2)** Attempt any two of the following :

**[10]**

- a) Give an account of heterochromatin.
- b) Explain the process of recombination in Genetics.
- c) Give an account of cloning vectors.

**P.T.O.**

**Q3)** Write short notes on any two of the following :

**[10]**

- a) Regulation of gene action
- b) PCR
- c) Hardy - Weinberg equilibrium.

**Q4)** What is 'Central Dogma of Molecular Biology'?

Describe process of translation in eukaryotes.

**[10]**

OR

Define mutation. Describe various types of mutation.



Total No. of Questions : 4]

SEAT No. :

**P838**

[Total No. of Pages : 2

**[5315]-438**

**T.Y. B.Sc. (Semester - IV)**

**ZOOLOGY**

**ZY - 344 : Organic Evolution**

**(2013 Pattern) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) Who was Lamark?
- b) State any one factor influencing speciation.
- c) What are plastids?
- d) What is mesozoic era?
- e) Define protenoid microsphere.
- f) Define mutation.
- g) Write any one palaeontological evidence of organic evolution.
- h) What is Zoogeography?
- i) State two characters of Kenyapithecus.
- j) Define postzygotic isolating mechanisms.

**Q2)** Attempt any two of the following :

**[10]**

- a) Describe allopatric and Sympatric speciation.
- b) Describe patterns of animal distribution.
- c) Explain modern synthetic theory of organic evolution.

**P.T.O.**

**Q3)** Write short notes on any two of the following : **[10]**

- a) Geographic range and fauna of Oriental and Nearctic realms.
- b) Prezygotic isolating mechanisms
- c) Darwinism

**Q4)** What is organic evolution? Explain embryological and biochemical evidences supporting it. **[10]**

OR

What is antiquity of man? Describe characters of Homo Sapiens and Homo erectus.



Total No. of Questions : 4]

SEAT No. :

**P839**

[Total No. of Pages : 2

**[5315]-439**

**T.Y. B.Sc. (Semester - IV)**

**ZOOLOGY**

**ZY - 345 : GENERAL EMBRYOLOGY**

**(2013 Pattern) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) Define microlecithal egg.
- b) What is amnion?
- c) Define morula.
- d) What is chalaza?
- e) What is tertiary egg membrane?
- f) What is primary organiser?
- g) Define spermatogenesis.
- h) What is isogamy?
- i) Define amphimixis?
- j) What is epiboly?

**Q2)** Attempt any two of the following :

**[10]**

- a) Describe the structure of isolecithal egg.
- b) Describe stereoblastula.
- c) Describe Ultra structure of sperm.

**P.T.O.**

**Q3)** Write short notes on any two of the following : **[10]**

- a) Vitellogenesis
- b) Gastrula
- c) Planes of cleavages

**Q4)** What is fertilization? Describe in detail sperm penetration. **[10]**

OR

Describe the development of chick embryo up to 24 hours.



Total No. of Questions : 4]

SEAT No. :

**P840**

[Total No. of Pages : 4

**[5315]-440**

**T.Y. B.Sc. (Semester - IV)**

**ZOOLOGY**

**ZY - 346 (A) : Public Health and Hygiene**

**(2013 Pattern) (Paper - VI) (Elective - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) Define personal health.
- b) Define condiments.
- c) What is coronary heart disease?
- d) State any two radiation risks.
- e) State any two emergencies in industry.
- f) Define epidemiology.
- g) State any two symptoms of tuber culosis.
- h) Define food.
- i) What is biosafety for disabled persons?
- j) State any two components of soil.

**Q2)** Attempt any two of the following :

**[10]**

- a) Explain the purpose of data sampling.
- b) Give an account of properties of soil.
- c) Describe artificial ventilation system.

**P.T.O.**

**Q3)** Write short notes on any two of the following :

**[10]**

- a) Methods of epidemiology
- b) Necessity of food
- c) Mechanical filtration of water

**Q4)** Explain the signs, symptoms, mode of transmission and control measures of chicken pox.

**[10]**

OR

Explain the concept of sanitation with reference to disposal of refuse.



Total No. of Questions : 4]

**P840**

**[5315]-440**

**T.Y. B.Sc. (Semester - IV)**

**ZOOLOGY**

**ZY - 346 (B) : Medical Entomology**

**(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following :

**[10]**

- a) Define medical entomology.
- b) Define interspecific relationship.
- c) Mention any two methods of Ant control.
- d) Mention any two diseases spread by tick.
- e) State the names of any two forest pests.
- f) State the order of mosquito.
- g) Write any two control methods of bed bug.
- h) Apterygotan insect.
- i) Mention any two adaptations in head louse.
- j) Write any two names of abdominal appendages.

**Q2)** Attempt any two of the following :

**[10]**

- a) Describe the effects of flea on man.
- b) Explain veterinary entomology.
- c) Describe social organisation in termites.

**Q3)** Write notes on any two of the following :

**[10]**

- a) Forest entomology.
- b) Digestive system of insects.
- c) Intraspecific relationship.

**Q4)** Describe the life cycle of Housefly. Add a note on diseases spread by it and its control.

**[10]**

OR

Describe the life cycle of silverfish in brief and add a note on its distribution, damage and control measures.



Total No. of Questions : 4]

SEAT No. :

**P841**

[Total No. of Pages : 2

**[5315]-441**

**T.Y. B. Sc.**

**GEOLOGY**

**GL - 341 : Metamorphic Petrology**

**(2013 Pattern) (Paper - I) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following questions in 2/3 lines.

**[10]**

- a) What is AFM diagram?
- b) What is metasomatism?
- c) Define cataclastic metamorphism.
- d) What is tourmalinisation?
- e) What is contact metamorphism?
- f) What are eclogites?
- g) What are phase diagrams?
- h) What is lineation?
- i) What is augen structure?
- j) What are antistress minerals?

**Q2)** Write notes on (any 2) :

**[10]**

- a) Growth of minerals under stress.
- b) Textures and structures of regional metamorphism.
- c) Significance of inclusions in metamorphic crystals.

**P.T.O.**

- Q3)** Write notes on (any 2) : **[10]**
- a) Aureoles of thermal metamorphism.
  - b) Effects of thermal metamorphism on igneous rocks.
  - c) Gneissosity.

- Q4)** Describe the effect of regional metamorphism on argillaceous rocks. **[10]**

OR

Describe the concept of metamorphic facies. Give diagrammatic representation of pressure temperature conditions of metamorphic facies.



Total No. of Questions : 4]

SEAT No. :

**P842**

[Total No. of Pages : 2

**[5315]-442**

**T.Y. B.Sc.**

**GEOLOGY**

**GL - 342 : Environmental Geology  
(2013 Pattern) (Paper - II) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*

**Q1)** Define/Answer the following in 2/3 lines.

**[10]**

- a) Erosion
- b) Mining restoration
- c) Tsunami
- d) Environmental Geology
- e) Soil Pollution.
- f) Alkalinity of Soil
- g) Impact assesment.
- h) Avalanches
- i) Floods
- j) Conventional source of energy.

**Q2)** Write notes on (any two)

**[10]**

- a) Types of natural resources.
- b) Flood hazards in India.
- c) Causes of Dessertification.

**P.T.O.**

**Q3)** Answer the following (any two)

**[10]**

- a) Causes of subsidence of land
- b) Explain Nitrogen cycle.
- c) Effects of volcano

**Q4)** Define Earthquake. Describe the terms associated with earthquake Explain instrumental and natural precursors to predict earthquake. **[10]**

OR

What is water pollution? Explain in detail sources of water pollution. Add a note on flourosis.



Total No. of Questions : 4]

SEAT No. :

**P843**

[Total No. of Pages : 2

**[5315]-443**

**T.Y. B.Sc.**

**GEOLOGY**

**GL - 343 : Economic Geology**

**(2013 Pattern) (Paper - III) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following questions in 2/3 lines.

**[10]**

- a) What are epigenetic deposits?
- b) What is tenor of ore?
- c) What is shale gas?
- d) What are mesothermal deposits?
- e) What is true gossan?
- f) What is metasomatic replacement?
- g) Give two ore minerals of silver.
- h) Give the different variation of coal.
- i) Give the types of oil traps
- j) What is saddle reef?

**Q2)** Answer the following questions (any two)

**[10]**

- a) Types of placer deposits.
- b) Mineralogy and uses of radioactive elements.
- c) Gossans as guides to the hidden deposits.

**P.T.O.**

**Q3)** Write notes on (any two)

**[10]**

- a) Residual concentration
- b) Origin of coal
- c) Assam shelf oil field

**Q4)** Explain early and late magmatic deposits with suitable examples.

**[10]**

OR

Give, mineralogy, geological and geographical distribution and uses of Iron deposits.



Total No. of Questions : 4]

SEAT No. :

**P844**

[Total No. of Pages : 2

**[5315]-444**

**T.Y. B.Sc.**

**GEOLOGY**

**GL - 344 : Geotectonics**

**(2013 Pattern) (Paper - IV) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer in 2/3 lines.

**[10]**

- a) What are S waves?
- b) What is lithosphere?
- c) What is CRM?
- d) What is Wilson's cycle?
- e) What is divergent plate boundary?
- f) Give 2 examples of hot spots.
- g) What is platform?
- h) Name any 2 fold mountains.
- i) What is magnetic inclination?
- j) What is conrad discontinuity?

**Q2)** Write notes on (any two)

**[10]**

- a) Core
- b) P & S waves shadow zone
- c) Back arc basins

**P.T.O.**

**Q3)** Write notes on (any two)

**[10]**

- a) Neotectonics
- b) Triple junctions.
- c) Low velocity zone

**Q4)** Write a note on different types of plate boundaries.

**[10]**

OR

Write a note on meteorites.



Total No. of Questions : 4]

SEAT No. :

**P845**

[Total No. of Pages : 2

**[5315]-445**

**T.Y. B.Sc.**

**GEOLOGY**

**GL - 345 : Phanerozoic Stratigraphy of India and Palaeontology  
(2013 Pattern) (Paper - V) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Answer the following in 2/3 lines.

**[10]**

- a) Give fossils of Narmada valley
- b) Give morphological characters of Graptolites.
- c) Give fauna and flora of siwaliks.
- d) Give systematic classification of ptillophyllum.
- e) Give economic importance of Deccan traps.
- f) Give fossil content of Jurassic of Kachchh.
- g) Give systematic classification of Brachyphyllum.
- h) Give origin of laterites.
- i) Give economic importance of Gondwana super group.
- j) Give the duration of volcanic eruption during Deccan volcanism.

**Q2)** Answer the following (any two)

**[10]**

- a) Classification of Gondwana supergroup
- b) Age of Deccan trap.
- c) P-C boundary

**P.T.O.**

- Q3)** Write notes on (any two) **[10]**
- a) Cretaceous of Cauvery basin
  - b) Tertiary of Assam
  - c) Lithology and fossil content of Devonian.

- Q4)** Give the systematic classification, generic definition and distribution of Glossopteris. **[10]**

OR

- a) Origin and types of Laterites **[5]**
- b) Give the classification, lithology and fossil content of Tertiary system. **[5]**



Total No. of Questions : 4]

SEAT No. :

P 846

[Total No. of Pages : 2

[5315]- 446

T.Y. B.Sc. (Semester - IV)

GEOLOGY (Paper - VI)

GL- 346 : Applied Geology - II

(Engineering Geology, Geohydrology and Prospecting)

(2013 Pattern)

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer in 2/3 lines

**[10]**

- a) What is Perched Aquifer?
- b) What are Geophones?
- c) What is meant by Rainwater Harvesting?
- d) Define Tunnel.
- e) Define Railroad Ballast.
- f) Define Arch Dam.
- g) Give uses of rock aggregate.
- h) What is Connate and Juvenile water?
- i) Name two types of dams.
- j) What is Torsion Balance?

**P.T.O**

**Q2)** Answer in short (any two)

**[10]**

- a) Explain Tunnelling in Deccan traps
- b) Describe Mineralogic Guides
- c) Describe recharge through Pits and Shafts.

**Q3)** Write short notes (any two)

**[10]**

- a) Opencast mining
- b) Porosity and Secondary porosity
- c) Any two engineering properties of rocks.

**Q4)** Define the terms Hydrology, Geohydrology and hydrogeology. Explain the vertical distribution of Groundwater.

**[10]**

OR

Explain in detail Lithological and Structural criteria for prospecting.



Total No. of Questions : 4]

SEAT No. :

P 847

[Total No. of Pages : 3

[5315] - 447

T.Y.B.Sc.

STATISTICS (Principal)

ST - 341 : Actuarial Statistics

(2013 Pattern) (Paper - I) (Semester - IV) (Theory)

Time : 2 Hour]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of Calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following :

[1 each]

A) Choose the correct alternative in each of the following :

i) If  $S(x)$  is survival function of  $X$  then  $S(0)$  is

- |             |                  |
|-------------|------------------|
| a) 0        | b) 1             |
| c) $\infty$ | d) $\frac{1}{2}$ |

ii) the present value of annuity certain immediate at the rate of 1 unit per annum for  $n$  years is

- |                      |                           |
|----------------------|---------------------------|
| a) $\frac{1+v^n}{d}$ | b) $\frac{1-v^n}{\delta}$ |
| c) $\frac{1-v^n}{i}$ | d) $\frac{1-v^n}{d}$      |

iii) Discount function  $V$  and instantaneous rate of interest  $\delta$  is related as :

- |                       |                      |
|-----------------------|----------------------|
| a) $V = -\log \delta$ | b) $V = \log \delta$ |
| c) $V = e^{-\delta}$  | d) $V = e^{\delta}$  |

P.T.O

- iv) Which of the following statement or expression is not true for  ${}^t p_x$
- ${}^t p_x$  is survival function of  $T(x)$
  - $P(T(x) > t)$
  - ${}^t p_x = 1 - {}^t q_x$
  - ${}^t p_x$  is the probability that a person aged  $(x)$  dies in  $(x, x + t)$
- B) State whether the following statements are True or False : **[1each]**
- Premiums are determined by actuary.
  - If  $T(x) = 7.5$  then  $K(x) = 8$
- C) Define the following terms : **[1each]**
- Loss function
  - Policy
- D) Explain each of the following terms : **[1each]**
- $\ddot{a}_{x:n}$
  - $A^1_{x:n}$

**Q2)** Attempt any two of the following : **[5 each]**

- a) The survival model of a species of birds is as :

|       |     |      |     |      |     |   |
|-------|-----|------|-----|------|-----|---|
| X     | 0   | 1    | 2   | 3    | 4   | 5 |
| $P_x$ | 0.8 | 0.65 | 0.5 | 0.35 | 0.2 | 0 |

For a radix of  $l_0 = 1000$ , obtain the columns of  $l_x$  and  $d_x$ . Obtain the limiting age.

- Explain the concept of utility function  $U(w)$ . If  $G$  is one time premium and  $X$  is loss random variable with  $E(X) = \mu$ , then prove that  $G \geq \mu$ .
- Define curtate future lifetime random variable  $K(x)$  and find it's probability mass function.

Q3) Attempt any Two of the following :

[5 each]

- a) Explain the term 'Annuity' with an illustration. Explain
  - i) Annuity certain due
  - ii) Annuity certain immediate
- b) A loan of Rs. 80,000 is taken and it has to be repaid in 10 equal installments payable yearly at the beginning of the year. Based on 6% annual effective rate of interest. Determine the amount of installments.
- c) State any two properties of survival function  $S(x)$ . Derive the expression for  $S(x)$  in terms of force of mortality.

Q4) Attempt any one of the following :

- A) a) Explain, with an illustration, each of the following : [5]
- i)  $n$  year term insurance
  - ii) Whole life insurance

State and explain the expression for net single premium in terms of  $V$  for each of the above insurance schemes.

- b) On 5<sup>th</sup> June 2002, (65) bought a Rs. 1,00,000 whole life insurance policy with death benefit payable at the end of year of death. The policy is purchased by means of annual premiums, payable at the start of each year policy remains in force. The policy holder died on 10<sup>th</sup> August 2009 and the loss to the insurer was 35,000. If  $i = 0.06$ , what was the annual premium paid? [5]
- B) a) Given that  $P_{60} = 0.985$ ,  $P_{61} = 0.98$ ,  $A_{62} = 0.6$ ,  $i = 0.05$  Calculate  $A_{61}$ ,  $A_{60}$  [5]
- b) If effective rate of interest is 7% per annum, then obtain [5]
- i) Accumulated value of Rs. 40,000 at the end of 5<sup>th</sup> year,
  - ii) Present value of Rs. 35,000 due at the end of third year.



Total No. of Questions : 4]

SEAT No. :

P 848

[Total No. of Pages : 3

[5315] - 448

T.Y.B.Sc.

STATISTICS (Principal)

ST - 342 : Testing of Hypotheses

(2013 Pattern) (Paper - II) (Semester - IV) (Theory)

Time : 2 Hour]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of Calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following :

- A) Choose the correct alternative in each of the following : **[1each]**
- i) For exponential distribution with mean  $\theta$ , to test null hypothesis  $H_0 : \theta = \theta_0$  against  $H_1 : \theta > \theta_0$ , the critical region will be
    - a)  $\sum X_i < C$
    - b)  $\sum X_i > C$
    - c)  $|\bar{X}| < C$
    - d)  $|\bar{X}| > C$
  - ii) Which of the following is used for testing goodness of fit?
    - a) Sign test
    - b) Mann - Whitney U test
    - c) Kolmogorov- Smirnov test
    - d) Run Test
  - iii) For carrying out SPRT which of the following should be fixed in advance?
    - a) Both  $\alpha$  and  $\beta$
    - b) Only  $\alpha$
    - c) Only  $\beta$
    - d) Neither  $\alpha$  nor  $\beta$

P.T.O

iv) For a random sample of size  $n$  from the Bernoulli distribution with parameter  $\theta$ , the likelihood ratio test for testing the hypothesis  $H_0 : \theta = 0.5$  against  $H_1 : \theta \neq 0.5$  is to reject  $H_0$  if

a)  $\sum X_i^2 < C$

b)  $|\bar{X}| < C$

c)  $\sum X_i^2 > C$

d)  $|\bar{X}| > C$

B) State whether the following statements are true or false : **[1each]**

i) The value of the likelihood ratio statistic close to zero indicates that data supports the null hypothesis.

ii) For testing randomness of the sample run test is used.

C) Define each of the following : **[1each]**

i) Test of hypothesis.

ii) Type I error.

D) Explain each of the following : **[1each]**

i) Power of the test.

ii) Likelihood ratio test.

**Q2)** Attempt any two of the following : **[5each]**

A) Construct, UMP test of level of significance  $\alpha$  for testing  $H_0 : \theta = \theta_0$  against  $H_1 : \theta > \theta_0$  where  $\theta$  is the mean of exponential distribution based on a random sample of size  $n$  drawn from it.

B) Construct SPRT of strength  $(\alpha, \beta)$  for testing,  $H_0 : m = m_0$  against  $H_1 : m = m_1$  ( $m_0 > m_1$ ), Where  $m$  is the mean of poisson distribution.

C) Let  $X$  is a cauchy random variable with location parameter  $\theta$  and scale parameter  $\lambda = 3$ . To test the hypothesis  $H_0 : \theta = 5$  against  $H_1 : \theta = 10$ , a single observation is taken. The rejection region is  $x > 8$ . compute the probabilities of type I error and type II error.

**Q3) Attempt any two of the following : [5 each]**

- A) Describe Kolmogorov - Smirnov test for one sample problem
- B) Construct a likelihood ratio test of level  $\alpha$  for testing the hypothesis  $H_0 : \sigma^2 = \sigma_0^2$  against  $H_1 : \sigma^2 < \sigma_0^2$  for a random sample of size  $n$  taken from the  $N(4, \sigma^2)$  distribution.
- C) State Neyman - Pearson theorem. Use it to find the most powerful test of level  $\alpha$  for testing the hypothesis  $H_0 : \theta = 1$  against  $H_1 : \theta = 2$  where  $\theta$  is the parameter of the distribution of a random variable  $X$  with p.d.f. given by

$$f(x) = \frac{\theta}{1-\theta} x^{\left(\frac{2\theta-1}{1-\theta}\right)} \quad 0 < x < 1, \theta > 0$$

$= 0 \quad \text{o.w.}$

**Q4) Attempt any one of the following :**

- A) i) Construct a SPRT of strength  $(\alpha, \beta)$  for testing the hypothesis  $H_0 : \theta = \theta_0$  against the hypothesis  $H_1 : \theta = \theta_1 (\theta_1 > \theta_0)$  for Bernoulli distribution with parameter  $\theta$ . **[5]**
- ii) Following is a random sample drawn from the continuous population in the order in which the observations are made :  
75, 56, 44, 89, 95, 23, 32, 84, 77, 71, 88, 41.  
Test the hypothesis of randomness of the sample. Use 5% level of significance. **[5]**
- B) i) Let  $X_1, X_2, \dots, X_n$  denote the random sample of size  $n$  from the normal distribution with mean  $\mu$  and standard deviation 16. Find the sample size  $n$  and a uniformly most powerful test of level 0.1 for testing  $H_0 : \theta = 25$  against  $H_1 : \theta < 25$  with power function  $K(\theta)$  such that  $k(24) = 0.5$  **[5]**
- ii) Steel rods produced by a certain company have a median length 10 meters when the process is operating properly. A sample of 10 rods, randomly selected from production line, yields the following observed length.  
9.87, 10.18, 10.22, 9.84, 10.05, 9.81, 10.03, 10.09, 9.95, 9.80  
Assuming that the lengths are symmetrically distributed about their median, test whether the process is operating properly using Wilcoxon's signed ranked test. (Use 5% . l.o.s.) **[5]**



Total No. of Questions : 4]

SEAT No. :

P 849

ss[Total No. of Pages : 3

[5315]-449

T.Y.B.Sc. (Semester - IV)

STATISTICS (Principal)

ST - 343 : STATISTICAL QUALITY CONTROL

(2013 Pattern)

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of Scientific and statistical Calculator tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

**Q1)** Attempt each of the following :

- a) Choose the correct alternative in each of the following : **[1each]**
  - i) The UCL and CL on  $\bar{X}$  Chart are respectively a and b. Hence the LCL on the  $\bar{X}$  chart is
    - a)  $2a + b$
    - b)  $2a-b$
    - c)  $2b-a$
    - d)  $2b+a$
  - ii) Which of the following process tool is used to evaluate inter - relationship between two quality characteristic?
    - a) Pareto diagram
    - b) Histogram
    - c) Cause and effect diagram
    - d) Scatter plot
  - iii) Producer's risk is probability of rejecting a lot of quality
    - a) AQL
    - b) AOQ
    - c) LTFD
    - d) AOQL

**P.T.O**

- iv) Average total Inspection for single sampling plan is
- |                   |                           |
|-------------------|---------------------------|
| a) $n$            | b) $n.p_a + N. (1 - p_a)$ |
| c) $N. (1 - p_a)$ | d) $N$                    |
- b) State whether each of the following statement is true or false. **[1each]**
- i) A process in statistical control guarantees that the percent defectives is zero.
  - ii) Natural tolerance is defined as the difference between the upper and lower specification limits.
- c) Define the following terms : **[1each]**
- i) Chance Causes
  - ii)  $K\text{-}\sigma$  limits
- d) i) Give interpretation of 'low spot' on C-chart. **[1each]**
- ii) State the rule for shifting to tightened inspection from normal inspection.

