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SEAT No. :

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P481

[5215] - 301

T.Y.B.Sc.

MATHEMATICS

MT - 331 : Metric Spaces

(2013 Pattern) (Paper - I) (Semester - III) (New Course) (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 $d(x, y) = |x + y|$ define a metric on $\mathbb{R}$? Justify.
- b) For $P = (x_1, x_2)$, $Q = (y_1, y_2) \in \mathbb{R}^2$, define a metric
 $d(P, Q) = |x_1 - y_1| + |x_2 - y_2|$. Find $S_1((0,0))$.
- c) Show that $A^\circ = A$, for any subset of discrete metric space X_d .
- d) Give an example of a subset of $\mathbb{R}_u$ which has
 - i) no limit point
 - ii) exactly one limit point
- e) Show that $(0, 1]$ and $[1, \infty)$ are homeomorphic under usual metric.
- f) Give an example of a closed subset of $\mathbb{R}_u$ which is neither compact nor connected.
- g) If A and B are dense in X , is $A \cup B$ dense in X ? Is $A \cap B$ dense in X ?

P.T.O.

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

- a) In metric space (X, d) , Prove that finite union of closed sets in X is closed. Is $\bigcup_{i=1}^{\infty} F_i$ closed in X , Where F_i is closed in X ?
- b) Let A and B be subsets of metric space (X, d) . Show that $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$.
- c) Let (X, d) be metric space. For $x, y \in X$ define $\delta(x, y) = \min \{1, d(x, y)\}$. Show that δ is a metric on X .

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

- a) Let (X, d) and (Y, δ) be metric spaces and $f : X \rightarrow Y$ be a function. Show that f is continuous on X if and only if $f^{-1}(G)$ is open in X whenever G is open in Y .
- b) Let (Y, d_y) be a subspace of a metric space (X, d) . If Y is complete then prove that Y is closed.
- c) Prove that $(0, 1)$ with absolute value metric is not complete but $(0, 1)$ with discrete metric is complete.

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

- a) Prove that a metric space is sequentially compact if and only if it has BWP (Bolzano Weierstrass Property).
- b) i) Let (X, d) be a metric space and $Y \subseteq X$ be connected. If $Y \subseteq A \cup B$ where A and B are separated sets in X then prove that either $Y \subseteq A$ or $Y \subseteq B$.
- ii) Prove that a subset of $\mathbb{R}_u$ is totally bounded if and only if it is bounded.



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P482

[5215] - 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) Let $f : \mathbb{R}^1 \rightarrow \mathbb{R}^2$ be function defined as $f(x) = (\cos x, \sin x)$, $x \in \mathbb{R}^1$. Find range of f .
- b) Prove that if B is countable subset of uncountable set A, then $A - B$ is uncountable.
- c) Give an example of divergent sequence $\{S_n\}_{n=1}^{\infty}$ such that $\{S_n\}_{n=1}^{\infty}$ is convergent.
- d) Find $\limsup_{n \rightarrow \infty}$ and $\liminf_{n \rightarrow \infty}$ of the sequence $\left\{ \sin\left(\frac{n\pi}{2}\right) \right\}_{n=1}^{\infty}$.
- e) Give an example of sequences $\{S_n\}$ and $\{t_n\}$ such that $S_n \rightarrow \infty$, $t_n \rightarrow \infty$ and $S_n - t_n \rightarrow 10$ as $n \rightarrow \infty$.
- f) Does the series $\sum_{n=1}^{\infty} \log\left(1 + \frac{1}{n}\right)$ converge or diverge? Justify.
- g) Show that series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n}{2n+1}$ diverges.

P.T.O.

Q2) Attempt any two of the following :

[10]

- a) If $f : X \rightarrow Y$ is function and if $A, B \subseteq X$ then prove that $f^{-1}(A \cup B) = f^{-1}(A) \cup f^{-1}(B)$.
- b) Show that countable union of countable sets is countable.
- c) If A is infinite set and $x \in A$ then show that A and $A - \{x\}$ are equivalent sets.