**Q2)** Attempt any two of the following : **[5each]**

- a) Write note on check sheet.
- b) Derive expression of Average Total Inspection (ATI) in case of double sampling plan.
- c) For 25 samples of size 5,  $\bar{\bar{X}} = 0.9315$  and  $\bar{R} = 0.01527$ . The specification limits are  $0.93 \pm 0.01$ . Assuming the quality characteristic X to be normally distributed and the process to be in statistical control, verify whether the process meets specifications. If not, estimate the percent defectives.

**Q3) Attempt any two of the following :**

- a) Explain the construction and interpretation of p-chart when subgroup sizes  $n_i$  are same and process fraction defective is not known. **[5]**
- b) Define  $C_p$  and  $C_{pk}$  indices for a stable process. Also interpret the following:
  - i)  $C_p = C_{pk}$  ii)  $C_p > C_{pk}$
  - iii)  $C_{pk} = 1.33$  **[5]**
- c) i) A single sampling plan with  $N = 10,000$ ,  $n = 100$ ,  $c=3$ , obtain AOQ if lot quality is  $p = 0.03$ . **[3]**  
ii) Explain the method of obtaining AOQL graphically **[2]**

**Q4) Attempt any one of the following :**

- a) i) Define the following terms. **[3]**
  - I) Consumer's risk
  - II) Producer's risk
  - III) Acceptance Sampling number
- ii) State any four dimensions of quality **[2]**
- iii) In C-chart, show that  $LCL > 0 \leftrightarrow \bar{C} > 9$  **[5]**
- b) i) For a double sampling plan  $N = 2000$ ,  $n_1 = 60$ ,  $n_2 = 100$ ,  $C_1 = 0$ ,  $C_2 = 2$ . Compute ASN if the lot is of quality 0.04. **[5]**
- ii) Give justification for the use of  $3\sigma$  limits on control charts. **[5]**



Total No. of Questions : 4]

SEAT No. :

P 850

ss[Total No. of Pages : 4

[5315]-450

T.Y. B.Sc.

STATISTICS (Principal)

ST - 344 : Operations Research

(2013 Pattern) (Paper - IV) (Semester - IV)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) a) Choose the correct alternative in each of the following : [1each]

- i) If the primal linear programming problem (LPP) has infeasible solution, the solution of its dual is
  - 1) infeasible
  - 2) unbounded
  - 3) unique optimal
  - 4) not optimal
- ii) The method used for obtaining optimal solution of a Transportation Problem (TP) is
  - 1) Vogel's approximation method
  - 2) Least cost method
  - 3) Hungarian method
  - 4) Modified distribution (MODI) method
- iii) The solution to a TP with m sources and n destinations is non degenerate if the number of positive allocations is
  - 1)  $m + n$
  - 2)  $m + n - 1$
  - 3)  $m \times n$
  - 4)  $m + n + 1$

P.T.O

- iv) In PERT, variance of the project is based on
- 1) critical activities
  - 2) non - critical activities
  - 3) all activities
  - 4) dummy activities
- b) State whether each of the following is true or false. **[1each]**
- i) The dual of a dual is primal.
  - ii) Assignment problem can be treated as a particular case of transportation problem.
- c) Define each of the following. **[1each]**
- i) Artificial variable
  - ii) Surplus variable
- d) What is an unbalanced TP? How to convert it into a balanced TP? **[2]**

**Q2)** Attempt any two of the following : **[5 each]**

- a) A firm engaged in producing two models A and B performs three operations; assembly, painting and testing. The relevant data are as follows.

Total number of hours available each week are :

Assembly - 150 Painting - 80 Testing - 24

| Model | Unit sale      | Hours    | required for | each unit |
|-------|----------------|----------|--------------|-----------|
|       | Price (in Rs.) | Assembly | Painting     | Testing   |
| A     | 50             | 1        | 0.5          | 0.2       |
| B     | 80             | 1.25     | 0.5          | 0.1       |

The firm wishes to determine its weekly product - mix 50 as to maximize revenue. Formulate it as a LPP.

- b) Explain the following terms with regards to LPP.
- i) feasible solution
  - ii) optimal solution
  - iii) infeasible solution
  - iv) unbounded solution
  - v) alternate solution

c) Write dual of the following LPP

$$\begin{aligned} \text{Minimize } z &= 2x_1 + 3x_2 + x_3 \\ \text{Subject to } x_1 - x_2 + x_3 &\leq 5 \\ 2x_1 + x_2 &= 7 \\ x_1 + x_2 - x_3 &\geq 8 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

Q3) Attempt any two of the following :

[5 each]

- a) Explain the term "simulation". Write its merits and demerits.
- b) A car hire company has one car in each of four depots  $D_1, D_2, D_3$  and  $D_4$ . A Customer in each of four regions  $R_1, R_2, R_3$  and  $R_4$  requires a car. The distance in km between depots and regions is as follows.

| Depo \ Region | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
|---------------|-------|-------|-------|-------|
| $D_1$         | 160   | 120   | 50    | 55    |
| $D_2$         | 130   | 120   | 50    | 35    |
| $D_3$         | 190   | 160   | 80    | 80    |
| $D_4$         | 200   | 175   | 110   | 105   |

How should cars be assigned to the customers so as to minimise the total distance travelled?

- c) Explain the following terms as regards to CPM :
- i) earliest start time
  - ii) earliest finish time
  - iii) latest start time
  - iv) latest finish time
  - v) critical path

**Q4)** Attempt any one of the following :

- a) i) Explain how simulation can be used to obtain probabilities of events related to gamma distribution. [3]
- ii) Following table gives per unit cost of transportation (in Rs.) from sources to destinations along with availability and requirement.

| Sources \ destination | destination    |                |                |                | Availability |
|-----------------------|----------------|----------------|----------------|----------------|--------------|
|                       | D <sub>1</sub> | D <sub>2</sub> | D <sub>3</sub> | D <sub>4</sub> |              |
| S <sub>1</sub>        | 15             | 10             | 17             | 18             | 20           |
| S <sub>2</sub>        | 16             | 13             | 12             | 13             | 60           |
| S <sub>3</sub>        | 12             | 17             | 20             | 11             | 70           |
| Requirement           | 30             | 30             | 40             | 50             |              |

Obtain IBFS using VAM. Further, find optimal solution. [7]

- b) i) Explain the following terms in PERT analysis [4]
- 1) Pessimistic time estimate
  - 2) Optimistic time estimate
  - 3) Most likely time estimate
  - 4) Variance of the project length
- ii) Draw a network diagram from following activities. Find critical path.

| Activity    | A | B | C | D | E | F    | G    | H  | I  | J | K    | L    | M    | N | O |
|-------------|---|---|---|---|---|------|------|----|----|---|------|------|------|---|---|
| Predecessor | - | - | - | B | B | A, E | C, D | G  | H  | I | C, D | C, D | C, D | J | M |
| Time (days) | 2 | 2 | 4 | 6 | 1 | 1    | 3    | 45 | 10 | 7 | 6    | 2    | 2    | 1 | 2 |

[6]



Total No. of Questions : 4]

SEAT No. :

P851

[Total No. of Pages : 8

[5315]-451

T.Y. B.Sc. (Semester - IV)

STATISTICS (Principal) (Paper - V)

ST - 345 (A) : Reliability and Survival Analysis

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

a) Choose the correct alternative in each of the following : [1 each]

i) For a k-out-of-n : G system, the number of cut vectors is

A)  $2^n - \sum_{r=k}^n {}^n C_r$

B)  $2^n - \sum_{r=0}^{k-1} {}^n C_r$

C)  $\sum_{r=k}^n {}^n C_r$

D)  $\sum_{r=0}^{k-1} {}^n C_r$

ii) The number of irrelevant components in a series system is

A) n

B) 0

C) 1

D) n - 1

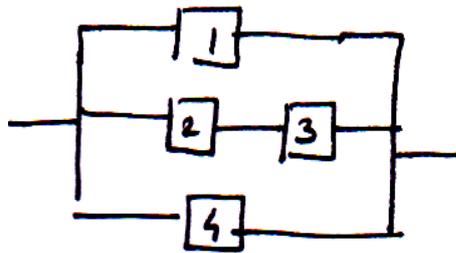
P.T.O.



- d) Attempt each of the following : [1 each]
- i) Give an application of a k - out - of - n : G system.
  - ii) Give an example of right random censoring scheme.

**Q2)** Attempt any two of the following: [5 each]

- a) Consider the system with reliability block diagram as given below :



- i) Find minimal path sets
  - ii) Find minimal cut sets
  - iii) Represent the above system as a series arrangement of minimal cut parallel structure.
  - iv) Draw reliability block diagram of a dual of a given system.
- b) Let  $h(\cdot)$  be the reliability function of a coherent system then show that
- $$h(\underline{P} \parallel \underline{P}') \geq h(\underline{P}) \parallel h(\underline{P}') \text{ for all } 0 \leq P_i \leq 1, 0 \leq P_i' \leq 1 \text{ and equality holds for all } P_i, P_i' \text{ iff the system is parallel.}$$
- c) Show that if F belongs to Increasing Failure Rate (IFR) class of lifetime distributions then it belongs to Increasing Failure Rate in Average (IFRA) class of lifetime distributions.

**Q3)** Attempt any two of the following: [5 each]

- a) Discuss in detail structural importance of a component in a coherent system with the help of an illustration. Also state its use.

- b) Let a lifetime r.v.T with cumulative hazard rate function as

$$R(t) = \begin{cases} kt & ; 0 \leq t \leq 1 \\ \frac{t^2}{2} & ; t > 1 \end{cases}$$

Where k is a positive constant

Find

- i) the value of k such that T is strictly continuous.
  - ii) Survival function of T.
  - iii) Probability density function of T.
- c) Obtain an expression for an actuarial estimator of survival function of a lifetime r.v.T.

**Q4)** Attempt any one of the following:

- a)
  - i) Show that k-out-of-n : G system is a coherent system hence show that series system is also a coherent system. [6]
  - ii) Let a lifetime r.v.T follows Weibull ( $\lambda$ :scale. parameter,  $\gamma$ :shape parameter)  
Compute failure rate function. Discuss its different nature for various values of shape parameter  $\gamma$ . [4]
- b)
  - i) Define Decreasing Mean Residual Life property (DMRL) of a lifetime r.v.T and New Better than used in Expectation (NBUE) class of lifetime distributions. [6]  
Show that
    - 1) If  $F \in \text{IFR} \Rightarrow F \in \text{DMRL}$
    - 2) If  $F \in \text{DMRL} \Rightarrow F \in \text{NBUE}$
  - ii) What is the component reliability of each of n identical components in a series system if the system reliability is 0.9? [2]
  - iii) Consider the following data of remission time (in weeks) of leukemia patients receiving control treatment.  
1, 1, 2, 2, 5, 5, 5, 5, 6, 6, 8, 8, 8, 8, 9, 9, 10, 10  
Calculate an estimate of an unbiased estimator of  $\bar{F}(9)$  where  $\bar{F}(\cdot)$  is a survival function. [2]



Total No. of Questions : 4]

P851

[5315]-451

T.Y. B.Sc. (Semester - IV)

STATISTICS (Principal) (Paper - V)

ST - 345 (B) : Introduction to Stochastic Processes  
(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

- a) Choose the correct alternative in each of the following: [1 each]
- i) In a Markov chain if all states communicate with each other then it is called
- A) irreducible                      B) reducible  
C) discrete                          D) finite
- ii) Let  $\{N(t), t \geq 0\}$  be a Poisson process with parameter  $\lambda$ . Mean number of occurrences in an interval of length  $t$  is
- A)  $\frac{1}{\lambda}$                                   B)  $\lambda t$   
C)  $\lambda^2 t$                                 D)  $\frac{1}{\lambda t}$
- iii) A persistent state is null persistent if the mean recurrence time is
- A) finite                                B) infinite  
C) 0                                      D) 1



**Q3)** Attempt any two of the following:

**[5 each]**

- a) Explain the periodicity of a state of a Markov Chain with the help of a suitable example.

Check whether state 1 is aperiodic for the following transition probability matrix (P) of a Markov Chain with state space  $s = \{1, 2, 3\}$

$$P = \begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$$

- b) Let  $\{X_n, n \geq 0\}$  be a Markov Chain with state space  $s = \{0, 1, 2, 3, 4\}$  and transition probability matrix is

$$P = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 & 0 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{4} & \frac{1}{4} & 0 & 0 & \frac{1}{2} \end{bmatrix}$$

Show that state 4 is transient.

- c) Explain Gambler's ruin problem.

**Q4)** Attempt any one of the following:

- a) i) A Particle performs a random walk with absorbing barriers 0 & 4. Whenever it is at any position  $r$  ( $0 < r < 4$ ), it moves to  $r + 1$  with probability  $p$  or to  $(r - 1)$  with probability  $q$ , s. t  $p + q = 1$ . But as soon as it reaches 0 or 4 it remains there itself. **[5]**

Let  $X_n$  be position of the particle after  $n$  moves.

Obtain a transition probability matrix of the Markov Chain  $\{X_n\}$ .

Also compute  $P[X_2 = 3 / X_1 = 2]$

- ii) If  $\{N_1(t), t \geq 0\}$  and  $\{N_2(t), t \geq 0\}$  are two independent Poisson processes with parameters  $\lambda_1$  &  $\lambda_2$  respectively, then show that [5]

$$P[N_1(t) = k | N_1(t) + N_2(t) = n] = \binom{n}{k} p^k q^{n-k}$$

$$\text{where } p = \frac{\lambda_1}{\lambda_1 + \lambda_2} \text{ and } q = \frac{\lambda_2}{\lambda_1 + \lambda_2}$$

- b) i) State & Explain postulates of Poisson process. [3]  
ii) Explain closed set of states in M.C. [2]  
iii) Let  $\{X_n, n \geq 0\}$  be a Markov Chain with state space  $s = \{0, 1, 2\}$  with one step transition probability matrix [5]

$$P = \begin{bmatrix} 0.2 & 0.1 & 0.7 \\ 0.5 & 0.3 & 0.2 \\ 0.4 & 0.2 & 0.4 \end{bmatrix}$$

and initial probability distribution  $P[X_0 = i] = \frac{1}{3}$  for  $i = 0, 1, 2$ .

Obtain two step transition probability matrix

compute

- 1)  $P[X_2 = 1 | X_0 = 0]$   
2)  $P[X_2 = 2, X_0 = 0]$



Total No. of Questions : 4]

SEAT No. :

P852

[Total No. of Pages : 4

[5315]-452

T.Y. B.Sc. (Semester IV)

STATISTICS : (Principal) (Paper - VI)

ST - 346 : Statistical Computing Using R Software  
(2013 Pattern) (Batch - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Each question is to be solved using R Software installed on your computer.
- 4) Attach computer printout of your work to the answer book supplied to you.

Q1) Attempt each of the following:

[1 each]

- a) Create a data frame of following data consists names of students and their marks in the exam:

|         |      |         |      |         |
|---------|------|---------|------|---------|
| Richard | Jack | Anthony | Wang | Statham |
| 58      | 52   | 68      | 75   | 42      |

- b) Represent the p.m.f of Binomial distribution with parameters  $n = 6$  and  $p = 0.65$  through a rod plot.
- c) Using for loop obtain sum of first 10 natural numbers.
- d) The following are the measurements of the breaking strength ( $X$ ) (in pounds) of a certain kind of 2-inch cotton ribbon:

163, 165, 160, 189, 161, 171, 158, 151, 169, 162, 163, 139, 172, 165, 148, 166, 172, 163, 187, 173

Test the hypothesis that population median of  $X$  is 160 against it is greater than 160 at 5% level of significance using Wilcoxon signed rank test.

- e) The following data relates to the heights (in cm) of 20 flowers. Create a vector " $h$ " of the heights using scan function. Hence extract the values which are greater than 24.

9, 26, 28, 21, 20, 44, 40, 33, 31, 22, 20, 28, 39, 8, 12, 11, 9, 31, 25, 24

P.T.O.

- f) Calculate quartile deviation for the following set of observations:  
2, 6, 4, 1, 3, 5, 10, 5, 4, 3, 6, 2, 3, 4, 7
- g) Let  $X \sim P(\lambda = 4.5)$ . Find  $P(X = 3)$  and  $P(X \leq 4E(x))$ .
- h) Draw boxplot for the following data on weight (in kg) of 20 school boys:  
41, 50, 47, 38, 45, 47, 31, 35, 41, 52, 57, 62, 49, 48, 45, 35, 37, 49, 39, 41.
- i) Find harmonic mean of following observations:  
63, 79, 70, 55, 42, 37, 67, 29, 36, 74, 36, 68, 58, 30, 60
- j) Draw a random sample of size 8 from hypergeometric distribution with parameters  $N = 28$ ,  $M = 10$  and  $n = 6$ .

**Q2)** Attempt **any two** of the following:

**[5 each]**

- a) Suppose  $X_1, X_2, \dots, X_n$  is a random sample from  $N(\mu = 5, \sigma^2 = 2.5)$  distribution. Verify whether sample mean is consistent for  $\mu$ . Write R program script.
- b) The time in minutes taken to complete a job by machine I and machine II is given below:

|            |    |    |    |    |    |    |    |    |    |
|------------|----|----|----|----|----|----|----|----|----|
| Machine I  | 20 | 16 | 26 | 27 | 23 | 22 | 25 |    |    |
| Machine II | 27 | 33 | 42 | 35 | 32 | 34 | 38 | 29 | 40 |

Using Mann-Whitney test can we conclude that the time taken to complete a job by machine I is less than that in machine II?

- c) Frequency distribution of height (in cms) of number of students is given below:

|                 |         |         |         |         |         |         |
|-----------------|---------|---------|---------|---------|---------|---------|
| Height          | 140-145 | 145-150 | 150-155 | 155-160 | 160-165 | 165-170 |
| No. of students | 4       | 13      | 22      | 45      | 16      | 9       |

Draw histogram and frequency polygon for the above data.

**Q3)** Attempt **any two** of the following:

**[5 each]**

a) Represent the following data by a subdivided bar diagram:

| Cost per vehicle (Rs.) | 2002  | 2003  | 2004  |
|------------------------|-------|-------|-------|
| Raw materials          | 21600 | 26000 | 27000 |
| Labour                 | 5400  | 7000  | 8100  |
| Direct expenses        | 3600  | 3000  | 3500  |
| Office expenses        | 1800  | 2000  | 2700  |
| Factory expenses       | 3600  | 2000  | 3600  |

b) The following data represent the distribution of number of students according to their monthly pocket money (in Rs.)

| Pocket money    | 100-150 | 150-200 | 200-250 | 250-300 | 300-350 | 350-400 |
|-----------------|---------|---------|---------|---------|---------|---------|
| No. of students | 13      | 31      | 47      | 27      | 18      | 5       |

Compute coefficient of skewness based on moments.

c) Fit a Poisson distribution to the following data related to faulty units produced in a single shift in a factory:

| No. of faults | 0 | 1  | 2  | 3  | 4  | 5 | 6 and more |
|---------------|---|----|----|----|----|---|------------|
| No. of shifts | 4 | 14 | 23 | 23 | 18 | 9 | 9          |

Find the expected frequencies. Plot observed and expected frequencies and comment on adequacy of model.

**Q4)** Attempt **any one** of the following:

a) i) A coffee company appoints four salesmen P, Q, R and S and observed their sales (in lakh Rs.) in three districts A, B and C as given below:

| District / Salesman | P  | Q  | R  | S  |
|---------------------|----|----|----|----|
| A                   | 36 | 36 | 21 | 35 |
| B                   | 28 | 29 | 31 | 32 |
| C                   | 26 | 28 | 29 | 29 |

Perform two way analysis of variance by verifying the assumptions. **[6]**

- ii) Two batsmen A and B scored the following runs in ten innings:

|   |     |    |    |    |    |    |    |    |    |    |
|---|-----|----|----|----|----|----|----|----|----|----|
| A | 101 | 27 | 5  | 36 | 82 | 45 | 7  | 13 | 65 | 14 |
| B | 97  | 12 | 40 | 96 | 13 | 8  | 85 | 8  | 56 | 15 |

Who is the more consistent batsman? [4]

- b) i) Following are the data on the time (in mts.) required to fill the bottles by two machines A and B.

|   |     |     |   |     |     |     |     |
|---|-----|-----|---|-----|-----|-----|-----|
| A | 5   | 9   | 7 | 8   | 5.7 | 7.5 | 8.1 |
| B | 7.5 | 3.5 | 8 | 7.5 | 3.9 | 4.5 | 8.1 |

Can we conclude that average time required by two machines is same. Take  $\alpha = 0.05$ . Write R program script. [5]

- ii) A group of 50 girls and 40 boys was asked to give their preference between two brands of mobile hand sets. The results obtained are as follows:

|       | Brand I | Brand II |
|-------|---------|----------|
| Boys  | 23      | 17       |
| Girls | 20      | 30       |

Test at 5% level of significance whether preference of a particular brand is independent of sex. [5]



Total No. of Questions : 4]

SEAT No. :

P853

[Total No. of Pages : 4

**[5315]-452A**  
**T.Y. B.Sc. (Semester IV)**  
**STATISTICS : (Principal) (Paper - VI)**  
**ST - 346 : Statistical Computing Using R Software**  
**(Batch - II) (2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Each question is to be solved using R Software installed on your computer.*
- 4) Attach computer printout of your work to the answer book supplied to you.*

**Q1)** Attempt each of the following:

**[1 each]**

- a) Create a data frame using edit command of item name and its price for 5 items.
- b) Find geometric mean of following observations:  
63, 79, 70, 55, 42, 37, 67, 29, 36, 74, 36, 68, 58, 30, 60
- c) An experiment of tossing a die 50 times gave following results:

|                 |   |   |    |    |   |   |
|-----------------|---|---|----|----|---|---|
| Number appeared | 1 | 2 | 3  | 4  | 5 | 6 |
| Frequency       | 4 | 8 | 13 | 17 | 6 | 2 |

Draw spike plot.