Q3) Attempt any two of the following :

[10]

- a) If sequence $\{S_n\}_{n=1}^{\infty}$ converges to L and $\{S_{n_k}\}_{k=1}^{\infty}$ is subsequence of $\{S_n\}_{n=p}^{\infty}$ then prove that $\{S_{n_k}\}_{k=1}^{\infty}$ converges to L .
- b) Prove that every convergent sequence is bounded. Is converse true? Justify.
- c) If $S_1 = \sqrt{2}$ and $S_{n+1} = \sqrt{2}\sqrt{S_n}$, $\forall n \geq 2$ then show that $\{S_n\}_{n=1}^{\infty}$ is convergent sequence. Hence evaluate $\lim_{n \rightarrow \infty} S_n$.

Q4) Attempt any one of the following :

[10]

- a) i) Prove that $\sum_{n=1}^{\infty} \frac{1}{n}$ is divergent series.
- ii) If $\{a_n\}_{n=1}^{\infty}$ is sequence of positive numbers such that $a_1 \geq a_2 \geq a_3 \geq \dots$ and $\lim_{n \rightarrow \infty} a_n = 0$ then prove that $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$ is convergent series.

b) i) Let $\sum_{n=1}^{\infty} a_n$ be a series of non zero numbers such that

$A = \limsup_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| < 1$ then prove that $\sum_{n=1}^{\infty} a_n$ converges absolutely.

ii) Define class l^2 . Also, prove that if sequence $\{S_n\}_{n=1}^{\infty} \in l^2$ then $\lim_{n \rightarrow \infty} S_n = 0$.



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[5215] -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 seperate answer books.*
- 4) *Tie answer books of both sections together.*

SECTION - I

(Metric Spaces)

Q1) a) Attempt any three of the following.

[6]

- i) Let $x = [0, 1)$ be absolute value metric space. Find $S_{\frac{1}{2}}\left(\frac{1}{4}\right)$ and $S_{\frac{1}{4}}\left(\frac{1}{2}\right)$
- ii) State whether true or false. Justify your answer. If $A \subset B \subset C$ and if A, C are connected then B is connected.
- iii) Prove that an open interval (a, b) in $\mathbb{R}_4$ is an open set.
- iv) Show by an example that intersection of an arbitrary family of open sets need not be open.

P.T.O.

b) Attempt any one of the following. [4]

i) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be the function given by

$$f(x) = \begin{cases} 1, & \text{If } x \text{ is rational} \\ 0, & \text{If } x \text{ is irrational} \end{cases}$$

show that f is discontinuous at every point. of $\mathbb{R}$

ii) Show that any discrete metric space is complete.

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

a) If A is any finite subset of a metric space then show that $X - A$ is open.

b) Let $\mathbb{R}^2$ be metric space with usual metric,

$$d(x, y) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2} \text{ for } x = (x_1, x_2), y = (y_1, y_2) \in \mathbb{R}^2$$

then find $A^\circ, B^\circ, (A \cup B)^\circ, \overline{A}, \overline{B}$ for $A = \mathbb{Q} \times \mathbb{Q}$ and $B = \mathbb{Q}^c \times \mathbb{Q}^c$

c) Show that $\mathbb{R}$ is not compact with respect to usual metric.

SECTION - II

(Real Analysis -I)

Q3) a) Attempt any three of the following: [6]

i) Give an example of a Cauchy sequence.

ii) Show that the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2$ is not one - one

iii) Is the series $\sum_{n=1}^{\infty} \frac{n+1}{n+4}$ convergent? Justify.

iv) If $S_n = \frac{10^n}{n!}$, then find $N \in \mathbb{I}$ such that $S_{n+1} < S_n, n \geq N$.

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

i) If $0 < x < 1$, then show that the sequence $\{x^n\}_{n=1}^{\infty}$ is converges to 0.

ii) Prove that the series $\sum_{n=0}^{\infty} \frac{1}{n!}$ is convergent.

Q4) Attempt any two of the following: [10]

a) Show that the Cantor set is uncountable.

b) If $S_n = \frac{1+2+\dots+n}{n^2}$, then show that the sequence $\{S_n\}_{n=1}^{\infty}$ is monotone, bounded and $\lim_{n \rightarrow \infty} S_n = \frac{1}{2}$.

c) For any $x > 0$ prove that the series $1 - \frac{x^2}{2!} + \frac{x^4}{4!} \dots$ and $x - \frac{x^3}{3!} + \frac{x^5}{5!} \dots$ converge absolutely.



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SEAT No. :

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P484

[5215] - 304

T.Y.B.Sc.

MATHEMATICS

MT-334 : Group Theory

(New Course) (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) Find all subgroups of Klein 4 - group V.
- b) Show that $\mathbb{Z}p$ has no proper nontrivial sub groups if p is a prime number.
- c) List all elements of $\mathbb{Z}_2 \times \mathbb{Z}_4$ and state the order of each element.
- d) Find all cosets of the subgroup $8\mathbb{Z}$ of $2\mathbb{Z}$.
- e) Let $\phi: G \rightarrow G'$ be a group homomorphism show that $\ker \phi$ is a normal sub group of G.
- f) Show that $H = \left\{ e, \begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \end{pmatrix} \right\}$ is not a normal subgroup of S_3
- g) Find the maximum possible order for an element of S_{10}

Q2) Attempt any two of the following:

[10]

- a) State and prove Lagrange's theorem for groups.

P.T.O.

- b) Let H be a subset of a group G . Show that H is a subgroup of G if and only if
- i) H is closed under the binary operation of G .
 - ii) the identity element e of G is in H .
 - iii) for all $a \in H$ it is true that $a^{-1} \in H$
- c) Let $\phi: \mathbb{Z} \rightarrow \mathbb{Z}_{10}$ be a group homomorphism such that $\phi(1) = 6$.
- i) Find $\phi(18)$
 - ii) Find $\ker \phi$
 - iii) To which group is $\mathbb{Z}/\ker \phi$ isomorphic?

Q3) Attempt any two of the following:

[10]

- a) Let $\phi: G \rightarrow G'$ be a group homomorphism. Show that ϕ is one-one if and only if $\ker \phi = \{e\}$.
- b) Show that $A_n (n \geq 2)$, the collection of all even permutations of $\{1, 2, \dots, n\}$
- i) is a subgroup of S_n .
 - ii) is a subgroup of order $\frac{n!}{2}$ of S_n .
 - iii) is a normal subgroup of S_n .
- c) Let $C(a) = \{x \in G / ax = xa, \text{ for all } x \in G\}$, for fixed a in group G . Then,
- i) Show that $C(a)$ is a subgroup of G .
 - ii) Find $C\left(\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}\right)$ in $GL(2, \mathbb{R})$.

Q4) Attempt any one of the following:

- a) i) Show that, following are three equivalent conditions for a subgroup H of a group G to be normal subgroup of G [6]

I. $ghg^{-1} \in H$ for all $g \in G$ and $h \in H$

II. $gHg^{-1} = H$ for all $g \in G$

III. $gH = Hg$ for all $g \in G$

- ii) Show that $\mathbb{Z}_4 \times \mathbb{Z}_6 / \langle (0,1) \rangle$ is isomorphic to $\mathbb{Z}_4$. [4]

- b) i) Show that M is a maximal normal subgroup of G if and only if G/M is simple. [6]

ii) Let $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix} \in S_6$ and

$$\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 1 & 3 & 4 & 5 & 2 & 6 \end{pmatrix} \in S_6$$

Then find I. $\sigma\tau$ [4]

II. σ^{-1}

III. $|\langle \sigma \rangle|$

IV. σ^{100}



Total No. of Questions : 4]

SEAT No. :

P485

[5215]-305

[Total No. of Pages : 2

T.Y.B.Sc.