- d) Use Kolmogorov-Smirnov test to test whether the following observations comes from  $U(0, 1)$  distribution:  
0.25, 0.1, 0.3, 0.75, 0.85, 0.9, 0.39, 0.56.
- e) Create a vector Y of following numbers using scan function:  
37, 73, 55, 33, 40, 57, 50, 77, 61, 77  
Using vector Y create vector T containing numbers of Y which are smaller than 55.
- f) Using for loop obtain product of first 10 natural numbers.

**P.T.O.**

- g) A car hire firm has 2 cars. The number of demands for a car on a day has Poisson distribution with mean 1.5. Find the probability that on a day
- neither car is used
  - some demand is not fulfilled.
- h) From the following data find mean deviation about mean :
- 74, 55, 55, 46, 57, 75, 66, 37
- i) Let  $X \sim N(\mu = 3, \sigma^2 = 5)$ . Find  $P(-3 \leq x \leq 5)$ .
- j) Draw stem and leaf plot for the following data on weight (in kg) of 20 school boys:
- 41, 50, 47, 38, 45, 47, 31, 35, 41, 52, 57, 62, 49, 48, 45, 35, 37, 49, 39, 41.

**Q2) Attempt any two of the following:**

**[5 each]**

- a) Suppose  $X_1, X_2, \dots, X_n$  is a random sample from a Poisson distribution with mean 3.2. Verify whether sample mean is consistent for  $m$ . Write R. program script.
- b) Calculate quartile deviation for the following data :

|                 |      |       |       |       |       |       |
|-----------------|------|-------|-------|-------|-------|-------|
| Marks           | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
| No. of students | 10   | 25    | 62    | 26    | 19    | 8     |

- c) Frequency distribution of height (in cms) of number of students is given below:

|                 |         |         |         |         |         |         |
|-----------------|---------|---------|---------|---------|---------|---------|
| Height          | 140-144 | 145-149 | 150-154 | 155-159 | 160-164 | 165-169 |
| No. of students | 4       | 13      | 22      | 45      | 16      | 9       |

Draw less than and more than cumulative frequency curves for the above data.

**Q3)** Attempt **any two** of the following:

**[5 each]**

- a) Fit a normal distribution to the following data:

|           |       |       |       |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Class     | 40-45 | 45-50 | 50-55 | 55-60 | 60-65 | 65-70 | 70-75 | 75-80 |
| Frequency | 3     | 18    | 45    | 62    | 51    | 34    | 9     | 2     |

- b) Following table gives the mode of transport used by employees of a certain company

|                   |      |         |       |     |             |              |
|-------------------|------|---------|-------|-----|-------------|--------------|
| Mode of transport | Walk | Bicycle | Train | Bus | Two-wheeler | Four wheeler |
| No. of employees  | 45   | 60      | 105   | 200 | 380         | 70           |

Represent the above data by pie diagram.

- c) The manufacturer of a certain make of electric tubes claims that the tubes have a minimum mean life of 50 months with a standard deviation of 8 months. A random sample of 8 such tubes gave the following life times (in months):

52, 59, 78, 41, 38, 67, 54, 50

Can we regard the producers claim to be valid at 1% level of significance? Write R program script.

**Q4)** Attempt **any one** of the following:

- a) i) Find AM, GM and HM of the observations given below:

47, 51, 35, 66, 35, 45, 55, 41, 60, 34.

Verify the relation between them.

**[5]**

- ii) Measurements of the fat content of brands of icecream A and B gave the following data:

|   |      |      |      |      |      |
|---|------|------|------|------|------|
| A | 13.5 | 14   | 13.6 | 12.9 | 13   |
| B | 12.1 | 15.5 | 12.4 | 13   | 16.9 |

Test whether the variation of fat contents in both brands is same by verifying the assumptions. Write R program script.

**[5]**

- b) i) The following data represent the number of hours that two different types of scientific pocket calculators operate before a recharge is required:

|              |     |     |     |     |     |     |     |     |     |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Calculator A | 5.5 | 5.6 | 6.3 | 4.6 | 5.3 | 5   | 6.2 | 5.8 | 5.1 |
| Calculator B | 3.8 | 4.8 | 4.3 | 4.2 | 4   | 4.9 | 4.5 | 5.2 | 4.5 |

Use Mann-Whitney test with 1% level of significance to determine if calculator A operates longer than calculator B on a full battery charge. **[4]**

- ii) A farmer applies three types of fertilizers on four separate plots. The figures of yield per acre are given below:

| Fertilizer / Plots | A | B | C  | D |
|--------------------|---|---|----|---|
| Nitrogen           | 6 | 4 | 8  | 6 |
| Potash             | 7 | 6 | 6  | 9 |
| Phosphates         | 8 | 5 | 10 | 9 |

Carry out two way analysis of variance using above data. **[6]**



Total No. of Questions : 4]

SEAT No. :

P854

[Total No. of Pages : 4

**[5315]-452B**  
**T.Y. B.Sc. (Semester - IV)**  
**STATISTICS (Principal) (Paper - VI)**  
**ST - 346 : Statistical Computing Using R Software**  
**(2013 Pattern) (Batch - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Each question is to be solved using R Software installed on your computer.*
- 4) *Attach computer printout of your work to the answer book supplied to you.*

**Q1)** Attempt each of the following:

**[1 each]**

- a) Use Kolmogorov-Smirnov test to test whether the following observations comes from exponential distribution with parameter 5:  
0.132, 0.343, 0.055, 0.086, 0.273, 0.513, 0.016, 0.205, 0.784, 0.071  
Use 5% level of significance.
- b) Let  $X \sim \text{Poisson}(m)$  such that  $P(X = 0) = P(X = 1)$ . Find  $P(X > 2)$ .
- c) Using following data compute quartile deviation:  
70, 43, 56, 36, 53, 71, 74, 35, 75, 49
- d) Create a data frame of seven days in a week showing maximum temperature ( $^{\circ}\text{C}$ ) on that day.
- e) Create a vector Z of following numbers using scan function  
34, 93, 46, 69, 220, 113, 297, 1196, 200, 364, 123, 12, 139, 21,98  
Using vector Z create vector T containing numbers of Z which are less than 100.
- f) Find mode of following observations:  
63, 79, 70, 55, 42, 37, 67, 29, 36, 74, 36, 55, 55, 30, 60
- g) Using for loop find factorial 10.

**P.T.O.**

- h) Draw box plot of following observations:  
2.50, 15.98, -34.93, -20.93, 20.68, -0.69, 35.61, 45.67, -31.13, -49.60
- i) Draw a random sample of size 8 from  $N(\mu = 4, \sigma^2 = 5.8)$  distribution.
- j) Represent the p.m.f of Poisson distribution with parameters  $m = 4$  through a rod plot.

**Q2) Attempt any two of the following: [5 each]**

- a) Frequency distribution of height (in cms) of number of students is given below:

|                 |         |         |         |         |         |         |
|-----------------|---------|---------|---------|---------|---------|---------|
| Height          | 140-144 | 145-149 | 150-154 | 155-159 | 160-164 | 165-169 |
| No. of students | 4       | 13      | 22      | 45      | 16      | 9       |

Calculate mean deviation about mean for the above data.

- b) Find AM, GM and HM of the observations given below:

23 ,11 ,11 ,24 ,21 ,21 ,22, 20, 10, 20.

Verify the relation between them.

- c) Suppose  $X_1, X_2, \dots, X_n$  is a random sample from a  $N(\mu = 2.5, \sigma^2 = 4)$  distribution. Verify whether sample mean is consistent for  $\mu$ . Write R program script.

**Q3) Attempt any two of the following: [5 each]**

- a) Fit a Poisson distribution to the following data:

|           |    |    |    |    |    |   |   |
|-----------|----|----|----|----|----|---|---|
| x         | 0  | 1  | 2  | 3  | 4  | 5 | 6 |
| Frequency | 93 | 67 | 50 | 30 | 16 | 5 | 2 |

Also, plot observed and expected frequencies and comment on adequacy of model.

- b) Frequency distribution of marks in Marathi obtained by the students is given below:

|                 |      |       |       |       |       |       |       |
|-----------------|------|-------|-------|-------|-------|-------|-------|
| Marks           | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
| No. of students | 1    | 14    | 22    | 40    | 31    | 9     | 3     |

Calculate Bowleys coefficient of skewness.

- c) Following are the data on the time (in mts.) required to fill the bottles by two machines A and B.

|   |     |     |   |     |     |     |     |
|---|-----|-----|---|-----|-----|-----|-----|
| A | 5   | 9   | 7 | 8   | 5.7 | 7.5 | 8.1 |
| B | 7.5 | 3.5 | 8 | 7.5 | 3.9 | 4.5 | 8.1 |

Can we conclude that average time required by two machines is same. Take  $\alpha = 0.05$ . Write R program script.

**Q4)** Attempt **any one** of the following:

- a) i) The following data represent the number of hours that two different types of scientific pocket calculators operate before a recharge is required: [5]

|              |     |     |     |     |     |     |     |     |     |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Calculator A | 5.5 | 5.6 | 6.3 | 4.6 | 5.3 | 5   | 6.2 | 5.8 | 5.1 |
| Calculator B | 3.8 | 4.8 | 4.3 | 4.2 | 4   | 4.9 | 4.5 | 5.2 | 4.5 |

Use Mann-Whitney test with 1% level of significance to determine if calculator A operates longer than calculator B on a full battery charge.

- ii) Represent the following data by a multiple bar diagram: [5]

|                        |       |       |       |
|------------------------|-------|-------|-------|
| Cost per vehicle (Rs.) | 2002  | 2003  | 2004  |
| Raw materials          | 21600 | 26000 | 27000 |
| Labour                 | 5400  | 7000  | 8100  |
| Direct expenses        | 3600  | 3000  | 3500  |
| Office expenses        | 1800  | 2000  | 2700  |
| Factory expenses       | 3600  | 2000  | 3600  |

- b) i) For the following data draw histogram and frequency polygon: [4]

|                 |      |       |       |       |       |       |
|-----------------|------|-------|-------|-------|-------|-------|
| Marks           | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
| No. of students | 10   | 25    | 62    | 26    | 19    | 8     |

- ii) Three processors A, B and C are tested to see whether their outputs are equivalent. The following observations of output are obtained:

|   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| A | 12 | 8  | 17 | 14 | 13 | 10 | 11 |
| B | 13 | 16 | 15 | 12 | 9  |    |    |
| C | 9  | 10 | 18 | 17 | 16 | 12 |    |

Carry out the analysis of variance using above data by verifying the assumptions. [6]



Total No. of Questions : 4]

SEAT No. :

P855

[Total No. of Pages : 4

**[5315]-452(C)**  
**T.Y. B.Sc. (Semester - IV)**  
**STATISTICS : (Principal) (Paper - VI)**  
**ST - 346 : Statistical Computing Using R Software**  
**(2013 Pattern) (Batch - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Attempt each of the following:

**[1 each]**

- a) Let  $X \rightarrow C(3,2)$  find  $P(3 \leq X < 4)$ .
- b) Draw a rodplot for the following data  
68, 44, 25, 68, 75, 72, 83, 88, 40, 25, 68, 44.
- c) Create a vector X of the following observations by using scan function  
28, 50, 30, 48, 39, 25, 28.
- d) Find mean & median of the following observations.  
23, 15, 20, 18, 32, 30, 35, 20, 18, 50, 19, 20.
- e) Let  $X \rightarrow N(\mu = 5, \sigma^2 = 9)$ .  
Find K such that  $P(7 < X < K) = 0.3$ .
- f) Draw a box plot of the following data  
5, 10, 23, 28, 50, 27, 18, 98, 10, 18, 25, 28.
- g) Create a data frame of name of 6 students & their favourite colour using edit command.
- h) Draw a random sample of size 10 from Poisson distribution with  $m = 8$ .

**P.T.O.**

- i) Write R - program script for computing value of factorial 10 using a for loop.
- j) Create a file in MS-Excel containing number of students from Arts, Commerce & Science faculty in the year 2010, 2012 respectively & save it as text file. Import this text file in R.

**Q2)** Attempt any two of the following:

**[5 each]**

- a) Draw Histogram & frequency polygon for the following data :

| Length (in cms) | Number of rods |
|-----------------|----------------|
| 0 - 5           | 2              |
| 5 - 10          | 7              |
| 10 - 15         | 18             |
| 15 - 20         | 30             |
| 20 - 25         | 41             |
| 25 - 30         | 6              |

- b) The following are the lengths of time (in minutes) spent in the operating room by 20 patients undergoing the same operative procedure.

Hospital A : 25 20 23 29 31 19 20 26 35 37 30

Hospital B : 35 48 32 40 50 30 31 46 51

From above data, can we conclude that, for the same operative procedure, patients in Hospital B tend to be in the operating room longer than patients in hospital A?

Use Mann - Whitney test, Use  $\alpha = 0.01$ .

- c) Measurements of the fat content of brands of ice-cream A & B gave the following sample data :

A: 12.8 13 13.8 12.9 14

B: 12.1 15.4 15 12.8 16.9

Test whether the variation of fat contents in both brands are same. Write R-program in script to check normality of samples A & sample B. & then carry out the F-test for equality of variances.

**Q3)** Attempt any two of the following:

**[5 each]**

- a) Fit a Poisson distribution to the following data & find expected frequencies. Plot observed & expected frequencies & comment on adequacy of the model :

|                     |     |    |    |   |   |   |
|---------------------|-----|----|----|---|---|---|
| Number of misprints | 0   | 1  | 2  | 3 | 4 | 5 |
| No. of pages        | 139 | 76 | 28 | 4 | 2 | 1 |

- b) Calculate Bowley's coefficient of skewness for the following data :

|                   |        |         |         |         |         |
|-------------------|--------|---------|---------|---------|---------|
| Age group         | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 |
| Number of persons | 15     | 20      | 35      | 15      | 8       |

- c) A Tea Company appoints four salesmen P, Q, R & S and observes their sales in three seasons Summer, Winter & Monsoon.

The figures (in lakhs) of sales are given in the following table :

| Season  | Salesmen |    |    |    |
|---------|----------|----|----|----|
|         | P        | Q  | R  | S  |
| Summer  | 36       | 35 | 20 | 34 |
| Winter  | 27       | 30 | 30 | 33 |
| Monsoon | 28       | 30 | 27 | 29 |

- i) Do the salesmen significantly differ in performance?  
ii) Is there significant difference between the seasons?  
(Use Two way ANOVA)

**Q4)** Attempt any one of the following:

- a) i) Draw a probability curve of Weibull distribution with shape parameter 1.5 & scale parameter 2. **[3]**  
ii) Following data represents information regarding favourite colour of 400 school boys & girls. **[5]**

| Gender \ Colour | Blue | Yellow | Pink |
|-----------------|------|--------|------|
|                 | Boy  | 80     | 70   |
| Girl            | 50   | 40     | 120  |

Test whether the attributes Gender & Favourite colour are independent using Chi - Square test for independence.

(Use  $\alpha = 0.05$ )

- iii) The times to failure (in hours) of 10 randomly selected 9-volt transistor batteries of a certain brand were recorded as follows :[2]

25, 28.7, 48.6, 45, 44.8, 50, 51.5, 54.5, 45.8, 44.8

Test the hypothesis that the failure times are exponentially distributed with mean 42 hours at 5% l.o.s. (Use Kolmogorov - Smirnov test)

- b) i) The following are the measurements of the breaking strength (X) in pounds of a certain kind of 2 - inch cotton ribbon : [5]

163, 165, 160, 189, 161, 171, 158, 151, 169, 153, 139, 170, 166, 152, 183, 163, 150, 152, 150, 149.

Test the null hypothesis that population median of X is 150 against the alternative that it is greater than 150 at  $\alpha = 0.05$  using Wilcoxon signed rank test.

- ii) Suppose  $X_1, X_2, \dots, X_n$  is a random sample from a  $N(\mu = 3, \sigma^2 = 16)$  distribution.

Verify whether sample mean is consistent for  $\mu$ . Write R program script. [5]



Total No. of Questions : 4]

SEAT No. :

**P856**

[Total No. of Pages : 2

**[5315]-453**

**T.Y. B.Sc**

**GEOGRAPHY**

**Gg. 341: FUNDAMENTALS OF HUMAN GEOGRAPHY**

**(2013 Pattern) (Semester - IV) (Paper - II) (Part - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

**Q1)** Answer the following questions in one or two sentences (any ten): **[10]**

- a) Define urbanisation.
- b) Give any two examples of conurbation.
- c) Define Gini coefficient.
- d) Names the types of age-sex pyramids.
- e) Define balance of payments.
- f) Name the continent with maximum proportion of urban population.
- g) List various criteria used to define a town.
- h) State any two demographic factors affecting urbanization.
- i) Name the largest megacity in China.
- j) Name the major crop grown under extensive agriculture in North America.
- k) Name the areas of intensive agriculture in India.
- l) Name the areas of plantation agriculture in the world.
- m) Who developed the 'Demographic Transition Model.

**Q2)** Write short notes (any two): **[10]**

- a) Lorenz curve
- b) Plantation Agriculture.

**P.T.O**

- c) Measurement of active population.
- d) International trade.

**Q3)** Answer the following questions in 100 words (any two): **[10]**

- a) Explain Weber's theory of industrial location.
- b) Describe the Demographic Transition Model.
- c) Explain Von Thunen's theory of agricultural landuse.
- d) Discuss the factors affecting trade.

**Q4)** Answer the following questions in 200 words (any one): **[10]**

Explain Malthus' theory of population growth.

OR

Explain the network indices for transport network analysis.



Total No. of Questions : 4]

SEAT No. :

**P857**

[Total No. of Pages : 2

**[5315]-454**

**T.Y. B.Sc**

**Gg. 342: GEOGRAPHY OF TRAVEL & TOURISM (Part - II)  
(2013 Pattern) (Semester - IV) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicates full marks.*
- 3) Draw neat diagrams and sketches wherever necessary.*
- 4) Use of map stencils is allowed.*

**Q1)** Answer the following questions in one or two sentences (any ten): **[10]**

- a) Define cultural tourism.
- b) What is eco tourism?
- c) Name any two UNESCO world Heritage sites in Tamil Nadu.
- d) In which State is the Great Himalayan National park located.
- e) What is meant by multiplier effect of tourism?
- f) Name any two hill stations in Uttarakhand.
- g) Name any two luxury trains in India exclusively for the purpose of tourism
- h) Name any two beaches in Kerala.
- i) Name any two mountain railways of India in the rugged hill regions of Himalayas.
- j) State any two impacts of tourism on language.
- k) In which State is Manas wildlife sanctuary located?
- l) In which city is Sri Harmandir Sahib located.
- m) Name any two hill forts of Rajasthan which are under UNESCO world heritage sites.

**P.T.O**

**Q2) Write short notes (any two):** **[10]**

- a) Caravan tourism
- b) Houseboats in India
- c) Sustainable Tourism development
- d) IRTC web portal

**Q3) Answer the following questions in 100 words (any two):** **[10]**

- a) Describe the impacts of tourism on health giving suitable examples.
- b) Explain the importance of road transport in development of tourism in India.
- c) Explain the different types of expenditures giving suitable examples.
- d) Explain the impact of tourism on balance of payment of the country.

**Q4) Answer the following questions in 200 words (any one):** **[10]**

- a) Explain the social and cultural impacts of tourism by giving suitable examples.

OR

- b) Describe the importance of National parks in tourism with reference to Jim corbett and Kaxiranga National park.



Total No. of Questions : 4]

SEAT No. :

**P858**

[Total No. of Pages : 2

**[5315]-455**

**T.Y. B.Sc**

**GEOGRAPHY**

**Gg. 343: Fundamentals of Geo-informatics (Part -II)**

**(2013 Pattern) (Semester - IV) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Diagrams and maps must be drawn wherever necessary.*
- 4) Use of map stencils is allowed.*

**Q1)** Answer the following questions in two or three sentences (any ten): **[10]**

- a) Define GIS.
- b) Mention any two types of data input in GIS.
- c) Define the term 'Topology'.
- d) What is a TIN?
- e) Define spatial analysis in GIS.
- f) Define contiguity.
- g) What is a DTM?
- h) What is a non-spatial query?
- i) What is a GPS?
- j) Give any two uses of GPS.
- k) When is merge analysis used?
- l) What is edge-matching?
- m) What is a space segment of GPS?

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- Q2)** Write short notes (any two): **[10]**
- a) Locational errors
  - b) Buffer analysis
  - c) Scan map as an input in GIS
  - d) Accuracy factors of GPS

- Q3)** Answer the following questions in 100 words (any two): **[10]**
- a) Explain overlay analysis.
  - b) Describe topological errors.
  - c) Explain the types of spatial queries in GIS.
  - d) Discuss recent trends in GIS.

- Q4)** Answer the following questions in 200 words (any one): **[10]**
- a) Explain in detail various types of data input in GIS.
  - b) Give an account of topographic analysis in GIS.



Total No. of Questions : 4]

SEAT No. :

**P859**

[Total No. of Pages : 2

**[5315]-456**  
**T.Y. B.Sc**  
**GEOGRAPHY (Part - II)**  
**Gg. 344 : Geography of India**  
**(Semester - IV) (Paper - VIII)**  
**(2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Diagrams and maps must be drawn wherever necessary.*
- 4) Use of map stencils is allowed.*

**Q1)** Answer the following questions in two or three sentences (any ten): **[10]**

- a) What do you mean by non-conventional resources?
- b) State any two states with highest bauxite production in India.
- c) Mention any two disadvantages of atomic energy.
- d) What do you mean by white revolution?
- e) Define horticulture.
- f) What do you understand by population composition?
- g) Name any two states with lowest sex ratio.
- h) Define overpopulation.
- i) What do you mean by regional planning?
- j) State any two needs of regional planning.
- k) Define natural hazards.
- l) State any two effects of floods.
- m) Name any two areas affected by cloud burst in India.