MATHEMATICS

MT - 335 : Ordinary Differential Equations
(2013 Pattern) (Paper - V) (New Course) (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.*

Q1) Attempt any five of the following : **[10]**

- a) Find the general solution of the differential equation $(D^2 - 4D + 2)y = 0$.
- b) Find the particular solution of the differential equation $(D - 1)^3 (D + 1)y = e^x$.

c) If $X_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} e^t$, $X_2 = \begin{pmatrix} 2 \\ -3 \\ -3 \end{pmatrix} e^{4t}$, $X_3 = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} e^{-2t}$, Find the Wronskian $W(X_1, X_2, X_3)$ at $t = 0$.

d) Classify all singular points in the finite plane of the differential equation $x^3(x-1)y'' + (x-1)y' + 4xy = 0$.

e) Verify that $y = e^x$ is a solution of the differential equation $x^2y'' - (2x+1)y' + (x+1)y = 0$.

f) Construct the homogeneous differential equation with constant coefficients whose solution is $y = 7e^x \sin 2x$.

g) Find a power series solution of the form $\sum_{n=0}^{\infty} a_n x^n$ for the differential equation $y' = y$.

P.T.O.

Q2) Attempt any two of the following :

[10]

- a) With usual notation prove that $\frac{1}{f(D)}e^{ax} = \frac{x^r}{r!\phi(a)}e^{ax}$, where
 $f(D) = (D-a)^r \phi(D)$, $\phi(a) \neq 0$.
- b) Obtain the general solution of the differential equation $(D^2 + 4)y = \cos 2x$.
- c) Solve the differential equation $(D^2 - 4)y = e^{2x} + 2$, by using the method of undetermined coefficients.

Q3) Attempt any two of the following :

[10]

- a) Explain the method of variation of parameters to solve the second order differential equation $y'' + p(x)y' + q(x)y = R(x)$.
- b) Verify that $y_1 = x^2$ is a solution of $x^2y'' + xy' - 4y = 0$, use this fact to find another solution y_2 and general solution of this equation.
- c) Obtain the general solution of the differential equation
 $(D^2 - 3D + 2)y = \frac{1}{1 + e^{-x}}$, by using method of reduction of order.

Q4) Attempt any one of the following :

[10]

- a) i) If $W(t)$ is a Wronskian of the two solutions of the homogeneous system of differential equations of first order, then prove that $W(t)$ is identically zero or now here zero on $[a, b]$.
- ii) Solve : $\frac{dx}{dt} = x + y$, $\frac{dy}{dt} = 4x - 2y$.
- b) Find the general solution of $y'' + y = 0$, in terms of power series in x .



Total No. of Questions : 4]

SEAT No. :

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[5215]-306

[Total No. of Pages : 3

T.Y. B.Sc.

MATHEMATICS

**MT - 336 : Problem Course Based on MT - 334 and MT - 335
(2013 Patter) (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) *Write both sections on separate answer books and tie together*

SECTION - I

(Group Theory)

Q1) a) Attempt any Three of the following: **[6]**

- i) Is the set $H = \{e^x \mid x \in \mathbb{Z}\}$ closed under multiplication? Justify your answer.
- ii) Find the order of cyclic subgroup of $\mathbb{Z}_{30}$ generated by 25.
- iii) Find orbits of permutation $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 7 & 6 & 2 & 5 & 1 & 4 \end{pmatrix} \in S_7$.
- iv) Find all cosets of the subgroup $\langle 4 \rangle$ of $\mathbb{Z}_{12}$.

b) Attempt any one of the following: **[4]**

- i) Find the number of automorphisms of the group $\mathbb{Z}_6$. Justify your answer.
- ii) List all subgroups of $\mathbb{Z}_{36}$ and draw its subgroup diagram.

P.T.O.

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

- a) i) Let a and b be elements of a group G . Show that if ab has finite order n , then ba also has order n .
- ii) Let $\phi: G \rightarrow G'$ be a group homomorphism, and Let N be a normal subgroup of G . Show that
- I) $\phi[N] = \{\phi(n) | n \in N\}$ is a subgroup of G' .
- II) $\phi[N]$ is a normal subgroup of $\phi[G]$.
- b) i) Let H be a subgroup of $\mathbb{Z}_3 \times \mathbb{Z}_6$ generated by $(1, 1)$. List all elements of the factor group $\frac{\mathbb{Z}_3 \times \mathbb{Z}_6}{H}$. Also, find the order of $(2, 1) + H$.
- ii) Let $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 7 & 6 & 8 & 5 & 4 & 2 & 3 & 1 \end{pmatrix} \in S_8$. Then
- I) Express τ as product of disjoint cycles.
- II) Express τ as product of transpositions.
- III) Determine whether τ is odd or even permutation.
- IV) Find inverse of τ .
- V) Find order of τ .

SECTION - II

(Ordinary Differential Equations)

Q3) a) Attempt any three of the following: **[6]**

- i) Solve : $(D^2 + 5D + 6)y = 0$.
- ii) Show that the series $y = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$ satisfies the equation
- $y'' - y = 0$.
- iii) Solve: $(D^2 - 1)y = e^{2x}$.
- iv) Verify that $(e^{10t}, -2e^{10t})$ is a solution of the system:

$$\frac{dx}{dt} = 8x - y$$

$$\frac{dy}{dt} = 4x - 12y$$

- b) Attempt any one of the following: [4]
- Solve: $y'''(x) - y'(x) = 4e^{-x} + 3e^{2x}$ by using the method of undetermined coefficients.
 - Solve: $y'' - y = e^x$ by reduction of order method.

Q4) Attempt any Two of the following: [10]

- Solve: $(D^2 + 4)y = \sin 2x$.
- Solve: $y'' - y = 0$ by power series method.
- Solve:

$$\frac{dx}{dt} = 2x - 5y$$

$$\frac{dy}{dt} = 2x - 4y .$$



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[5215] - 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 calculator is allowed.*

Q1) Attempt any Five of the following :

[5×2=10]

- a) Write any two applications of operations research.
- b) What is degeneracy in transportation problem? How is it resolved?
- c) What is sensitivity analysis?
- d) What do you mean by unbalanced assignment problem? Give an example of unbalanced assignment problem.
- e) Find the feasible region of the following L.P.P.

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{Subject to } x_1 \leq 5$$

$$x_1 + x_2 = 5, \quad x_1, x_2 \geq 0$$

- f) Find any two basic solutions of the following L.P.P.

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{Subject to } x_1 + 3x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 6$$

$$x_1, x_2 \geq 0.$$

P.T.O.

- g) Find the Initial basic feasible solution of the following transportation problem by North-West corner method.

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	10	30	20	13	5
S ₂	22	9	7	16	10
S ₃	4	32	5	29	15
Demand	5	5	10	10	

Q2) Attempt any Two of the following : **[2×5=10]**

- a) A company can produce three types of clothes say A, B and C. The clothes are made of three colours of wools say red, green and blue. One unit of cloth A needs 2 meters of red wool and 3 meters of blue wool; one unit of cloth B requires 3 meters of red wool, 2 meters of green and 2 meters of blue wool and one unit of cloth C requires 5 meters of green wool and 4 meters of blue wool. The firm has only a stock of 800 meters of red wool, 1000 meters of green wool and 1500 meters of blue wool. Suppose that the profit per unit of clothes A, B and C is Rs.3, Rs.4 and Rs.5 respectively. Formulate the problem as LP to determine how the firm should use the available material so as to maximize the income from the finished clothes.
- b) Solve the following L.P.P. by graphical method.