**P.T.O**

**Q2) Write short notes (any two):** **[10]**

- a) Non-conventional energy resources.
- b) Remedies on overpopulation.
- c) Blue revolution.
- d) Objectives of regional planning.

**Q3) Answer the following questions in 100 words (any two):** **[10]**

- a) Explain the distribution of coal reserves in India.
- b) Discuss the significance of horticulture in India.
- c) Explain the suicides of farmers in Maharashtra.
- d) Explain the advantages of wind energy.

**Q4) Answer the following questions in 200 words (any one):** **[10]**

- a) Describe the merits and demerits of hydroelectricity in India.

OR

- b) Discuss the causes and effects of droughts in India.



Total No. of Questions : 4]

SEAT No. :

**P860**

[Total No. of Pages : 2

**[5315]-457**

**T.Y. B.Sc.**

**GEOGRAPHY**

**Gg. 345: Geography of Soils (Part - II) (Semester - IV)  
(2013 Pattern) (Paper - X)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Diagrams and maps must be drawn wherever necessary.*
- 4) Use of map stencils is allowed.*

**Q1)** Answer the following questions in two or three sentences. (any 10) **[10]**

- a) Define 'Soil Colloids'.
- b) Define 'Soil taxonomy'.
- c) Name any two soil survey methods.
- d) Define gully erosion.
- e) Write two characteristics of acidic soils.
- f) Name any two secondary minerals.
- g) Mention any two soil nutrients.
- h) What is neutral soil?
- i) Define soil pH.
- j) What is C:N ratio?
- k) What is transformation processes?
- l) Write two sources of organic material.
- m) Define organic carbon.

**P.T.O**

- Q2)** Write short note (any two) **[10]**
- a) Chemical weathering
  - b) Bench mark soil
  - c) Types of organic colloids
  - d) Irrigation techniques

- Q3)** Answer the following questions in 100 words (any two) **[10]**
- a) Write different agents of soil erosion.
  - b) Write the importance of soil Humus.
  - c) Discuss the 'P' factor in the USLE.
  - d) Write soil erosion types and suggest measurement techniques.

- Q4)** Answer the following questions in 200 words (any one) **[10]**
- a) Write soil classification of Maharashtra.
  - b) Explain land capability classification with suitable examples.



Total No. of Questions : 4]

SEAT No. :

P862

[Total No. of Pages : 2

[5315]-459

T.Y. B.Sc. (Semester - IV)

MICROBIOLOGY

MB - 341 : Medical Microbiology - II

(2013 Pattern) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) All questions carry equal marks.
- 3) Draw neat labelled diagrams wherever necessary.

Q1) Attempt the following :

A) Match the following :

[5]

I

II

i) Rifamycin

a) Lentivirus

ii) Zidovudin

b) Reoviridae

iii) HIV

c) Bird faeces

iv) Rotavirus

d) AZT

v) Cryptococcus

e) RNA polymerase

B) State True or False :

[2]

i) MIC is always greater than MBC.

ii) FMD is zoonotic disease.

C) Fill in the blanks :

[3]

i) Diploid cell lines used for virus cultivation are prepared from tissues of \_\_\_\_\_ origin.

ii) Two hosts for plasmodium are \_\_\_\_\_ & \_\_\_\_\_

iii) \_\_\_\_\_ is amount of chemotherapeutic agent killing half of the population of experimental animals.

P.T.O.

**Q2)** Attempt any two of the following : **[10]**

- a) Diagrammatically explain life cycle of Giardia lamblia.
- b) Write a note on antibiotic misuse.
- c) Describe pathogenesis & lab diagnosis of Rinderpest.

**Q3)** Write short notes on any two of the following : **[10]**

- a) Structure of Rabies virus.
- b) Dermatomycosis.
- c) Mode of action of Trimethoprim.

**Q4)** Attempt any one of the following : **[10]**

- a) Enlist various mechanisms of drug resistance & describe any two mechanisms in detail.
- b) Describe pathogenesis and clinical features of poliomyelitis.



Total No. of Questions : 4]

SEAT No. :

**P863**

[Total No. of Pages : 3

**[5315]-460**

**T.Y. B.Sc. (Semester - IV)**

**MICROBIOLOGY**

**MB - 342 : Genetics and Molecular Biology - II**

**(2013 Pattern) (Semester - IV) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Draw neat labelled diagrams wherever necessary.*

**Q1) A)** Select the correct answer from the given options.

**[10]**

- a) Interrupted mating experiment was carried out by \_\_\_\_\_
  - i) Lederberg & Tatum
  - ii) Smith & Nathans
  - iii) Jacob & Wallman
  - iv) Kornberg
- b)  $\lambda$ dg is formed in \_\_\_\_\_
  - i) Conjugation
  - ii) Generalized transduction
  - iii) Specialized transduction
  - iv) Transformation
- c) Base excision repair is mediated by \_\_\_\_\_
  - i) Oxidase
  - ii) Glycosylase
  - iii) Catalase
  - iv) Amylase

**P.T.O.**

- d) Certain sites in genome of  $T_4$  phage, highly prone to mutation observed in rII mutants are called \_\_\_\_\_
- i) Hot Spots
  - ii) Transitions
  - iii) Deletions
  - iv) Transversions.
- e) E. Coli DNA ligase requires \_\_\_\_\_ as co factor.
- i) ATP
  - ii)  $NAD^+$
  - iii) CTP
  - iv) GTP
- B) State true or false.
- a) Genetic recombination is one of the mechanisms leading to evolution.
  - b) Amber mutant of  $T_4$  phage is formed due to missense type of mutation.
  - c) Name the artificially constructed plasmid, widely used in r-DNA technology developed in Bolivar's laboratory.
  - d) What is c - DNA? Name the key enzyme used for c-DNA preparation.
  - e) Define the term 'Clone'.

**Q2) Attempt any two of the following : [10]**

- a) Diagrammatically represent generalized transduction in bacteria.
- b) Explain with suitable examples, damage of DNA by hydrolysis and deamination.
- c) With suitable diagram, explain the process of conjugation in Hfr and  $F^-$  strains of E. Coli.

**Q3)** Attempt any two of the following : **[10]**

- a) With suitable diagram, explain transformation in Gram Positive Bacteria.
- b) Explain the mechanism of translesion DNA synthesis.
- c) With suitable example, explain the use of plasmids as vectors in r-DNA technology.

**Q4)** Attempt any one of the following : **[10]**

- a) Explain the method of construction of c-DNA library. What are the advantages of it?
- b) Explain the following mutants of bacteriophages.
  - i) Plaque morphology mutants.
  - ii) Conditional lethal mutants.



Total No. of Questions : 4]

SEAT No. :

**P864**

[Total No. of Pages : 2

**[5315]-461**

**T.Y. B.Sc. (Semester - IV)**

**MICROBIOLOGY**

**MB - 343 : Metabolism**

**(2013 Pattern) (Paper - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Draw neat labelled diagrams wherever necessary.*

**Q1) A) Attempt the following : [5]**

a) Define :

i) Antiport

ii) Free energy

b) List any two enzymes of cellulose degradation.

c) State True or False

Hypotonicity is due to high solute concentration outside the cell.

d) What is Group translocation?

**B) Match the following : [5]**

a) NADH

i) Green bacteria

b) NAG

ii) Complex I

c) FADH<sub>2</sub>

iii) Purple bacteria

d) Chromatium

iv) Monomer of peptidoglycas

e) Chlorobium

v) Complex II

**P.T.O.**

**Q2)** Attempt any two of the following : **[10]**

- a) Describe urea cycle.
- b) Diagrammatically represent Noncyclic photophosphorylation.
- c) Define passive transport and comment on facilitated transport.

**Q3)** Write short note on any two : **[10]**

- a) Pathway of phospholipid synthesis
- b) Structure of ATP synthase
- c) Carboxylation phase of calvin cycle

**Q4)** Attempt any one **[10]**

- a) Explain steps in glycogen synthesis.
- b) What are high energy compounds? Explain with suitable example how Acyl phosphates are high energy compounds.



Total No. of Questions : 4]

SEAT No. :

**P865**

[Total No. of Pages : 2

**[5315]-462**

**T.Y. B.Sc. (Semester - IV)**

**MICROBIOLOGY**

**MB - 344 : Immunology - II (Paper - IV)**

**(2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

**Q1) A) Match the following :**

**[5]**

- |                                |                         |
|--------------------------------|-------------------------|
| a) Salk vaccine                | i) Rabies               |
| b) Sabin vaccine               | ii) Tuber culosis       |
| c) BCG                         | iii) Live polio vaccine |
| d) Human immuno gamma globulin | iv) Snake bite          |
| e) Horse antivenom serum       | v) Killed polio vaccine |

**B) Fill in the blanks by using correct option.**

**[2]**

- a) When Anti A, Anti B and Anti H antibodies are present in the serum of the person's blood, the blood group is \_\_\_\_\_.
- |             |       |
|-------------|-------|
| i) AB       | ii) A |
| iii) Bombay | iv) O |
- b) Organization of MHC in humans is called \_\_\_\_\_.
- |                  |                 |
|------------------|-----------------|
| i) H-2 complex   | ii) HLA complex |
| iii) MLA complex | iv) D-2 complex |

**P.T.O.**

- C) Attempt the following : [3]
- a) State true or false :
- i) Type II hypersensitivity can be induced by penicillin.
  - ii) 'B' Rh negative person can donate the blood to 'B' Rh positive person.
- b) Define : Antibody avidity.

**Q2)** Attempt any two of the following : [10]

- a) Illustrate diagrammatically : Solid phase RIA
- b) Describe the structure and functions of MHC II.
- c) Elaborate on : Inheritance of ABH antigens.

**Q3)** Write short note (any two) : [10]

- a) Biochemistry of ABH substances
- b) Interferons
- c) Application of monoclonal antibodies.

**Q4)** Attempt any one. [10]

- a) Write comparative account of type I, II, III and IV hypersensitivity reactions.
- b) What are precipitation reactions? Explain ouchterlony and immunoelectrophoresis in brief.



Total No. of Questions : 4]

SEAT No. :

P 866

[Total No. of Pages : 2

[5315] - 463

**T.Y. B.Sc. MICROBIOLOGY (Semester - IV)**

**MB - 345 : Fermentation Technology -II**

**(2013 Pattern) (Paper - V)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat, labelled diagrams wherever necessary.*

**Q1)** Attempt the following:

a) Define: **[04]**

- i) SSF
- ii) Fermentation
- iii) Spawn
- iv) Immune Sera

b) Fill in the blanks. **[03]**

- i) Cortisolone biotrans formation to hydrocortisone is carried out by \_\_\_\_\_.
- ii) Botanical name of button mushroom is \_\_\_\_\_.
- iii) Immune sera is \_\_\_\_\_ and \_\_\_\_\_ type.

**P.T.O.**

- c) State True or False: [03]
- i) Production of steroids by microorganisms is not a fermentation process.
  - ii) Mushrooms are the fruiting bodies of basidiomycetes fungi.
  - iii) Antibiotic serum combat toxic metabolites of microbes.

- Q2)** Attempt any two : [10]
- a) Enlist the commercial applications of amylases. Describe briefly the production process of bacterial amylase.
  - b) Briefly describe the production process of white wine.
  - c) Enlist the commercial uses of citric acid. Explain the recovery of citric acid from the fermented broth.

- Q3)** Write short notes (any two) : [10]
- a) Production of oral polio vaccine
  - b) Bakers yeast production
  - c) Production of 'cheddar' cheese

- Q4)** Attempt any one: [10]
- a) Describe production of vinegar by 'Quick Vinegar Process.'
  - b) Describe the chemical changes occurring in a typical penicillin fermentation. Add a note on semisynthetic penicillins.



Total No. of Questions : 4]

SEAT No. :

P 867

[Total No. of Pages : 2

[5315] - 464

**T.Y. B.Sc. (MICROBIOLOGY) (Semester - IV)**  
**MB - 346 : Agricultural And Environmental Microbiology**  
**(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

**Q1)** Attempt the following:

- a) Define : Biosorption [1]
- b) What is Bioterrorism? [1]
- c) Write two applications of bioaugmentation [1]
- d) State true or false: [2]
  - i) Nitrogenase enzyme reduces other substrater besides nitrogen.
  - ii) Hillside leaching method is used for copper leaching.
- e) What is Heap leaching? [1]
- f) Write an example of iron chelates. [1]
- g) Enlist any two applications of nanoparticles produced by microorganisms. [1]
- h) Write two applications of biochips. [1]
- i) Write an advantage of bioleaching [1]

**P.T.O.**

**Q2)** Write short notes on any two : **[10]**

- a) Phosphate solubilization with respect to biofertilizers.
- b) Eradication as a method of plant disease control.
- c) Biofuel cells and biodegradable plastics.

**Q3)** Attempt any two : **[10]**

- a) Diagrammatically illustrate the mechanism of electron flow during nitrogen reduction.
- b) Bioleaching of gold and silver.
- c) Describe applications of Biosensors.

**Q4)** Attempt any one : **[10]**

- a) Describe the biological control of plant diseases with examples.
- b) Explain the role of plants and microbes in bioremediation of heavy metals.



Total No. of Questions : 4]

SEAT No. :

**P868**

[Total No. of Pages : 2

**[5315] - 465**

**T.Y. B.Sc. (ELECTRONIC SCIENCE) (Semester - IV)**

**EL - 341 : Advanced Communication Systems**

**(2013 Pattern) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*

**Q1)** Attempt all of the following:

- a) State one application of vocoder. [1]
- b) Define Directive gain of an antenna. [1]
- c) Give the types of A.M. transmitters. [1]
- d) Write two features of low noise amplifier. [1]
- e) Write different types of filters used in filter method of suppression of side band. [2]
- f) List applications of Doppler Radar. [2]
- g) Write different blocks of Deltamodulator. [2]
- h) Calculate critical frequency of E-layer of Ionosphere, if  $muf = 3\text{MHz}$  and angle of incidence is  $0^\circ$ . [2]

**Q2)** Attempt any two of the following:

- a) Discuss tropospheric scatter propagation. [4]
- b) Explain phase modulation using phase locked loop. [4]
- c) Draw the block diagram of PCM transmitter and explain its working. [4]

**P.T.O.**

**Q3)** Attempt any two of the following:

- a) Explain construction of rhombic antenna. Draw its radiation pattern. **[4]**
- b) Draw block diagram of Delta modulator and explain it. **[4]**
- c) Explain working of frequency stabilized reactance FM transmitter with suitable block diagram. **[4]**

**Q4)** Attempt any two of the following:

- a) With the help of block diagram, Explain working of Armstrong method of FM generation. **[6]**
- b) With the help of block diagram, Explain working of simple Doppler Radar. Write its advantages. **[6]**
- c) Describe working of balanced modulator using FETs. **[6]**



Total No. of Questions : 4]

SEAT No. :

**P869**

[Total No. of Pages : 2

**[5315] - 466**

**T.Y. B.Sc. (Electronic Science) (Semester - IV)**

**EL - 342 : Microcontroller And Its Applications**

**(2013 Pattern) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt all of the following:

- a) State which data type would you use to represent a temperature. [1]
- b) What is the function of TMOD register in 8051  $\mu$ C? [1]
- c) Which timer of 8051  $\mu$ C is used to set the baud rate? [1]
- d) Which register of 8051 is used to enable / disable the interrupts? [1]
- e) With XTAL = 11.0592 MHz, find the TH1 value needed to have 9600 baud rate . [2]
- f) What is RTC ? Where it is used? [2]
- g) Give the ROM and RAM size in PIC 18F4580 microcontroller. [2]
- h) Write the instruction to load 85H into WREG register of PIC microcontroller. [2]

**Q2)** Attempt Any Two of the following:

- a) State the major reasons for writing programs in embedded C instead of assembly. [4]
- b) Write the steps through which 8051 $\mu$ C goes upon activation of an interrupt. [4]
- c) Explain PIC 18 status register format. [4]

**P.T.O.**

**Q3)** Attempt any two of the following:

- a) Explain the factors that affect the accuracy of time delay using a for loop. [4]
- b) Draw and explain an interface diagram of LCD to 8051. [4]
- c) Draw a simplified view of a PIC microcontroller. [4]

**Q4)** Attempt any two of the following:

- a) Write a note on interrupt priority in 8051 $\mu$ C. [6]
- b) Interface DAC0808 to 8051 $\mu$ C & write a C program to generate square waveform. [6]
- c) Interface a stepper motor to 8051 $\mu$ C and write a C program to rotate the motor in clockwise direction. [6]

OR

Attempt all of the following:

- a) Write an 8051 C program to send values of -4 to +4 to port P1. [4]
- b) Write an 8051 C program to convert 11111101 (FDhex) to decimal and display the digits on P0,P1, and P2. [4]
- c) Write an 8051 C program to transfer the letter "A" serially at 4800 baud continuously. Use 8-bit data and 1 stop bit. [4]



Total No. of Questions : 4]

SEAT No. :

P870

[Total No. of Pages : 2

[5315] - 467

T.Y. B.Sc.

**ELECTRONIC SCIENCE (Semester - IV)**

**EL - 343 : Power Electronics**

**(2013 Pattern) (Paper - III)**

*Time :2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*

**Q1)** Attempt all of the following:

- a) State the names of any two power electronic circuits. [1]
- b) Sketch the out put characteristics of triac. [1]
- c) Draw the out put wave form of full wave controlled rectifier for firing angle of SCR at  $90^\circ$ . [1]
- d) State the type of UPS used for critical load. [1]
- e) "SCR requires dv/dt protection". Comment. [2]
- f) "The output of full bridge Inverter with resistive load is square wave" comment. [2]
- g) "Diode connected in antiparallel to Inducter coil is called as free whelling diode". Comment. [2]
- h) "Class-B chopper works in regnerative breaking mode". Comment. [2]

**Q2)** Attempt any two of the following:

- a) With the help of RLE load, explain the working of class - A chopper. [4]
- b) Explain the working of Half Bridge Inverter with Resistive load and sketch the output wave form accross the load resistance. [4]

**P.T.O.**

- c) With the help of neat diagram explain the working of Fly Back type SMPS. [4]

**Q3)** Attempt any two of the following:

- a) Draw the circuit diagram of switching Buck regulator and explain the working. Write the equation for output voltage and duty cycle. [4]
- b) Sketch the output characteristics of all choppers indicating motoring mode and regenerative mode. [4]
- c) State the names of different methods used to turn on SCR. Which method is widely used. [4]

**Q4)** Attempt any two of the following:

- a) Draw the block diagram of ONLINE UPS and explain the working of each block. state any two parameters of UPS. [6]
- b) Explain the working of PVT as relaxation oscillator. Write the equation for charging time of capacitor. [6]
- c) Explain the working at single phase Half Wave controlled rectifier. sketch the wave form across load resistance and SCR with reference to Input signal for  $45^\circ$  firing angle of SCR. [6]

**OR**

- a) In a step down DC converter the resistive load is  $R = 200\Omega$  and Input source voltage is 200 Volt. Calculate the average out put Voltage across load and input power feed to load of converter. Consider chopping frequency as 2 KH<sub>z</sub> and Duty cycle 50%
- b) If source voltage  $V_s = 100v$ ,  $R_s = 10\Omega$  and  $dv/dt = V/\mu s$ . Calculate the value of capacitor  $C_s$  in snubber circuit.
- c) If the secondary voltage of transformer is  $400 \sin \omega t$  and it is feed to single phase Half wave rectifier having firing angle of SCR at  $30^\circ$ . Calculate average load voltage and RMS load voltage.



Total No. of Questions : 4]

SEAT No. :

P871

[Total No. of Pages : 3

[5315] -468

T.Y.B.Sc.

ELECTRONIC SCIENCE

EL - 344 : Foundation of Nano Electronics

(2013 Pattern) (Paper - IV) (Semester - IV)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Use of calculator is allowed.

Given : i) Mass of electron,  $m_e = 9.1 \times 10^{-31}$  kg  
ii) Planck's constant,  $h = 6.625 \times 10^{-34}$  J.S.  
iii) Charge on electron  $e = 1.6 \times 10^{-19}$  C.

Q1) Attempt all of the following :

- a) Write an expression for equation of continuity. [1]
- b) What is tunneling effect? [1]
- c) What is Gaussian Distribution? [1]
- d) Define Lithography. [1]
- e) Write Schrodinger's time independent equation. [2]
- f) Define cyclotron frequency and write its expression. [2]
- g) What is density of states of electrons? [2]
- h) What is bottom up approach in nanoelectronics? [2]

P.T.O.

**Q2)** Attempt any two of the following :

- a) Write a note on electron transport in quantum wire. [4]
- b) Explain maxwell - boltzmann statistics. [4]
- c) Obtain an expression for wave equation for E in conducting medium? [4]

**Q3)** Attempt any two of the following :

- a) Describe the construction of resonant tunneling diode with proper diagram. [4]
- b) Obtain schrodinger time dependent wave equation. [4]
- c) Obtain an expression for density of states of electron in 2 D nanostructure. [4]

**Q4)** Attempt any two of the following.

- a) State poynting vector theorem and obtain expression for it. [6]
- b) i) State and explain Pauli's exclusion principle. [3]  
ii) Write the comparision between energy of electron in an atom and energy of electron in infinite potential well. [3]
- c) i) Explain Bose - Einstein statistics. [3]  
ii) Write any three applications of quantum dot. [3]

OR

Attempt all of the following

- a) Calculate the de - Broglie wave length of an electron moving with the velocity of  $10^6$  m/s. **[4]**
- b) Calculate the skin - depth for conducting medium for a wave of frequency 60 Hz, conductivity of  $3 \times 10^4$  mho/m and permeability of  $4 \pi \times 10^{-7}$  H/m. **[4]**
- c) Calculate the ground state energy of an electron in infinite potential well of width  $2A^\circ$  **[4]**



Total No. of Questions : 4]

SEAT No. :

P872

[Total No. of Pages : 3

[5315] - 469

T.Y. B.Sc. (Semester - IV)

ELECTRONIC SCIENCE

EL - 345 : Mathematical Methods and Circuit Analysis Using MATLAB  
(2013 Pattern) (Paper - V)

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*

**Q1)** Answer all of the following :

- a) Write the MATLAB command to clear figure window. [1]
- b) Write the MATLAB command to generate column vector  $x$  with three elements 10,20, & 30. [1]
- c) What is meant by periodic function? [1]
- d) State the use of Laplace Transform. [1]
- e) Write the Fourier series expansion for odd function. [2]
- f) Define Laplace Transform of a function. [2]
- g) Write a MATLAB program to plot  $y = e^x$ , for  $0 \leq x \leq 4$ . [2]
- h) Write the MATLAB commands to set equal scale on both axis & to set the axis limit. [2]

**P.T.O.**

**Q2)** Answer any two of the following :

- a) Write the MATLAB code to draw a straight line  $y = mx + c$ , where  $m$  &  $c$  are constants. Compute the  $y$  coordinates of a line with slope  $m = 0.3$  & the intercept  $e = -5$  at the following  $x$  - coordinates  $x = 0, 1.2, 1.5, 4, 5, 8, 9$  and  $10$ . [4]
- b) Find the Laplace transform of  $(e^{-2t} + e^{3t})^2$ . [4]
- c) Find the Laplace transform of  $\sin^2 3t$  [4]

**Q3)** Answer any two of the following :

- a) Explain the FOR - End loop in MATLAB. [4]
- b) Obtain the Laplace transform of unit step function. [4]
- c) For a square wave voltage.

$$v(t) = \begin{cases} -v & 0 < t < T/4 \\ v & T/4 < t < 3T/4 \\ -v & 3T/4 < t < T \end{cases}$$

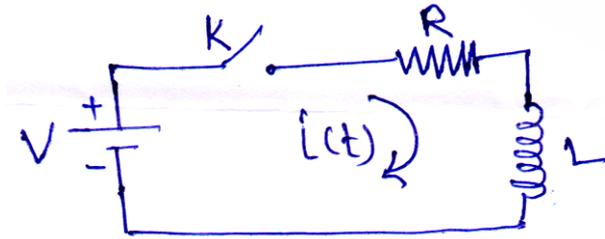
Find the fourier series coefficient  $a_4$ . [4]

**Q4)** Answer any two of the following :

- a) Describe polyfit command in MATLAB. Write a script file in MATLAB to fit a straight line to the following data & plot the polynomial. [6]

|     |     |     |   |   |   |   |     |
|-----|-----|-----|---|---|---|---|-----|
| $x$ | 0.9 | 1.5 | 3 | 4 | 6 | 8 | 9.5 |
| $y$ | 0.8 | 1.6 | 3 | 4 | 5 | 6 | 7.3 |

- b) Consider RL circuit as shown in figure. [6]



Find current  $i(t)$  using Laplace transform.

- c) Find inverse Laplace transform of [6]

$$\frac{11s^2 - 2s + 5}{(s-2)(2s-1)(s+1)}$$

OR

Answer the following :

- a) Write the MATLAB code to calculate  $f(3)$  and to plot the polynomial

$$f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$$

for  $-1.5 \leq x \leq 6.7$  [4]

- b) Find the Laplace transform of  $\sin at$ . [4]

- c) For fourier series, obtain the expression of fourier coefficient  $a_n$ . [4]



Total No. of Questions : 4]

SEAT No. :

**P873**

[Total No. of Pages : 5

**[5315] - 470**

**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL : 346(A) Industrial Automation**

**(Semester - IV) (2013 Pattern) (Paper - VI) (Optional)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

**Q1)** Attempt all of the following :

- a) What is peltier effect? [1]
- b) What is trans - impedance amplifier? [1]
- c) State any two advantages of position control. [1]
- d) What is dead time element? [1]
- e) State advantages of thermistor. [2]
- f) Draw symbols of push buttons and pressure switches used in ladder diagram. [2]
- g) Explain the concept of sample and hold circuit. [2]
- h) Identify two parameters of ON - OFF controller. [2]

***P.T.O.***

**Q2)** Attempt any two of the following :

- a) Explain the terms : **[4]**
  - i) Variable range and
  - ii) control lag.
- b) Explain the action of three position controller mode. **[4]**
- c) Explain zero order system with neat diagram. **[4]**

**Q3)** Attempt any two of the following :

- a) Draw and explain multichannel data acquisition system using single ADC. **[4]**
- b) Explain discrete control system with neat diagram. **[4]**
- c) Draw block diagram of generalized measurement system. Explain each block in brief. **[4]**

**Q4)** Attempt any two of the following :

- a) What is second order system? Draw and explain step response of second order system. **[6]**
- b)
  - i) Write a note on “Electrostatic shielding” **[3]**
  - ii) The temperature control system has a range of 330 to 450 k and a set point of 390 k. Find the percent of span error, when the temperature is 379 k **[3]**
- c) Describe proportional - Integral - Derivative (PID) controller mode. **[6]**

Total No. of Questions : 4]

**[5315] - 470**  
**T.Y.B.Sc.**  
**ELECTRONIC SCIENCE**  
**EL : 346 (B) Consumer Electronics**  
**(2013 Pattern) (Semester - IV) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt all of the following :

- a) Write down any two advantages of Impact Printer. [1]
- b) State the name of high wattage loud speaker [1]
- c) State the range of frequency used for microwave applications. [1]
- d) List any two parameters of digital camera. [1]
- e) “Local oscillator is used in out door unit of dish TV” Comment. [2]
- f) “LNA is noise amplifier”. Comment. [2]
- g) “OPC drum is a part of Xerox machine” comment. [2]
- h) State the names of blocks used in basic telephone set. [2]

**Q2)** Attempt any two of the following :

- a) With the help of block diagram explain the working of Hand set of cordless phone. **[4]**
- b) Draw the setup diagram of crystal microphone and explain the working. **[4]**
- c) With the help of block diagram explain the method used to read the data from the surface of compact Disc. **[4]**

**Q3)** Attempt any two of the following :

- a) Compare the LCD, Plasma TV and LED TV with reference to power used and picture quality. **[4]**
- b) With the help of Block diagram explain the working of remote control. **[4]**
- c) Draw the block diagram of Electronic weighing machine and explain each block in detail. **[4]**

**Q4)** Attempt any two of the following :

- a) Draw the block diagram of Dot matrix printer and explain each block. **[6]**
- b) With the help of block diagram explain the working of monochrome TV receiver. **[6]**
- c) With the help of Indoor unit and outdoor unit explain working of Dish TV. **[6]**

OR

- a) Draw the Setup diagram of Micro wave oven and explain its working of micro wave oven. **[4]**
- b) Draw the block diagram of public address system and explain each block. **[4]**
- c) With the help of block diagram explain the working of flat bed scanner. **[4]**



Total No. of Questions : 4]

SEAT No. :

**P874**

[Total No. of Pages : 2

[5315] - 471

**T.Y.B.Sc. (Semester - IV)**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 401 : Internal Security of India**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 sentences each.

**[16]**

- a) What are the characteristics of a state?
- b) Define Human security
- c) Define internal security
- d) What do you mean by SEZ?
- e) Define Guerrilla warfare
- f) Define ethnicity
- g) Define sustainable development
- h) Define cultural identity

**P.T.O.**

**Q2)** Answer in 8 to 10 sentences each (any two)

**[8]**

- a) Explain political dimensions of India's internal security
- b) Discuss roles of Governance in human security
- c) Discuss Link between development and internal security.

**Q3)** Write short notes on (any two)

**[8]**

- a) Kashmir Dispute
- b) Ethnicity Conflict
- c) Naxalite

**Q4)** Answer in 18 to 20 sentences (Any one)

**[8]**

- a) What are the challenges to India's North - west border security? Discuss.
- b) Explain current security challenges to Northeast region of India.



Total No. of Questions : 4]

SEAT No. :

**P875**

[Total No. of Pages : 2

**[5315] - 472**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 402 : Trend's In India's Defence expenditure**

**(Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 sentences each.

**[16]**

- a) Define financial management
- b) What do you mean by strategic control?
- c) Write any two merits of war time economy.
- d) Write the meaning of Zero budget.
- e) Define performance budget
- f) Write the meaning of dual economy
- g) Define national power
- h) Write any two characteristics of peace time economy.

**P.T.O.**

**Q2)** Answer in 8 to 10 sentences each (any two)

**[8]**

- a) Explain the concept of public good
- b) Discuss role of private sector in India's defence production
- c) Describe organization of Ministry of defence

**Q3)** Write short notes on (any two)

**[8]**

- a) Link between Parliament and India's Defence expenditure
- b) Structure of India's defence budget
- c) DPSU

**Q4)** Answer in 18 to 20 sentences (Any one)

**[8]**

- a) Explain trends of India's defence expenditure from 1971.
- b) Discuss salient features of India's economy.



Total No. of Questions : 4]

SEAT No. :

**P876**

[Total No. of Pages : 2

**[5315] - 473**

**T.Y.B.Sc. (Semester - IV)**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 404 : Information Warfare and Cyber Security**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each.

**[16]**

- a) Write any two threats to cyber security.
- b) Write any two needs for Information Security.
- c) Define Battlefield information system.
- d) Define War gaming
- e) Define operational planning.
- f) What do you mean by Internet Security?
- g) Define Cyber Laws
- h) Define E - Commerce.

**P.T.O.**

**Q2)** Answer in 8 to 10 sentences each (any two) **[8]**

- a) Discuss application of IT in Land warfare.
- b) Explain application of IT in War gaming.
- c) Explain application of IT in Sea warfare.

**Q3)** Write short notes on (any two) **[8]**

- a) 'Battle field information system'.
- b) Cyber Security
- c) Airborne Early warning system

**Q4)** Answer in 18 to 20 sentences (Any one) **[8]**

- a) Explain prospects of information warfare for military operations.
- b) Discuss role of information in the management of national security.



Total No. of Questions : 4]

SEAT No. :

**P877**

[Total No. of Pages : 2

**[5315] - 474**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 405 : Defence Production & Logistics in India**

**(Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each

**[16]**

- a) What do you understand by O.F?
- b) Define "Foreign Collaboration".
- c) What do you mean by Logistics?
- d) What do you mean by supply chain management?
- e) Define national Development.
- f) Under when the DRDC works?
- g) State the meaning of G.S.L
- h) Why the Mobilization of logistics resources is essential?

**P.T.O.**

**Q2)** Answer in 8 to 10 sentences. (Any Two)

**[8]**

- a) Explain in brief “Structure of Defence Production”.
- b) Write a few lines on “Just in Time Concept”.
- c) Discuss in brief the role of department of defence production.

**Q3)** Write short notes on (any Two)

**[8]**

- a) Concept of Foreign Collaboration.
- b) Aim & objectives of H.A.L.
- c) M.D.L. - Mumbai

**Q4)** Answer in 16 to 20 sentences. (Any one)

**[8]**

- a) Make in India programme will procure the defence requirements of our Armed forces “Do you agree? Justify your answer.
- b) Discuss the role of DPSU in modernisation of Indian Armed Forces.



Total No. of Questions : 4]

SEAT No. :

**P878**

[Total No. of Pages : 4

**[5315] - 475**

**T.Y.B.Sc. (Semester - IV)**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 406 (A) Defence Journalism and National Security**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each

**[16]**

- a) State the meaning of Features Writing
- b) Define Media Ethics
- c) Define Conflict Management
- d) Define Investigative Journalism
- e) Define Mass Communication
- f) Write any two Challenges to Defence Journalism.
- g) Define Conflict Studies.
- h) Define International Security.

***P.T.O.***

**Q2)** Answer in 8 to 10 Sentences each (any two) **[8]**

- a) Explain Evolution of Defence Journalism
- b) Discuss essential of knowledge of Defence Journalism
- c) Discuss relationship between Media and Armed forces.

**Q3)** Write short notes on (any two) **[8]**

- a) Link between Media and security studies.
- b) Current trends in Defence journalism
- c) Media Responsibilities

**Q4)** Answer in 18 to 20 sentences (Any one) **[8]**

- a) Explain problems and prospects of Defence Journalism
- b) Discuss role of Defence Journalism in International Security Studies.



Total No. of Questions : 4]

**[5315] - 475**  
**T.Y.B.Sc. (Semester - IV)**  
**DEFENCE AND STRATEGIC STUDIES**  
**DS : 406 (B) Gender Based Conflicts and Human Rights**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each

**[16]**

- a) Define Gender Equality
- b) Define 'positive peace'.
- c) Define Gender Based Conflicts
- d) State the meaning of Geopolitical Region
- e) Define structural violence
- f) Define gender violence
- g) State the meaning of sustainable education.
- h) Write the meaning of feminist perspectives.

**Q2)** Answer in 8 to 10 Sentences each (any two) **[8]**

- a) Explain Gender based violence in Africa.
- b) Write a note on the culture of peace
- c) Discuss Gender Issues in India.

**Q3)** Write short notes on (any two) **[8]**

- a) Challenges to world peace.
- b) Gender based violence in Middle East.
- c) Feminism and philosophy for peace.

**Q4)** Answer in 18 to 20 sentences (Any one) **[8]**

- a) Explain sustainable peace building and Human rights in India.
- b) Discuss causes of gender discrimination in India.



Total No. of Questions : 4]

SEAT No. :

**P879**

[Total No. of Pages : 4

**[5315] - 476**

**T.Y.B.Sc. (Semester - IV)**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 407(A) Role of Armed forces in Disaster Management**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each.

**[16]**

- a) Define Environmental Disaster.
- b) Write the meaning of Guideline to Disaster Management.
- c) Write two roles of civilian in Disaster Relief.
- d) Define Nuclear War
- e) Define Natural Disaster
- f) Define Strategic planning.
- g) Define global warming.
- h) Write any two importances of pre - disaster plan

***P.T.O.***

**Q2)** Answer in 8 to 10 Sentences each (any two) **[8]**

- a) Explain role of Army in Disaster Response.
- b) Discuss structure of NDRF in Disaster Relief.
- c) Describe Roles of Navy in disaster management.

**Q3)** Write short notes on (any two) **[8]**

- a) Role of NGO in Disaster Relief.
- b) Role of Local Civil Administration in Disaster management.
- c) Importance of training for Disaster Relief.

**Q4)** Answer in 18 to 20 sentences (Any one) **[8]**

- a) Describe role of Central Government in Disaster Response.
- b) Write a note on the relationship between Disaster and national security.

Total No. of Questions : 4]

**[5315] - 476**  
**T.Y.B.Sc.**  
**DEFENCE AND STRATEGIC STUDIES**  
**DS : 407 (B) Global Security - II**  
**(Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each.

**[16]**

- a) What do you mean by Nuclear proliferation?
- b) State any two principal organs of U.N.
- c) State the name of the countries who have maritime dispute with China.
- d) What do you understand by Veto?
- e) State the meaning of Regional Conflicts.
- f) What do you mean by Global Security?
- g) What do you know about N.P.T.?
- h) State the meaning of American Monopoly?

**Q2)** Answer in 8 to 10 sentences. [Any Two] **[8]**

- a) Explain in brief peaceful progressive uses of Nuclear Energy.
- b) Write in brief “Nuclear Arsenal as a threat to global security.
- c) Discuss in short catchment policy of china.

**Q3)** Write short notes on [Any Two] **[8]**

- a) U.S.A. as a responsible member of world community.
- b) Chinese policy of Containment.
- c) Causes of conflict between USA & North Korea.

**Q4)** Answer in 16 to 20 sentences. [Any One] **[8]**

- a) Highlight on present scenario in South China Sea & its relevance to global security.
- b) Evaluate the Chinese Policy of Power Projection with special reference to the power race in Indian Ocean.



Total No. of Questions : 4]

SEAT No. :

**P880**

[Total No. of Pages : 4

[5315] - 477

**T.Y. B.Sc. (Semester - IV)**

**DEFENCE & STRATEGIC STUDIES**

**DS : 408 (A) Indian Military Strategy (1947 - 2014)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each

**[16]**

- a) When the first indo - Pak War took place?
- b) What do you mean by ceasefire?
- c) When the first India - China war took place?
- d) Why India sent her forces in Kashmir in 1947 - 48?
- e) During 1962 war who declared the unilateral ceasefire?
- f) Which treaty it was signed between India & Pakistan at the end of 1965 war.
- g) What do you know about Raje Harisingh?
- h) What do you know about chou - En - Lai?

***P.T.O.***

**Q2)** Answer in 8 or 10 sentences (Any two) : **[8]**

- a) Explain in brief ceasefire process of Indo - Pak war of 1947 - 48
- b) What were the causes of India - China war of 1962.
- c) Write in brief background of Indo - Pak war of 1965.

**Q3)** Write short notes on (Any Two) : **[8]**

- a) Role of U.S.S.R during Indo - Pak War of 1965.
- b) Affected sectors during Indo - Pak War of 1947 - 48.
- c) Nature of India - China border dispute.

**Q4)** Answer in 16 to 20 sentences (Any One) : **[8]**

- a) What were the implications of 1962 war on domestic front of India?
- b) “During 1965 India Won the war on the battleground but lost it at the negotiation table” Do you agree? Justify your answer.



Total No. of Questions : 4]

**P880**

**[5315] - 477**

**T.Y. B.Sc. (Semester - IV)**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 408 (B) Indian Military Strategy (1680 - 1818)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Answer in 2or 4 sentences each :

**[16]**

- a) What do you mean Guerrilla Tactics?
- b) Why Nilzam fought a battle with Bajirao at Bhopal?
- c) Why Mughal released Sahu?
- d) Write any two causes of downfall of Maratha.
- e) Between whom the third battle of Panipat it was fought?
- f) State any two achievements of Sambhaji.
- g) Why Shivaji adopted Guerrilla Tactics?
- h) What do you know about Santaji?

**Q2)** Answer in 8 or 10 sentences (Any Two) : **[8]**

- a) Explain in brief impact of third battle of panipat.
- b) Write in brief causes for Anglo - Maratha conflict.
- c) Explain in brief Battle of Bhopal.

**Q3)** Write short notes on (Any Two) **[8]**

- a) Dhanaji.
- b) Tarabai.
- c) Background of first Anglo - Maratha war.

**Q4)** Answer in 16 to 20 sentences (Any One) : **[8]**

- a) Analyse the causes of Maratha defeat at III<sup>rd</sup> Battle of Panipat.
- b) Highlight on Sambhaji as a Military Leader.



Total No. of Questions : 4]

SEAT No. :

**P881**

[Total No. of Pages : 4

**[5315] - 478**

**T.Y. B.Sc. (Semester - IV)**

**DEFENCE & STRATEGIC STUDIES**

**DS : 409 (A) - United Nations Organisation**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each.

**[16]**

- a) State the date & Year of establishment of U.N.O.
- b) Define "Globalization".
- c) State the meaning of PM - 5 of S.C.
- d) Who is mainly responsible for Administration of UN?
- e) Define "Armscontrol"?
- f) What do you understand by UN - Charter
- g) What do you mean by diplomatic procedure?
- h) State the meaning of U.N. Peace keeping operation.

***P.T.O.***

**Q2)** Answer in 8 to 10 sentences (Any Two)

**[8]**

- a) Explain in brief the significance of UN security council.
- b) Highlight on the significance of “General Assembly”.
- c) Write few lines on “Veto”.

**Q3)** Write short notes on (Any Two)

**[8]**

- a) Structure of U.N.O.
- b) UN & Human rights
- c) Power & functions of secretary general.

**Q4)** Answer in 16 to 20 sentences. (Any One)

**[8]**

- a) “While restructuring U.N. Which changes you would like to introduce? Discuss.
- b) “U.N. Till today only postponed the third world war” Do you agree? Justify your answer.



Total No. of Questions : 4]

**P881**

**[5315] - 478**

**T.Y. B.Sc. (Semester - IV)**

**DEFENCE AND STRATEGIC STUDIES**

**DS : 409 (B) Indias Maritime Security**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1)** Answer in 2 or 4 sentences each

**[16]**

- a) What do you understand by continental shelf?
- b) Define “Exclusive Economic Zone”.
- c) What do you mean by Maritime trade?
- d) State the meaning of littoral countries.
- e) Write any two characteristics of Indian Navy
- f) State the limits of Exclusive Economic Zone.
- g) What do you understand by “Human Trafficking”.
- h) State the meaning of “Maritime Trade”.

**Q2)** Answer in 8 to 10 sentences. (Any Two) **[8]**

- a) Explain the concept of Fixed Assets.
- b) Write a few lines on “L.T.T.E”.
- c) Discuss in brief the limitations of coast guard.

**Q3)** Write short notes on (Any Two) **[8]**

- a) Limitations of Indian Navy
- b) Maritime Threats
- c) Territorial water

**Q4)** Answer in 16 to 20 sentences (Any One) : **[8]**

- a) Explain the role of Indian Navy for Maritime security.
- b) Highlight on 26/11 Mumbai attack & its linkages with Maritime Security.



Total No. of Questions : 4]

SEAT No. :

**P882**

[Total No. of Pages : 2

**[5315] - 479**

**T.Y.B.Sc. (Semester - IV)**

**ENVIRONMENTAL SCIENCE (Theory) (Paper - I)**

**Aquatic Ecosystems and Management**

**(2008 & 2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory and carry equal marks.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1 - 2 lines each.

**[10]**

- a) What is edge effect.
- b) Define Spatial niche
- c) Give to example mutalism association.
- d) Define Liminetic zone in freshwater aquatic system.
- e) Give two names of Biotic communities from abyssal benthic zone.
- f) Mention two characteristics of symbiosis.
- g) In which state chilka lake is located.
- h) What is ecotype.
- i) What is continental drift
- j) Define hypolimnion

**P.T.O.**

**Q2)** Write a short note on ANY TWO of the following : **[10]**

- a) Types of interspecific interaction in ecosystem.
- b) Eco - development programme.
- c) Zonation of marine ecosystem C.

**Q3)** Answer ANY TWO questions from the following : **[10]**

- a) Write a note on restoration of Chilka lake
- b) Explain the role of local public in Wetland Conservation.
- c) Briefly write the note on parasitic adaptation behaviour in ecosystem.

**Q4)** Attempt any ONE of the following : **[10]**

- a) Briefly explain the sampling methods and data analysis of ecosystem.
- b) Narrate the importance of mangrove ecosystem in coastal marine environment.



Total No. of Questions : 4]

SEAT No. :

**P883**

[Total No. of Pages : 2

**[5315] - 480**  
**T.Y.B.Sc. (Semester - IV)**  
**ENVIRONMENTAL SCIENCE (Paper - II)**  
**Nature Conservation**  
**(2008 and 2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory and carry equal marks.*
- 2) Neat and labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1 - 2 lines each.

**[10]**

- a) What are merits of In - Situ conservation?
- b) What are the natural heritage sites?
- c) How ecosystem approach is important in species conservation?
- d) Write any two examples of extreme activism in nature conservation?
- e) What is meant by captive breeding?
- f) Write name of any two personalities associated with nature conservation.
- g) What are seed banks?
- h) Mention any two functional areas of BNHS.
- i) Write any two objectives of convention on biological diversity.
- j) What is the name of our national tree?

***P.T.O.***

**Q2)** Write a short note on ANY TWO of the following **[10]**

- a) Protected Area Network in India.
- b) Role of NGO's in Nature conservation.
- c) Habitat Conservation.

**Q3)** Answer Any Two questions of the following : **[10]**

- a) Which are the challenges associated with nature conservation in India?
- b) Discuss salient features of wildlife protection act
- c) What are various protected areas categories of IUCN?

**Q4)** Attempt ANY ONE of the following : **[10]**

- a) Explain traditional conservation practices with suitable examples. Also add a note on challenges associated with it.
- b) What are the basic objectives of ecotourism? Also add a note on merits and demerits of it.



Total No. of Questions : 4]

SEAT No. :

**P884**

[Total No. of Pages : 2

**[5315] - 481**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**Air and Soil Quality**

**(Semester - IV) (Paper - III) (2008 and 2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory and carry equal marks.*
- 2) *Neat and labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1 - 2 lines each.

**[10]**

- a) Write name of methods used for estimation of phosphorous and total nitrogen.
- b) What are organic contaminants of the soil?
- c) What is meant by soil texture?
- d) What are soil toxins?
- e) What is meant by acid rain?
- f) Mention any two factors which influence soil structure?
- g) What was the reason behind chernobyl disaster?
- h) Write any two effects of particulate matter.
- i) What are macronutrients?
- j) What is meant by smog?

**P.T.O.**

**Q2)** Write a short note on ANY TWO of the following :

**[10]**

- a) El Nino Phenomenon
- b) Chemical Reactions in soil
- c) Soil Remediation

**Q3)** Answer ANY TWO questions of the following :

**[10]**

- a) What are effects of carbon monoxide and sulphur dioxide on human health?
- b) Discuss in detail on status of vehicular pollution in India.
- c) What are the applications of GIS in management of soil resources?

**Q4)** Attempt ANY ONE of the following :

**[10]**

- a) Discuss in detail sampling and analysis methods used for nitrogen dioxide and sulphur dioxide.
- b) What is the concept of soil fertility? Explain the methods used in estimation of manganese and sulphur.



Total No. of Questions : 4]

SEAT No. :

**P885**

[Total No. of Pages : 2

**[5315] - 482**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE (Theory)**

**Issues in Environmental Science - II**

**(Semester - IV) (Paper - IV) (2008 and 2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory and carry equal marks.*
- 2) Neat and labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1 - 2 lines each.

**[10]**

- a) Enlist effects of desertification.
- b) Write full form of SEZ.
- c) Define Eutrophication
- d) What is GIS?
- e) Who initiated chipko movement?
- f) Enlist causes of Global warming.
- g) Mention any two effects of major dam projects in India.
- h) What is Rain water Harvesting?
- i) Write any two examples of Natural disasters.
- j) Enlist Environmental problems of urbanization.

**P.T.O.**

**Q2)** Write a short note on ANY TWO of the following : **[10]**

- a) Occupational health and safety.
- b) Importance of sustainable development.
- c) Ganga Action Plan

**Q3)** Answer any Two questions of the following : **[10]**

- a) Discuss effects of Bhopal gas Tragedy on Environment.
- b) Discuss significance of Environmental Health Modelling.
- c) Explain impact of vehicular pollution on Urban air quality.

**Q4)** Attempt ANY ONE of the following : **[10]**

- a) Discuss principles of Agenda - 21. Explain its importance in Biodiversity Conservation.
- b) What is Alkaline & Saline Soil. Explain various measures used for its reclamation.



Total No. of Questions : 4]

SEAT No. :

**P886**

[Total No. of Pages : 2

**[5315] - 483**

**T.Y.B.Sc. (Semester - IV)**

**ENVIRONMENTAL SCIENCE (Theory)**

**Environmental Governance & Equity : EMS and ISO 14000**

**(2008 and 2013 Pattern) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory and carry equal marks.*
- 2) Neat and labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1 - 2 lines each.

**[10]**

- a) Write full form of BIS.
- b) What is PDCA cycle?
- c) Define 'Impact'?
- d) Enlist stages of Environmental Audit.
- e) What is EIA?
- f) Mention any two ambient air quality standards in India?
- g) What is ESR?
- h) Define EMS.
- i) Write any two functions of 'WHO'.
- j) Write standard limit of BOD for inland discharge of effluent.

**P.T.O.**

**Q2)** Write a short note on ANY TWO of the following : **[10]**

- a) National Environmental Policy.
- b) Constitutional provisions of India for Environment protection.
- c) Environmental Economics.

**Q3)** Answer ANY TWO questions of the following : **[10]**

- a) Discuss objectives of Environmental Audit.
- b) Explain benefits of ISO 14001 certification.
- c) Discuss role of society in effective implementation of Environmental regulations.

**Q4)** Attempt ANY ONE of the following : **[10]**

- a) What is Generic standard? Explain role of Technical committee. Discuss guidelines of ISO 14001.
- b) Discuss stages of EIA in detail. Explain importance of EIA in resource management.



Total No. of Questions : 4]

SEAT No. :

**P887**

[Total No. of Pages : 2

**[5315] - 484**  
**T.Y.B.Sc. (Semester - IV)**  
**ENVIRONMENTAL SCIENCE (Theory)**  
**Environmental Biotechnology - II**  
**(2008 & 2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory and carry equal marks.*
- 2) Neat and labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Attempt the following in 1 - 2 lines each.

**[10]**

- a) Define Rhizofiltration.
- b) Enlist the advantages of bioleaching.
- c) Write full form of FBR and ABR.
- d) What is biomass gasification?
- e) What is electrolysis process in hydrogen production.
- f) Enlist any two demerits of biomethanation of MSN.
- g) Define in Situ bioremediation.
- h) Define fermentation.
- i) Enlist any two aquatic biomass used for biogas.
- j) Define hog fuel.

***P.T.O.***

**Q2)** Write a short note on ANY TWO of the following : **[10]**

- a) Biotechnology for air pollution control.
- b) Rotating biological contractor.
- c) In - Situ Leaching

**Q3)** Answer ANY TWO questions from the following : **[10]**

- a) What are the advantages of using immobilized enzymes.
- b) Explain the factors affecting methane formation.
- c) What are the advantages of anaerobic waste water treatment.

**Q4)** Attempt ANY ONE of the following : **[10]**

- a) What is bioremediation? In what ways it is good tool for environmental clean up.
- b) Explain the techniques used for removal of heavy metals from waste water.



Total No. of Questions : 4]

SEAT No. :

**P888**

[Total No. of Pages : 2

**[5315] - 486**  
**T.Y.B.Sc. (Vocational)**  
**BIOTECHNOLOGY**  
**Environmental Biotechnology and Bioinformatics**  
**(2015 Pattern) (Semester - IV) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Draw neat labelled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Answer the following questions in short.

**[10]**

- a) What are Nitrogen fixers? Give 1 example.
- b) What is Entrez?
- c) What is gasohol?
- d) What is scoring matrix?
- e) What is bioleaching? Name a microbe involved in bioleaching.
- f) Define homologues.
- g) Name the microbes used in waste water treatment.
- h) What is FASTA?
- i) Name the microbes involved in pesticide degradation.
- j) What is TrEMBL?

**P.T.O.**

**Q2)** Answer any two of the following : **[10]**

- a) Explain the processes involved in phytoremediation.
- b) What is SWISS - PROT? Give its important features.
- c) Describe the process of bioaugmentation and biostimulation.

**Q3)** Write short notes on any two : **[10]**

- a) NDB
- b) Biogas production
- c) CATH

**Q4)** Answer any one in detail. **[10]**

- a) Describe the nucleic acid databases.
- b) What are hazardous wastes? Describe the role of biotechnology in hazardous waste management.



Total No. of Questions : 5]

SEAT No. :

**P889**

[Total No. of Pages : 2

**[5315] - 487**

**T.Y.B.Sc.**

**PHOTOGRAPHY AND AUDIO - VISUAL PRODUCTION**

**(Vocational) (Semester - IV) (Paper - V)**

**Entrepreneurship Development**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *Question number five is compulsory.*
- 2) *Answer any three questions from the remaining questions.*
- 3) *Provide suitable examples wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**Q1)** How is an “Entrepreneur” different from a “Businessman”? Support your answer with a relevant example and suitable logic. **[10]**

**Q2)** What is the difference between a “Client”, “Customer” and “Consumer”? Who according to you matters the most? **[10]**

**Q3)** How is “Marketing” different from “Sales”? Discuss the 4 Ps of Marketing in detail with suitable examples. **[10]**

**Q4)** Write short notes on any two of the following. **[10]**

- a) Utility
- b) Goods vs Services
- c) Demand

**P.T.O.**

**Q5)** Answer the following :

**[10]**

Mr. Ashirwad is a big dealer based in Dubai with an entire Gulf presence. However, Mr. Ganesh is a very well known supplier of electric wires and ICs and owns a workshop in Khopoli. Mr. Amit has a huge road transport business. His road transport network spans across all the Gulf nations. Miss. Neeraja and Miss. Sanjana have a similar network of transportation in India. However, they are not into International Cargo Transportation. Mr. Jonty is into Air Cargo and Mr. Shivang is into Water Cargo. Air Cargo is costlier and takes less time, while Water Cargo is cheaper but takes a lot of time to reach the destinations. Mr. Chetan has a huge farm of tomatoes near Bhigwan. Miss. Harshada and Miss Siddhi recently migrated to Abu Dhabi from Bhigwan in order to start some retail business outlets in the gulf. Mr. Shreyas owns a huge warehouse near JNPT Mumbai, but does not have cold storage facility. This facility is available in the warehouse of Mr. Gaurang, but it is a bit far from Mumbai JNPT and is a relatively costlier warehouse. Mr. Ketan and Mr. Kaushik are similar warehouse competitors in Dubai. Mr. Ketan has cold storage facility and has a cheaper storage rate. But there is no access to market from his warehouse. Where as Mr. Kaushik does not have storage facility, but is costlier as he has a great proximity to the Gulf markets. Mr. Oshan has a supreme command over any kind of production processes and is looking forward to joining a company in India as a Production Incharge. In all this, Mr. Pushkar is a confused entrepreneur at the moment. He is working out two options of starting an Export Business. Option 1 is to manufacture & export electric components in Gulf nations, while Option 2 is to manufacture tomato ketchups and export in Gulf nations. He plans to start a workshop in Pune. He comes to you for help, and asks you to design a Supply Chain for both the options. What are the 2 designs that you would prepare for him?



Total No. of Questions : 4]

SEAT No. :

**P890**

[Total No. of Pages : 2

**[5315] - 488**

**T.Y.B.Sc. (Vocational) (Semester - IV) (2013 Pattern)  
ELECTRONIC EQUIPMENT AND MAINTENANCE  
Entrepreneurship Development (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log tables calculators is allowed.*

**Q1)** Answer the following :

**[4 × 1 = 4]**

a) Answer the following :

- i) What is 'cash flow'?
- ii) State two disadvantages of sole proprietorship.
- iii) Define the term 'entrepreneurship'.
- iv) What is 'Value Added Tax'?

b) Answer the following :

**[2 × 2 = 4]**

- i) State the importance of 'Soft Skill' in marketing.
- ii) What is 'PAN'?

c) Comment on the following :

**[2 × 2 = 4]**

- i) Identification of opportunities are necessary for the growth of business.
- ii) Modern concept of marketing is consumer centric.

**P.T.O.**

**Q2)** Answer any two of the following : **[2 × 4 = 8]**

- a) Explain the term working capital. State its importance.
- b) Explain typical characteristics of entrepreneur.
- c) Discuss the duties of District Industry Centre (DIC)

**Q3)** Answer any two of the following : **[2 × 4 = 8]**

- a) Discuss the various difficulties encountered by entrepreneur.
- b) Explain the role of consultancy organization in entrepreneurship development.
- c) Explain the essential attributes of entrepreneur for running successful business.

**Q4)** Answer any two of the following : **[2 × 6 = 12]**

- a) Explain the role of human resource management.
- b) Explain the entrepreneurship as career option.
- c) Discuss sources of finance to start a new business.

OR

Write short notes on the following : **[3 × 4 = 12]**

- a) SWOT analysis
- b) Marketing strategy
- c) Market segmentation



Total No. of Questions : 4]

SEAT No. :

**P891**

[Total No. of Pages : 2

**[5315] - 489**

**T.Y.B.Sc. (Vocational)**

**INDUSTRIAL MICROBIOLOGY**

**VOC - IND - MIC - 345 (Theory Course)**

**Molecular Biology and Recombinant DNA Technology**

**(Semester - IV) (2013 Pattern)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*

**Q1)** Answer the following

**[10]**

- a) What is Human Genome Project?
- b) Maximum Size of DNA that can be inserted in YAC vector is \_\_\_\_\_.
- c) Which enzyme is used to cut DNA molecule in Recombinant DNA Technology?
- d) DNA fingerprinting was developed by \_\_\_\_\_
- e) Name any two examples of monoclonal antibodies produced by RDT.
- f) What is Recombinant DNA Technology?
- g) According to HGP genetic similarity between all humans is \_\_\_\_\_ percent.
- h) What do you understand by colony PCR?
- i) What is a minisatellite DNA?
- j) Draw the structure of ddNTP.

**P.T.O.**

**Q2)** Attempt any two of the following :

**[10]**

- a) Diagrammatically explain Real time PCR.
- b) Comment on the role of nucleic acid hybridization in screening of desired clone. Give types of nucleic acid probes used in RDT.
- c) What is Sangers method of sequencing? Write the principle and methodology.

**Q3)** Comment on : (Any two of the following)

**[10]**

- a) YAC as a vector
- b) Blue - White screening.
- c) Transgenic animals.

**Q4)** Attempt any one of the following :

**[10]**

- a) What is site - directed mutagenesis? Discuss any two methods of inducing point mutations and its applications.
- b) Explain in detail the steps involved in cloning a desired gene. Draw diagrams wherever necessary.



Total No. of Questions : 4]

SEAT No. :

**P892**

[Total No. of Pages : 2

**[5315] - 491**  
**T.Y.B.Sc. (Vocational)**  
**VOC - ST - 321 : SEED TECHNOLOGY**  
**Entrepreneurship Development**  
**(2013 Pattern) (Paper - III) (Semester - IV)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

**Q1)** Answer in one sentence.

**[10 × 1 = 10]**

- a) Give one merit and demerit in partnership business.
- b) Mention any one skill the entrepreneurs need to possess.
- c) What is service tax?
- d) What is working capital?
- e) Give any two important aspects of marketing.
- f) What is pricing?
- g) What is wages act?
- h) Give the importance of soft skill in business organisation.
- i) Write any two roles/services of funding agency.
- j) Give the concept of entrepreneurship.

***P.T.O.***

**Q2)** Answer any two of the following : **[2 × 5 = 10]**

- a) Write an account on entrepreneurial process.
- b) Explain the role of Government Bank in entrepreneurship development.
- c) Comment on marketing mix.

**Q3)** Write notes on any two of the following : **[2 × 5 = 10]**

- a) District Industry Bank
- b) MIDC
- c) Training of personnel.

**Q4)** Explain in detail about the management of human resource in business organisation. **[10]**

OR

Write about various criteria used for selection of new product or service.



Total No. of Questions : 4]

SEAT No. :

**P893**

[Total No. of Pages : 2

**[5315] - 493**  
**T.Y.B.Sc. (Vocational)**  
**BIOTECHNOLOGY**  
**Entrepreneurship Development**  
**(2013 Pattern) (Semester - IV) (Paper - II)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Draw neat labelled diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Answer the following questions in short.

**[10]**

- a) What is SIDBI?
- b) What are the components of marketing mix?
- c) Define Entrepreneurship.
- d) What is SWOT?
- e) What is working capital?
- f) What is CGTMSE?
- g) What is Angel Finance?
- h) What is SICOM?
- i) Mention 2 types of entrepreneurs.
- j) What is digital marketing?

**P.T.O.**

**Q2)** Answer any two of the following : **[10]**

- a) Who is an entrepreneur? Explain his keys elements and characteristics.
- b) Explain any 2 forms of business organization.
- c) What is a consultancy organization? Explain its role in development.

**Q3)** Write short notes on any two : **[10]**

- a) Exit policy
- b) SSI Registration
- c) Marketing channels.

**Q4)** Answer any one of the following : **[10]**

- a) What is the concept and scope of human resource management? Explain different modes of employment.

OR

- b) What are the sources of finance? Give the role of various government and commercial funding agencies.



Total No. of Questions : 8]

SEAT No. :

**P894**

[Total No. of Pages : 2

**[5315] - 494**

**T.Y.B.Sc.**

**PHOTOGRAPHY AND AUDIO - VISUAL PRODUCTION**

**Entrepreneurship Development**

**(Semester - IV) (Paper - VI) (Vocational)**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) Question number ONE is compulsory.*
- 2) Answer any four questions from the remaining questions.*
- 3) Provide suitable examples wherever necessary.*
- 4) Figures to the right indicate full marks.*

*Q1) Radio is a medium of "Intimacy". Explain. [8]*

*Q2) How Radio writing differs from print writing? [8]*

*Q3) In an interview programme, why interviewer should listen to others? [8]*

*Q4) Write a script for 3 minute talk on any one of the following. [8]*

- a) IPL Cricket matches.*
- b) Demonetization.*

*Q5) What is OB. programme? What care should be taken to cover any OB programme? [8]*

**P.T.O.**

*Q6)* Explain any Broadcasting code in detail. [8]

*Q7)* It is a challenge to broadcast for visually challenged listeners. [8]

*Q8)* Appreciate any movie you like the most. [8]



Total No. of Questions : 4]

SEAT No. :

**P895**

[Total No. of Pages : 2

**[5315] - 495**  
**T.Y.B.Sc. (Semester - IV)**  
**Electronic Equipment Maintenance**  
**Medical Instrumentation**  
**Vocational EEM Paper - VI**

*Time : 2 Hours]*

*[Max. Marks :40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

**Q1) a)** Answer the following :

**[4 × 1 = 4]**

- i) Which ion selective electrode is used as reference electrode?
- ii) What is CNS?
- iii) What is bioelectric potential?
- iv) State full forms of
  - 1) ENG,
  - 2) EEG

**b)** Answer the following :

**[2 × 2 = 4]**

- i) What are
  - 1) SA node
  - 2) AV node
- ii) State two considerations for bioelectric recorder amplifier.

**P.T.O.**

- c) Answer the following : [2 × 2 = 4]
- i) State 2 general senses and 2 special senses.
  - ii) What is reflex arc?

**Q2)** Attempt any two [2 × 4 = 8]

- a) Explain electrical activity of excitable cells.
- b) Write a note on ENG.
- c) Discuss electrodes for electrical stimulation of tissues.

**Q3)** Attempt any two [2 × 4 = 8]

- a) Give key features of EEG waves
- b) Discuss direct writing system.
- c) What are physiological effects of electric current on human body.

**Q4)** Attempt any two [2 × 6 = 12]

- a) Explain filter photometer.
- b) Discuss external noise sources in medical instrumentation.
- c) Explain spectrophotometer.

OR

**Q4)** Answer the following :- [3 × 4 = 12]

- a) Explain protection aspect with respect to equipment design in medical instrumentation.
- b) Write a note on ECG.
- c) Explain any one type of amplifier used with bioelectric recorders.



Total No. of Questions : 4]

SEAT No. :

**P896**

[Total No. of Pages : 2

**[5315]-496**

**T.Y. B.Sc. (Semester - IV)**

**INDUSTRIAL MICROBIOLOGY(Vocational)**

**VOC-IND-MIC-346: Entrepreneurship Development**

**(2013 Pattern) (Paper - VI)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Answer the following :

**[10]**

- a) Answer the following questions in 1-2 lines.
  - i) Define the term 'entrepreneur'.
  - ii) What is Sales Tax?
  - iii) Write full form of DIC.
  - iv) Write the Act of Partnership Firm.
  - v) State any two qualities possessed by an entrepreneur.

b) Match the pairs

**Group "A"**

Co-operative Societies Act

Maharashtra Value Added Tax Act

Indian Partnership Act

Sole Proprietorship

The Patents Act

**Group "B"**

1932

Maximum Secrecy

1904

Intellectual Property

2002

**P.T.O.**

**Q2)** Attempt *any two* of the following : **[10]**

- a) Distinguish between a Private Limited Company and a Public Limited Company.
- b) Explain the Bases for Market Segmentation.
- c) Write a note on four P's of Marketing Mix.

**Q3)** Attempt *any two* of the following : **[10]**

- a) Write a note on Factories Act.
- b) How to determine residential status in case of an individual under Income Tax Act.
- c) Write merits of Joint Stock Company.

**Q4)** Attempt *any one* of the following : **[10]**

- a) Explain the characteristics of a Company.
- b) Describe the characteristics which the investors seek in an entrepreneur.



Total No. of Questions : 4]

SEAT No. :

**P897**

[Total No. of Pages : 2

**[5315]-498**

**T.Y. B.Sc. (Vocational) (Semester - IV)**

**SEED TECHNOLOGY**

**VOC-ST-322: Biotechnology and Intellectual Property Rights  
(2013 Pattern) (Paper - IV)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat and labeled diagrams wherever necessary.*

**Q1)** Answer in one sentence each :

**[10 × 1 = 10]**

- a) Define Biotechnology
- b) What is ICAR?
- c) Define Southern Blotting.
- d) Write full form of PCR.
- e) What is Gene cloning?
- f) Give any one name of Transgenic plant.
- g) What is Micropropagation?
- h) Define anther culture.
- i) What is meant by Trade Secret.
- j) Enlist aids to variety identification.

***P.T.O.***

**Q2)** Answer the following (Any two) : **[2 × 5 = 10]**

- a) Explain SDS-PAGE analysis.
- b) Describe in detail Northern Blotting.
- c) Explain in detail transgenics with suitable example.

**Q3)** Write Notes on any two of the following : **[2 × 5 = 10]**

- a) Plasmid vectors.
- b) Embryo culture.
- c) Intellectual Property Rights.

**Q4)** What is Tissue culture? Explain in detail tissue culture technique in Banana. **[10]**

OR

Give an account of DNA finger printing.



Total No. of Questions : 4]

SEAT No. :

**P898**

[Total No. of Pages : 2

**[5315]-501**

**T.Y. B.Sc.**

**PHYSICS (Theory)**

**PH - 333 : Classical Mechanics**

**(2008 Pattern) (Paper - III) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logtable & calculator is allowed.*

**Q1)** Attempt all. (1 mark each)

**[10]**

- a) What do you mean by centre of mass of system?
- b) Define range of projectile.
- c) State kepler's second law of planetary motion.
- d) What is meant by central force?
- e) What is meant by inelastic collision? Give an examples.
- f) Define differential cross section.
- g) What are generalized co-ordinator?
- h) What is meant by holonomic constraints?
- i) What do you mean by inertial frame of reference?
- j) State the principle of Galilean invariance.

**Q2)** Attempt any two

**[10]**

- a) Show that the path of charged particle moving with a uniform velocity in transverse electric field is parabola.
- b) Explain how a two body problem can be reduced into equivalent one body problem
- c) Derive the differential equation for the orbit in central force motion.

**P.T.O.**

**Q3)** Attempt any two

**[10]**

- a) Two projectiles are projected with same velocity if one is projected at an angle of  $30^\circ$  and other to the horizontal. Find the ratio of maximum heights and range of the projectiles.
- b) Explain the effect of coriolis force on cyclone formation.
- c) A geostationary satellite is orbiting the earth at a height of  $11 R_e$  above the surface of the earth. Where  $R_e$  is radius of earth. Find the time period of another satellite at height of  $5R_e$  from the surface of earth.

**Q4)** a) Attempt any one:

**[8]**

- i) Explain the terms differential cross-section and impact parameter. prove the relation.

$$\sigma(\theta) = \frac{-S}{\sin \theta} \frac{ds}{d\theta}$$

- ii) State and explain D'Alembert's principle. Obtain lagrange's equation of motion from D'Alembert's principle.

b) Attempt any one

**[2]**

- ii) What do you mean by degree's of freedom?
- ii) Give any two examples of pseudo force.



Total No. of Questions : 4]

SEAT No. :

**P899**

[Total No. of Pages : 2

**[5315]-502**

**T.Y. B.Sc.**

**PHYSICS (Theory) (Paper - V)**

**PH - 335 : C-Programming and Computational Physics  
(2008 Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator is allowed.*

**Q1)** Attempt all. (one mark each)

**[10]**

- a) What is pixel?
- b) What is flow chart?
- c) What is use of scan f ( ) function?
- d) Write syntax of for statement.
- e) Why break statement is used?
- f) Define keywords?
- g) Give syntax of graphic command arc used in C-program.
- h) State difference between ++i and i++.
- i) What is conditional operator?
- j) What is curve fitting?

**Q2)** Attempt any two

**[10]**

- a) Explain switch statement with suitable example
- b) What is algorithm? Explain advantages of algorithm approach while solving the problem.
- c) Write C-program to print even integers less than 100.

**P.T.O.**

**Q3) Attempt any two** **[10]**

- a) State different operators used in C-language. Give example of each operator.
- b) Draw flow chart to print first 100 integers.
- c) Explain the difference between while and do ..... while statements with suitable examples.

**Q4) A) Attempt any one:** **[8]**

- a)
  - i) Write C-program to find square and cube of a given integer.
  - ii) Draw flow chart for newton Raphson method to find solution.
- b)
  - i) Find truncation error in the series given below

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots \text{ for}$$

- 1) First three
- 2) First five terms with  $x = \frac{1}{5}$
- ii) Write C-program to find area of circle.

**B) Attempt any one of the following** **[2]**

- a) Give the syntax for drawing an ellipse and rectangle
- b) Explain use of gets() and puts() functions.



Total No. of Questions : 4]

SEAT No. :

**P900**

[Total No. of Pages : 2

**[5315]-503**

**T.Y. B.Sc.**

**PHYSICS (Paper - VI)**

**PH - 336 (E) : Medical Electronics**

**(2008 Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

**Q1)** Attempt all of the following. (1 mark each)

**[10]**

- a) What is need of electrode paste or electrolyte?
- b) Give any two physiological effects of electricity.
- c) What is systolic pressure?
- d) What are bio-potential electrodes?
- e) What is the basic function of bio-amplifier?
- f) State nernst equation for bio-potential.
- g) What is sensor?
- h) State various type of calorimeter
- i) What is function of cardiac monitor.
- j) State doppler frequency shift relation.

**P.T.O.**

**Q2) Attempt any two** **[10]**

- a) Explain construction, working of spectrophotometer with example.
- b) Explain an isolation amplifier with block diagram.
- c) Give analysis of ECG pattern with a neat diagram.

**Q3) Attempt any two** **[10]**

- a) If the patient has heart rate 90 beats/min cardiac output 5400 mL/min, systolic pressure 155 mm Hg and diastolic pressure 95mmHg. Then determine
  - i) Stroke volume
  - ii) Pulse pressure
  - iii) What its condition
- b) A differential amplifier has an output of 1v with a differential input of 10mV and an output of 5mV with a common mode input of 10mV. Find the CMRR in dB.
- c) For a 1-c m<sup>2</sup> capacitance sensor, R is 100mΩ. Calculate radius (r), the plate spacing required to pass sound frequency above 20 Hz.

**Q4) a) Attempt any one:** **[8]**

- i) What do you mean by electrode-electrolyte interface? Describe silver-silver chloride electrode interface.
- ii) What do you mean by heart sound? Explain variety of heart sound with cardiac cycle.

**b) Attempt any one:** **[2]**

- i) Draw diagram for double beam spectrophotometer.
- ii) Give various applications of calorimeter.



Total No. of Questions : 4]

SEAT No. :

P901

[Total No. of Pages : 3

**[5315]-504**  
**T.Y.B.Sc. (Principal)**  
**STATISTICS (Theory)**  
**Distribution Theory - I**  
**(2008 Pattern) (Semester - III) (Paper - I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

**Q1)** Attempt each of the following :

A) Choose the correct alternative in each of the following **[1 each]**

- a)  $\beta_1(m,n)$  distribution is symmetric about  $\left(\frac{1}{2}\right)$  if
- |              |                 |
|--------------|-----------------|
| i) $m > n$   | ii) $m < n$     |
| iii) $m = n$ | iv) $m = n + 1$ |
- b) If  $(X_1, X_2, X_3) \sim MD(12, 0.1, 0.4, 0.5)$ , then Karl Pearson's coefficient of correlation between  $X_2$  and  $X_3$  is
- |                          |                           |
|--------------------------|---------------------------|
| i) $-\sqrt{\frac{2}{3}}$ | ii) $-\sqrt{\frac{3}{2}}$ |
| iv) $\sqrt{\frac{2}{3}}$ | vi) $-0.02$               |
- c) Mean of  $W(\alpha = 3, \beta = 1)$  distribution is
- |        |                   |
|--------|-------------------|
| i) 1   | ii) 3             |
| iii) 2 | iv) $\frac{1}{3}$ |
- d) The cumulative distribution function of 1<sup>st</sup> order statistic  $X_{(1)}$  of a random sample of size  $n$  from the distribution of a r.v.  $x$  is
- |                          |                        |
|--------------------------|------------------------|
| i) $[F(x)]^n$            | ii) $1 - [F(x)]^n$     |
| iii) $1 - n[F(x)]^{n-1}$ | iv) $1 - [1 - F(x)]^n$ |

**P.T.O.**

B) State whether each of the following statement is true or false : [1 each]

- a) If  $X \sim \beta_1(5,6)$ , then mean of  $\left[\frac{1-X}{X}\right]$  is 1. [1]
- b) If  $X \sim W(4,2)$ , then  $\frac{X^2}{16}$  follows exponential distribution. [1]
- c) Define convergence in distribution [1]
- d) State chebychev's inequality. [1]
- e) State the additive property of cauchy distribution [1]
- f) Define order statistics [1]

**Q2)** Attempt any two of the following: [5 each]

- a) Let  $X \sim W(\alpha, \beta)$ , obtain the cumulative distribution function of X and hence find first and third quartile of X.
- b) Let  $X \sim \beta_2(m, n)$ , obtain mean and variance of X.
- c) State and prove central limit theorem for i.i.d. random variables.

**Q3)** Attempt any two of the following: [5 each]

- a) Obtain the probability distribution of  $i^{\text{th}}$  order statistic of a random sample of size n drawn from a distribution.
- b) Let  $(x_1, x_2, x_3) \sim MD(12, 0.4, 0.2, 0.4)$ .  
Compute
  - i)  $P(x_1 = 2, x_3 = 6)$
  - ii)  $\text{Corr}(2x_1 + 3, x_2 + 2)$
- c) If X is a random variable with  $E(x) = 5$  and  $E(x^2) = 34$ . Obtain the upper limit for  $p[-1 < x < 11]$  using chebychev's inequality.

**Q4)** Attempt any one of the following:

- a) i) Find the expectation of sample median drawn from  $U(0,1)$  distribution when sample size  $n = (2m + 1)$  where  $m$  is non-negative integer.
- ii) If  $\{X_k\}$  is a sequence of independent r.v. each assuming three values  $-1, 0, 1$  with the respective probabilities  $P[X_k = -1] = P[X_k = 1] = \frac{1}{k}$  and  $P[X_k = 0] = 1 - \frac{2}{k}$ . Verify WLLN for this. **[6+4]**
- b) i) State and prove the inter relation between  $\beta_1(m,n)$  and  $\beta_2(m,n)$  distributions.
- ii) Eight independent observations are taken on a r.v.  $X$  having the p.d.f.  $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$

Suppose the interval  $(0,1)$  is divided into 4 equal parts.

Find the probability that equal number of observations lie in each of these parts. **[6+4]**



Total No. of Questions : 4]

SEAT No. :

P902

[Total No. of Pages : 3

[5315]-505

T.Y. B.Sc.

STATISTICS (Principal)

ST - 333 : Statistical Process Control (Online Methods)  
(2008 Pattern) (Semester - III)

Time : 2 Hour]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

A) Choose the correct alternative in each of the following: (1 each)

- i) Which of the following process control tool uses 80:20 principle?
  - a) Pareto Diagram
  - b) Histogram
  - c) Control Chart
  - d) Check Sheet
- ii) Which of the following limits are not determined directly by using sampled observations?
  - a) 0.001 probability limits
  - b)  $3\sigma$  limits
  - c) Control limits
  - d) Specification limits
- iii) \_\_\_\_\_ chart shows the centering of the process.
  - a)  $\bar{X}$
  - b) R
  - c) p
  - d) C
- iv) Natural tolerance band is always
  - a)  $3\sigma$
  - b)  $6\sigma$
  - c)  $\sigma$
  - d)  $2\sigma$

P.T.O.

- B) In each of the following, state whether the given statement is true or false. (1 each)
- $C_p \geq C_{pk}$  (always)
  - Pareto diagram is a simple bar diagram of causes.
- C) Define the following terms: (1 each)
- Defective
  - Modern definition of quality.
- D) i) State any two criteria for detecting lack of control situations. [1]
- ii) State any two disadvantages of variable control chart. [1]

**Q2)** Attempt any two of the following: (5 each)

- Give justification for the use of  $3\sigma$  control limits on control charts.
- Explain the construction of p-chart for fixed sample size when standards are not given.
- Write a short note on cause and effect diagram.

**Q3)** Attempt any two of the following: (5 each)

- A) A normally distributed quality characteristic is controlled by  $\bar{X}$  and R chart and it is found that the process is under control. It is given that for  $\bar{X}$  chart and for R chart.

$$\begin{array}{l|l} UCL_{\bar{X}} = 626 & UCL_R = 18.795 \\ CL_{\bar{X}} = 620 & CL_R = 8.236 \quad n = 4 \\ LCL_{\bar{X}} = 614 & LCL_R = 0 \end{array}$$

- Find estimate of process standard deviation.
  - If the specification limits were  $610 \pm 15$ , what would be the estimate of process fraction defectives?
- B) Distinguish between assignable causes and chance causes of variation.
- C) The following is a record of the number of point defects per unit for metal disk equipment painted by dipping 16, 15, 17, 15, 14, 16, 18, 17. Draw a suitable control chart and comment.

**Q4)** Attempt any one of the following:

- A) a) Distinguish Natural tolerance limit and Specification limit. **[4+6]**  
b) Define  $C_p$  and  $C_{pk}$ . Also interpret the following  
i)  $C_{pk} = 0$   
ii)  $C_{pk} = 1.33$
- B) a) Distinction between CRL and p-chart. **[5+5]**  
b) Write note on Online Process Control.



Total No. of Questions : 4]

SEAT No. :

**P903**

[Total No. of Pages : 7

**[5315]-506**

**T.Y. B.Sc. (Semester - III)**

**STATISTICS (Principal) (Paper - VI)**

**ST - 336 (A) : Operations Management**

**(Ele. - I) (2008 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory,*
- 2) Figures to the right indicate full marks.*
- 3) Use of statistical tables and calculator is allowed.*
- 4) Symbols and abbreviations have their usual meaning.*

**Q1)** Attempt each of the following:

A) Choose the correct alternative in each of the following: **[1 Each]**

- i) For the items that deteriorate gradually,
  - a) Operating and maintenance costs steadily increase with passage of time, whereas depreciation per year decreases with time
  - b) optimum replacement interval is the minimum time elapsing between the successive replacements
  - c) the annual maintenance cost and annual depreciation tend to decrease
  - d) all of the above
- ii) The decision makers knowledge and experience may influence the decision making process when using the criterion of,
  - a) realism
  - b) maximin
  - c) maximax
  - d) minimax regret
- iii) Economic order quantity results in,
  - a) equalization of carrying cost and procurement cost
  - b) minimization of setup cost
  - c) favorable procurement price
  - d) reduced chances of stock outs.

**P.T.O.**

- iv) In the context of network, which of the following is not correct?
- A network is a graphic representation of activities and nodes
  - A project network cannot have multiple initial and final nodes
  - An arrow diagram is essentially a closed network
  - An arrow representing an activity may not have a length and shape
- B) In each of the following cases state whether the given statement is true or false: **[1 Each]**
- If the unit cost rises, will optimum order quantity increase.
  - An activity has zero slack, it implies that it lies on critical path.
- C) Explain the following terms: **[1 Each]**
- Lead time.
  - Critical path.
- D) Explain the following terms: **[1 Each]**
- What is a replacement problem? When does it arise?
  - Explain any two differences between PERT and CPM.

**Q2) Attempt any two of the following: [5 Each]**

- a) The following are the details of estimated times of activities of a certain project

| Activity        | A  | B  | C | D  | E   | F    |
|-----------------|----|----|---|----|-----|------|
| Predecessor     | -  | -  | A | A  | B,C | D, E |
| Duration (days) | 16 | 20 | 8 | 10 | 6   | 12   |

Find the critical path and the expected time of the project. Hence, find total float and free float for each activity.

- b) Explain in brief Hurwitz criterion for the decision under uncertainty.
- c) The cost of a machine is Rs. 6100/- and its scrap value is Rs. 100/-. The maintenance cost found from past experience are as follows:

| Year         | 1   | 2   | 3   | 4   | 5   | 6    | 7    | 8    |
|--------------|-----|-----|-----|-----|-----|------|------|------|
| Running cost | 100 | 250 | 400 | 600 | 900 | 1200 | 1600 | 2000 |

When should the machine be replaced? Justify your answer.

**Q3)** Attempt any two of the following:

**[5 each]**

- a) Derive an expression for the economic lot size model with uniform rate of demand, instantaneous replenishment rate and no shortage.
- b) Under an employment promotion programme it is proposed to allow sale of newspapers on buses during off-peak hour. The vendor can purchase the papers at a special concessional rate of 25 paise and sell it for 40 paise. Any unsold copy is a dead loss. A vendor has estimated the following probabilities for the number of copies demanded

|               |      |      |      |      |      |      |
|---------------|------|------|------|------|------|------|
| No. of copies | 15   | 16   | 17   | 18   | 19   | 20   |
| Probability   | 0.04 | 0.19 | 0.33 | 0.26 | 0.11 | 0.07 |

Prepare a payoff table and find out how many copies should be ordered so that his expected profits will be a maximum.

- c) Explain the following terms used in PERT:
  - i) Pessimistic time
  - ii) Optimistic time
  - iii) Most likely time.

**Q4)** Attempt any one of the following:

- a) i) Write a note on VED analysis. **[5]**
- ii) A super bazaar must decide on the level of supplies it must stock to meet the needs of its customers during Diwali days. The exact number of customers is not known, but it is expected to be in one of the four categories: 300, 350, 400, or 450 customers. The table below provides these costs in thousands of rupees: **[5]**

| Customer category | Supplies level |    |    |    |
|-------------------|----------------|----|----|----|
|                   | A1             | A2 | A3 | A4 |
| E1                | 7              | 12 | 20 | 27 |
| E2                | 10             | 9  | 10 | 25 |
| E3                | 23             | 20 | 14 | 23 |
| E4                | 32             | 24 | 21 | 17 |

Determining the best level of supplies using Laplace criterion.

- b) A small project composed of seven activities, whose time estimates are listed in the table as follows: **[10]**

| Activity |          | Estimated duration (weeks) |                 |                  |
|----------|----------|----------------------------|-----------------|------------------|
| <i>i</i> | <i>j</i> | Most likely time           | Optimistic time | Pessimistic time |
| 1        | 2        | 1                          | 1               | 7                |
| 1        | 3        | 1                          | 4               | 7                |
| 1        | 4        | 2                          | 2               | 8                |
| 2        | 5        | 1                          | 1               | 1                |
| 3        | 5        | 2                          | 5               | 14               |
| 4        | 6        | 2                          | 5               | 8                |
| 5        | 6        | 3                          | 6               | 15               |

- i) Draw the project network.
- ii) Find the expected duration and variance of each activity. What is the expected project length?
- iii) Calculate the variance and standard deviation of project length. What is the probability that the project will be completed: i) at least 4 weeks earlier than expected? ii) no more than 4 weeks later than expected?
- iv) If the project due date is 19 weeks, what is the probability of meeting the due date?



Total No. of Questions : 4]

**[5315]-506**  
**T.Y. B.Sc. (Semester - III)**  
**STATISTICS (Principal) (Paper - VI)**  
**ST - 336 (C) : Time Series Analysis**  
**(2008 Pattern) (Ele : I)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) All questions are compulsory,*
- 2) Figures to the right indicate full marks.*
- 3) Use of scientific calculators and statistical tables is allowed.*
- 4) Symbols and abbreviations have their usual meaning.*

**Q1)** Attempt each of the following:

A) In each of the following cases, choose the correct alternative. **(1 each)**

i) In Time Series the types of Smoothing relationship is

- a)  $\hat{Y}_t = (1 - \alpha)\hat{Y}_{t-1} + a$
- b)  $\hat{Y}_t = (1 - \alpha)\hat{Y}_{t-1} + \alpha Y_{t-1}, \alpha \in (0,1)$
- c)  $\hat{Y}_t = (1 - \alpha)\hat{Y}_{t-1} + \alpha Y_{t+1}, \alpha \in R$
- d)  $\hat{Y}_t = (1 - \alpha)\hat{Y}_{t-1} + \alpha Y_{t-1}, \alpha \in R$

ii) A time series consist of:

- a) Short term variation
- b) Long term variation
- c) Irregular variation
- d) All of the above

iii) The data of time series should have time in

- a) Weeks
- b) Months
- c) Years
- d) Any unit of time

iv) Box – Cox transformation is

a)  $\frac{Y^\lambda - 1}{\lambda}, \lambda > 1$

b)  $\frac{Y^\lambda - 1}{\lambda}, \lambda < 1$

c)  $\frac{Y^\lambda - 1}{\lambda}, \lambda \neq 1$

d) None of these

B) State whether each of the following statement is **True or False**. [1 each]

i) Differencing is used to reduce stationary time series to non-stationary Series.

ii) Moving averages can give estimate of trend for future.

C) Define the following [1 Each]

i) Cyclical variation.

ii) Exponential smoothing.

D) i) State Stationary time series. [1]

ii) State AR(2) Model. [1]

**Q2)** Attempt any two of the following. [5 Each]

a) Explain the components of time series Analysis.

b) Explain in brief Durbin - Watson test.

c) Estimate the trend using 10 % smoothing constant for the following time series

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| t  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| Yt | 31 | 37 | 39 | 41 | 41 | 39 | 33 | 29 | 27 | 29 |

**Q3)** Attempt any two of the following. [5 each]

a) Fit a trend line to the following time series by the least squares methods. Obtain the trend value of production for 2016.

|                 |      |      |      |      |      |
|-----------------|------|------|------|------|------|
| Year(t)         | 2009 | 2010 | 2011 | 2012 | 2013 |
| Production (Yt) | 12   | 20   | 28   | 32   | 50   |

b) Explain the concept of moving averages. Also mention its merits and demerits

c) Write a note on Box — Jenkins time series modeling.

**Q4)** Attempt any one of the following.

- a) i) Explain utility of time series plots. [5]
- ii) Explain the use of transformation in time series. Explain any one type of transformation. [5]
- b) i) Write a note on double exponential smoothing [5]
- ii) Explain any one of the method for deseasonalizing a time series under multiplicative model. [5]

Total No. of Questions : 4]

SEAT No. :

P904

[Total No. of Pages : 2

**[5315]-601**  
**T.Y. B.Sc. (Semester IV)**  
**PHYSICS (Paper - V)**  
**PH - 345 (B) : Advanced Electronics**  
**(2008 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Use of log tables and calculator is allowed.*

**Q1)** Attempt all of the following (one mark each):

- a) Which material is used to construct NTC thermistors?
- b) Define the term : linearization of signals.
- c) Draw the circuit symbol for a photo diode.
- d) How the dosage of alum is decided in water purification process?
- e) Define the term : scan time for a PLC.
- f) State the principle of photo diode detector.
- g) What are the types of signal conditioning used in process control?
- h) State the working principle of narrow band pyrometer.
- i) What is discrete state process control?
- j) What is turbidity?

**Q2)** Attempt any two (five marks each)

- a) Explain the construction and working of photovoltaic detector with suitable diagram.

**P.T.O.**

- b) A metal wire shows following variation of resistance with temperature. Find the linear approximation for the resistance.

|       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|
| T(°C) | 50    | 55    | 60    | 65    | 70    | 75    | 80    |
| R(Ω)  | 150.0 | 162.5 | 170.1 | 175.0 | 180.2 | 184.2 | 190.0 |

- c) Draw a neat, labelled diagram for process control system.

**Q3)** Attempt any two (five marks each):

- Describe how analog control system can be used for continuous variation of temperature in an oven.
- State the main objectives of a control system. Discuss the terms - steady state regulation and transient regulation.
- What is chemical dosage in a water treatment plant? Discuss it with suitable diagram.

**Q4)** a) Attempt any one (Eight marks):

- Discuss the principle, construction and working of a broad band pyrometer using a neat diagram.
  - State the different types of motion; discuss the principle, construction and working of accelerometers.
- b) Attempt any one (Two marks):
- Discuss the principle of a bimetal strip temperature sensor in brief.
  - A RTD dissipates 20 mW/°C. If the temperature rise due to self heating is 0.55°C, determine the power dissipated in the RTD.



Total No. of Questions : 4]

SEAT No. :

P905

[Total No. of Pages : 4

**[5315]-602**  
**T.Y. B.Sc. (Semester IV)**  
**PHYSICS (Paper - VI) (Elective - II)**  
**PH - 346 (H) : Microcontrollers**  
**(2008 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of log table and calculator is allowed.*

**Q1)** Attempt all of the following (one mark each):

**[10]**

- a) What is the on-chip RAM space in 8051?
- b) What is PSW register in 8051?
- c) Convert 03FFH hex number in to decimal.
- d) Give the ASCII codes for '0' (zero) and 'A'.
- e) State function of instruction CLR A.
- f) Give format of TCON register.
- g) Write the instruction to set external interrupt O.
- h) Give the function of E (enable) of the LCD.
- i) State the use of TXD pin in 8051.
- j) Define the full duplex data transfer.

**Q2)** Attempt any two (five marks each)

**[10]**

- a) What are different groups (functional) of 8051 instructions? Give one example of each.
- b) With memory map explain internal memory organisation of 8051.
- c) How 8051 is interfaced to PC using RS 232 standard?

**P.T.O.**

**Q3) Attempt any two (five marks each):** **[10]**

- a) Write an assembly language program for finding the smallest number from the given set (an array) of numbers.
- b) Write an assembly language program for adding two 16-bit numbers 3377H and 6622H, store the result in R0 and R1 registers.
- c) Draw block diagram of 8051 microcontroller.

**Q4) A) Attempt any one** **[8]**

- i) List the timers of 8051 and their associated registers. Explain different modes of 8051 timers.
- ii) Explain 8051 logic instructions AND, OR, XOR complement and compare with one example of each.

**B) Attempt any one** **[2]**

- i) What is the stack? How it is used in calling the subroutines?
- ii) What are assembler directives? Explain DB, ORG.



Total No. of Questions : 4]

P905

[5315]-602

T.Y. B.Sc. (Semester IV)

PHYSICS (Paper - VI) (Elective - II)

PH - 346 (G) : Physics of Nanomaterials  
(2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams wherever necessary.

**Q1)** Attempt all of the following (1 mark each): **[10]**

- a) What is the meaning of word 'nano'?
- b) Name the scientist who delivered the historical talk "there's plenty of room at the bottom".
- c) Give an example of property of gold nano particles which is differ from bulk gold.
- d) State scherrer formula for diffraction from in nanomaterials.
- e) Enlist the four applications of nanomaterials.
- f) State two approches in the synthesis of nanomaterials.
- g) What are different types of carban nano tubes.
- h) Which detectors are typically used in a UV-vis-NIR spectrometer?
- i) Name any two nanomaterials prominently used in cosmetics.
- j) State hazardous effect of nanomaterials.

**Q2)** Attempt any two

- a) State and prove Bragg's law. **[5]**
- b) Explain : **[5]**
  - i) Atomic scattering factor
  - ii) Crystal structure factor.
- c) Explain working of transmission electron microscope (TEM) with suitable diagraph. **[5]**

**Q3)** Attempt any two:

- a) Write about the applications of nanomaterials in the field of medicine, electronics, sports, health and biology. [5]
- b) Explain with diagram, how the porous silicon is formed.
- c) What happens to the melting point, electrical conductivity and optical properties of nanoparticles compared to their bulk? [5]

**Q4)** a) Attempt any one : [8]

- i) Describe in detail UV- visible-NIR spectroscopy.
  - ii) Write a note on synthesis of nanoparticles by
    - 1) Sol-gel-method
    - 2) High energy ball milling
- b) Attempt any one :
- i) Name any two milestones in the development of nanotechnology. [2]
  - ii) State the magnitudes of resolution of SEM and TEM. [2]





b) In each of the following, state whether the given statement is true or false. **[1 each]**

i) Parallel system is a coherent system.

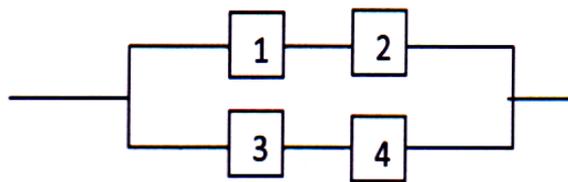
ii) In case of single sampling plan Average Total Inspection (ATI) always lies between  $n$  and  $N$ .

c) Define the following terms: **[1 each]**

i) Minimal cut vector

ii) Decreasing Failure Rate (DFR)

d) i) Draw the fault tree diagram for the following reliability **[1]**



ii) Explain the procedure of single sampling plan. **[1]**

**Q2)** Attempt **any two** of the following **[5 each]**

a) For a single sampling plan  $n = 100$ ,  $c = 3$  the lot is large as compared to sample size. Find the value of average outgoing quality AOQ if submitting lot has  $P = 0.03$

b) Explain: normal, reduced and tightened inspection.

c) Define reliability of a coherent system. Obtain reliability of parallel system with three components if all the components have same reliability.

**Q3)** Attempt **any two** of the following: **[5 each]**

a) Derive the expression of ATI in double sampling plan.

b) For the structure function  $1 - (1 - X_1 X_2)(1 - X_3 X_4)$  draw a reliability block diagram. Also find path vectors and path sets.

c) Write a short note on ISO.

**Q4)** Attempt **any one** of the following:

- a) i) Define hazard rate  $r(t)$ . Show that  $r(t) = \frac{f(t)}{\bar{F}(t)}$  ( $\bar{F}(t)$  is survival function)
- ii) Distinguish between 100% inspection and sampling inspection.
- [5 + 5]**
- b) i) For a double sampling plan with  $N=2000$ ,  $n_1 = 60$ ,  $C_1 = 1$ ,  $n_2 = 100$ ,  $C_2=3$ , find ATI if lots of quality  $p = 0.04$  are submitted for inspection.
- ii) Write note on acceptance sampling plan with rectification.
- [5 + 5]**



Total No. of Questions : 4]

SEAT No. :

P907

[Total No. of Pages : 4

[5315]-604

T.Y.B.Sc.

STATISTICS (Principal) (Paper - V)

ST - 345 : Operations Research

(2008 Pattern) (Semester - IV)

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

**Q1)** Attempt each of the following:

- A) Choose the correct alternative in each of the following: **[1 each]**
- i) The role of artificial variable in simplex method is
    - a) to obtain optimal solution
    - b) to get alternate solution
    - c) to facilitate initial basic feasible solution
    - d) to get standard form of LPP
  - ii) The solution of a transportation problem of dimension  $m \times n$  is said to be degenerate if it has
    - a) exactly  $m + n - 2$  allocations
    - b) less than  $m$  allocations
    - c) exactly  $m + n - 1$  allocations
    - d) less than  $m + n - 1$  allocations
  - iii) If the primal linear programming problem has un bounded solution then its dual has
    - a) infeasible solution
    - b) unique optimal solution
    - c) alternate solution
    - d) unbounded solution

**P.T.O.**

- iv) An assignment problem is balanced if
  - a) the cost matrix is rectangular
  - b) the cost matrix is square
  - c) the cost values are negative
  - d) the cost values are 1 or 0.
  
- B) State whether each of the following statements is true or false: **[1 each]**
  - i) Simulation is used to reduce the chances of failure to meet specifications.
  - ii) While sequencing  $m$  jobs on machines, the time required to transfer jobs between machines is negligible.
  
- C) Define each of the following: **[1 each]**
  - i) Standard form of LPP
  - ii) General sequencing problem
  
- D) i) Explain how to convert an unbalanced transportation problem to balanced one. **[1]**
- ii) State linear congruential generator that will generate pseudo random numbers. **[1]**

**Q2)** Attempt any two of the following: **[5 each]**

- a) What is a transportation problem? Give its mathematical formulation. Explain degeneracy with respect to transportation problem.
- b) A manufacturing company is engaged in producing three types of products A, B and C.

The production department produces components sufficient to make 50 units of A, 25 units of B and 30 units of C.

In the assembly department 100 man - hours are available daily to assemble the products. Assembly time required for a unit of A is 0.8 hrs and that for a unit of B and is 1.7 hrs and 2.5 hrs respectively.

Profit contribution per unit of A is Rs 12 and that of B and C is Rs 20 and Rs 45 each. The company has daily order commitment of at least 20 units of A and 15 units each of B and C.

Formulate above problem as linear programming problem.

c) Solve the following LPP using graphical method

$$\text{Maximize } Z = 2x_1 + 4x_2$$

Subject to

$$3x_1 + 2x_2 \leq 48$$

$$x_1 + 3x_2 \leq 42$$

$$x_1 + x_2 \leq 21$$

$$x_1, x_2 \geq 0.$$

**Q3)** Attempt any two of the following:

**[5 each]**

- Describe Monte Carlo method of simulation.
- Describe the Least Cost method to obtain initial basic feasible solution in case of transportation problem.
- Following table indicates processing time (in hrs) taken by two machines  $M_1$  and  $M_2$  to complete 8 jobs in the order  $M_1 M_2$ .

| Machines \ Jobs | A  | B | C  | D  | E  | F  | G  | H |
|-----------------|----|---|----|----|----|----|----|---|
| $M_1$           | 20 | 8 | 10 | 4  | 5  | 12 | 15 | 7 |
| $M_2$           | 8  | 5 | 13 | 11 | 12 | 8  | 13 | 6 |

Obtain the sequence of the jobs that will minimize total elapsed time.

**Q4)** Attempt any one of the following:

- Goods are transported from factories  $F_1, F_2, F_3$  to warehouses  $W_1, W_2, W_3$  and  $W_4$ .

Following matrix indicates per unit cost (in Rs) of transportation from factories to warehouses.

| Factory \ Warehouse | $W_1$ | $W_2$ | $W_3$ | $W_4$ | Availability |
|---------------------|-------|-------|-------|-------|--------------|
| $F_1$               | 48    | 60    | 56    | 54    | 140          |
| $F_2$               | 45    | 55    | 53    | 60    | 260          |
| $F_3$               | 50    | 63    | 60    | 62    | 360          |
| Requirement         | 100   | 300   | 150   | 210   |              |

Obtain optimal allocation to minimize total cost of transportation. [7]

ii) While solving LPP by simplex method, explain how to detect [3]

- 1) infeasible solution
- 2) unbounded solution

b) i) There are five jobs to be assigned to five machines. Following matrix shows the return in (100) rupees on assigning  $i^{\text{th}}$  job to  $j^{\text{th}}$  machine.  $i = 1, 2, \dots, 5, j = 1, 2, \dots, 5$

| Machines \ Jobs | A | B  | C  | D  | E  |
|-----------------|---|----|----|----|----|
| $M_1$           | 5 | 11 | 10 | 12 | 4  |
| $M_2$           | 2 | 4  | 10 | 7  | 14 |
| $M_3$           | 6 | 7  | 12 | 8  | 15 |
| $M_4$           | 7 | 8  | 13 | 5  | 10 |
| $M_5$           | 3 | 12 | 5  | 3  | 12 |

Obtain optimum assignment that will maximize the returns. [6]

ii) Write dual LPP for given primal LPP

$$\text{Maximize } Z = 3x_1 + 4x_2 - 7x_3$$

Subject to

$$x_1 + x_2 + x_3 \geq 5$$

$$2x_1 - 3x_2 \leq 15$$

$$4x_2 - 9x_3 = 12$$

$$x_1, x_2 \geq 0, x_3 \text{ unrestricted in sign.}$$

[4]





- iv) In epidemiology, logit function of probability  $\pi$  is given by
- A)  $\ln[(1 - \pi) / \pi]$                       B)  $\ln[\pi / (1 - \pi)]$   
 C)  $\ln[\pi(1 - \pi)]$                       D)  $\ln[\pi / (1 + \pi)]$
- b) In each of the following cases, state whether the given statement is true or false : **[1 each]**
- i) Correlation does not imply causation.  
 ii) Humans are used in preclinical trials.
- c) Define the following terms: **[1 each]**
- i)  $\pm 20\%$  role for assessment of bioequivalence  
 ii) blinding
- d) i) State the role of FDA. **[1]**  
 ii) Explain the term efficacy of drug. **[1]**

**Q2)** Attempt any *two* of the following: **[5 each]**

- a) Explain Mc Nemar's test for testing the hypothesis for symmetry of  $2 \times 2$  contingency table with help of an illustration.
- b) Explain in brief the discoveries in epidemiology made by the following:
- i) William Harvey  
 ii) Florence Nightingale
- c) Derive the equation for sigmoidal growth

**Q3)** Attempt any *two* of the following: **[5 each]**

- a) Suppose  $\mu_c$  and  $\mu_T$  denote the mean responses of two formulations control (C) and test (T) with unknown variance. Explain how you test  $H_0: \mu_T = \mu_c$  against  $H_1: \mu_T > \mu_c$ . Assuming equal sample sizes for both the test groups, find the expression of sample size of each group to get power  $1 - \beta$ .
- b) Write a short note on 'Parallel design' used in clinical trails.
- c) A survival model is defined by the following values of  $P_x$  for a radix of 1,00,000:

|                                |      |      |      |      |      |      |   |
|--------------------------------|------|------|------|------|------|------|---|
| Time Units (x)                 | 0    | 1    | 2    | 3    | 4    | 5    | 6 |
| Survival Probability ( $P_x$ ) | 0.95 | 0.90 | 0.80 | 0.50 | 0.30 | 0.10 | 0 |

Prepare life-table containing columns  $d_x, q_x, L_x, T_x, e_x$ .

**Q4)** Attempt any *one* of the following:

- a) i) Explain in brief Phase IV study in clinical trails. [5]  
 ii) Consider the following data on time and concentration for a hypothetical drug. Estimate  $C_{max}$ ,  $T_{max}$ . Also calculate  $AUC_{(0,12)}$  [5]

|                                 |      |      |      |   |     |     |     |     |     |     |
|---------------------------------|------|------|------|---|-----|-----|-----|-----|-----|-----|
| Time                            | 0.25 | 0.50 | 0.75 | 1 | 2   | 3   | 4   | 6   | 9   | 12  |
| Concentration<br>(microgram/ml) | 15   | 12.5 | 10.5 | 9 | 5.9 | 4.5 | 3.6 | 2.4 | 1.3 | 0.7 |

- b) i) Consider the following data on vision grades of two eyes of 7477 women factory workers. Grade 1 represent normal vision and Grade 4 is the weakest vision. Using Bowker test, test whether there is any relation between the grade of left eye and right eye. Use 5% level of significance.

Vision grades of eyes of women workers

|           |      |      |      |     |
|-----------|------|------|------|-----|
| Right eye | 1    | 2    | 3    | 4   |
| Left eye  |      |      |      |     |
| 1         | 1520 | 266  | 124  | 66  |
| 2         | 234  | 1512 | 432  | 78  |
| 3         | 117  | 362  | 1772 | 205 |
| 4         | 36   | 82   | 179  | 492 |

- ii) Define survival function and write down interpretation of  $S(x)$ . Also, state the properties of  $S(x)$ . [5]



Total No. of Questions : 4]

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[5315]-605

T.Y. B.Sc.

STATISTICS (Principal) (Paper - VI)

ST - 346 (B) : Statistical Ecology

(2008 Pattern) (Elective - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

- a) Choose the correct alternative in each of the following: [1 each]
- i) An exponential growth is characterized by a steadily \_\_\_\_\_ growth rate.  
A) increasing                      B) decreasing  
C) non - increasing              D) non - decreasing
  - ii) The growth of widely diverse organisms can be described by a \_\_\_\_\_ curve.  
A) Sigmoid                      B) Logistic  
C) Gompertz                      D) Normal
  - iii) In the study of rabbits which of the following model is used?  
A) Exponential                      B) Linear  
C) Logistic                      D) Leslie Matrix
  - iv) The population growth is zero if the intrinsic growth rate  $\lambda$  is  
A) 0                      B) 1  
C) greater than 1                      D) less than 1

b) In each of the following, state whether the given statement is true or false: **[1 each]**

i) Number of species in a community is called species richness.

ii) In case of a single recapture, Peterson's estimator is also m.l.e. of the population size (N).

c) Define each of the following: **[1 each]**

i) Gompertz curve

ii) Stable population

d) i) Explain the role of a Placebo in clinical trials.

ii) What is the role of FDA?

**[1 each]**

**Q2)** Attempt any two of the following: **[5 each]**

a) Explain Mc Nemar's test for testing the hypothesis for symmetry of  $2 \times 2$  contingency table with the help of an illustration.

b) Write a note on parallel designs used in clinical trials.

c) For a Gompertz model determine the maximum growth rate.

**Q3)** Attempt any two of the following: **[5 each]**

a) In Leslie matrix model state assumptions made, two kinds of parameters, model and its matrix representation.

b) Explain the concept of point to individual nearest neighbour distance in Poisson forest.

c) Explain the method of quadrant sampling to estimate the population density in a forest. Also discuss the scope and limitations of this method.

**Q4)** Attempt any one of the following:

- a) i) For a Gompertz model determine the maximum growth rate.
- ii) Discuss the states of equilibria in Gompertz growth model.

**[5+5]**

OR

- b) i) Describe the line transect method for estimating animal population in forest. What is rational behind using exponential detection function?
- ii) Describe capture - recapture method. Derive Peterson's estimator of population size (N) for single recapture in case of closed population.

**[5+5]**



Total No. of Questions : 4]

SEAT No. :

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[Total No. of Pages : 3

[5315]-606

T.Y.B.Sc.

STATISTICS (Principal) (Paper - VI)

ST - 346 (C) : Statistical Computing Using "R" Software  
(2008 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Each question is to be solved using R software installed on your computer.
- 4) Attach computer printout of your work to the answer book supplied to you.

Q1) Attempt each of the following:

[1 each]

- a) Draw a random sample of size 8 from a  $P(m=2.5)$ .
- b) Create a data frame of student name and marks obtained in one subject for 4 students.
- c) Find mode of the following observations:  
12, 16, 28, 23, 25, 27, 25, 19, 24, 25.
- d) Draw spike plot of the following data:  
x : 1 3 6 8 9  
f : 8 10 12 7 5
- e) Simulate an experiment of tossing a die 70 times and prepare its frequency distribution.
- f) Let  $X \sim B(n = 9, p = 0.6)$ , find  $P(X < 5)$  and  $P(X \geq 4)$ .
- g) Create a vector x of observations 12, 34, 25, 36, 48, 56, 28, 47. From x vector, create vector y containing elements of x greater than 40.
- h) Draw a SRSWR of size 2 from a population of 5 units.
- i) Access data CO2 and obtain its summary statistics.
- j) Let  $\sim N(7, 4^2)$ , compute  $P(-5 < X < 12)$ .

P.T.O.

**Q2)** Attempt any two of the following:

**[5 each]**

- a) Following are the data on the time in minutes required to fill the bottles by two machines A and B:

A : 8.1, 4.8, 3.9, 7.6, 8.2, 8.4, 6.9, 7.1

B : 3.9, 4.9, 7.5, 8.1, 8.3, 7.2, 5.8, 6.3

Can we conclude that average time required by two machines is same, test at 5% l.o.s.?

- b) Represent the following data by a simple bar diagram:

|                    |      |      |      |      |      |
|--------------------|------|------|------|------|------|
| Year               | 1995 | 1996 | 1997 | 1998 | 1999 |
| Profits (lakh Rs.) | 7.5  | 6.8  | 8.2  | 6.4  | 8.5  |

- c) A die is tossed 60 times with the following results:

|                          |   |    |    |    |   |   |
|--------------------------|---|----|----|----|---|---|
| Number On the upper face | 1 | 2  | 3  | 4  | 5 | 6 |
| Frequency                | 8 | 13 | 11 | 12 | 7 | 9 |

Compute mean deviation about mean.

**Q3)** Attempt any two of the following:

**[5 each]**

- a) Compute geometric mean and harmonic mean for the following data:

x: 0-5    5-10    10-15    15-20    20-25

f: 8    12    15    10    5

- b) Draw ogive curves for the following data:

|                |         |         |         |         |         |
|----------------|---------|---------|---------|---------|---------|
| Wage (in Rs.)  | 200-300 | 300-400 | 400-500 | 500-600 | 600-700 |
| No. of workers | 12      | 40      | 36      | 18      | 14      |

- c) Fit a Poisson distribution to the following data and find the expected frequencies:

|   |     |     |     |    |    |    |   |   |
|---|-----|-----|-----|----|----|----|---|---|
| X | 0   | 1   | 2   | 3  | 4  | 5  | 6 | 7 |
| f | 301 | 170 | 102 | 67 | 52 | 25 | 8 | 1 |

**Q4)** Attempt any one of the following:

- a) i) Calculate coefficient of variation for the following data:

| Marks           | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
|-----------------|------|-------|-------|-------|-------|-------|
| No. of students | 12   | 18    | 21    | 16    | 8     | 5     |

- ii) Draw a pie chart for the following data:

| Commodity    | Food | Clothing | Housing | Education | Misc. |
|--------------|------|----------|---------|-----------|-------|
| Expenses (%) | 30   | 15       | 15      | 20        | 20    |

**[6+4]**

- b) i) Carry out two way ANOVA for the following data of yield (in kgs):

|           | Manures |      |      |
|-----------|---------|------|------|
| Fertility | I       | II   | III  |
| F1        | 13.5    | 15.2 | 14.7 |
| F2        | 14.6    | 15.8 | 13.9 |
| F3        | 15.8    | 14.4 | 13.2 |
| F4        | 12.2    | 12.6 | 14.4 |

- ii) Compute Karl Pearson's coefficient of correlation and comment.

|   |   |    |    |    |    |
|---|---|----|----|----|----|
| x | 2 | 5  | 7  | 8  | 9  |
| y | 8 | 13 | 18 | 20 | 21 |

**[7+3]**