$$\text{Minimize } z = 3x_1 + 5x_2$$

$$\text{Subject to } -3x_1 + 4x_2 \leq 12$$

$$2x_1 + 3x_2 \geq 12$$

$$x_1 \leq 4$$

$$x_2 \geq 2$$

$$x_1, x_2 \geq 0$$

c) Solve the following L.P.P. by simplex method.

$$\text{Maximize } z = x_1 + 2x_2 + 3x_3$$

$$\text{Subject to } x_1 + 2x_2 + 3x_3 \leq 10$$

$$x_1 + x_2 \leq 5$$

$$x_1 \leq 1$$

$$x_1, x_2, x_3 \geq 0$$

Q3) Attempt any Two of the following :

[2×5=10]

a) Solve the following assignment problem.

	I	II	III	IV	V
A	3	8	2	10	3
B	8	7	2	9	7
C	6	4	2	7	5
D	8	4	2	3	5
E	9	10	6	9	10

b) A cricket team captain wishes to allot five batting positions I, II, III, IV, V to five batsmen A, B, C, D, E on an average score from the past experience. The runs scored by these batsmen at the given position is as shown in the following table.

Number of runs scored at the position					
Batsmen	I	II	III	IV	V
A	54	52	44	64	54
B	62	64	63	59	57
C	46	34	20	29	31
D	44	44	39	29	54
E	24	23	24	22	29

Solve the assignment problem in order to achieve the score as maximum as possible. What is the maximum possible score?

- c) Find the Initial basic feasible solution of the following transportation problem by
- North - West corner method.
 - Least - cost method.
 - Which method gives better solution?

	I	II	III	Supply
A	5	1	7	10
B	6	4	6	80
C	3	2	5	15
Demand	50	20	50	

Q4) Attempt any One of the following :

[1×10=10]

- a) Solve the dual of the following problem. Hence find the optimal solution of the primal from the solution of the dual.

$$\text{Minimize } z = x_1 + x_2$$

$$\text{Subject to } x_1 + 2x_2 \geq 2$$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0$$

- b) Find the Initial basic feasible solution of the following transportation problem by VAM. Also find the optimal solution.

Warehouse Factory ↓	W ₁	W ₂	W ₃	W ₄	Supply
F ₁	19	30	50	10	7
F ₂	70	30	40	60	9
F ₃	40	8	70	20	18
Capacity	5	8	7	14	



Total No. of Questions : 4]

SEAT No. :

P488

[5215]-308

[Total No. of Pages : 2

T.Y.B.Sc.

MATHEMATICS

MT- 337 (B) : Dynamical Systems

(2013 Pattern) (New Course) (Paper-VII) (Semester-III) (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) Give an example of a linear system for which $(3e^{2t} + e^{-2t}, e^{2t})$ is a solution.

b) Find $\exp(3A)$ where $A = \begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$.

c) Find the stable and unstable line of the system $X' = \begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix} X$.

d) Sketch the direction field associated to the system $x' = y, y' = -x$.

e) Let A and B be 2×2 matrices with real entries. If $AB = I_{2 \times 2}$ then show that $BA = I_{2 \times 2}$.

f) Find a basis of $\ker T$ where $T = \begin{bmatrix} 1 & 9 & 6 \\ 1 & 4 & 1 \\ 2 & 7 & 1 \end{bmatrix}$.

g) Is the equilibrium point $(0, 0)$ a source for the system $X' = \begin{bmatrix} -1 & 2 \\ 0 & -3 \end{bmatrix} X$?

Justify.

P.T.O.

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

- a) Let A be a 2×2 matrix for which λ is the only eigenvalue. Show that there

exists a 2×2 matrix T such that, $T^{-1}AT = \begin{bmatrix} \lambda & 1 \\ 0 & \lambda \end{bmatrix}$.

- b) Find the matrix T that puts $A = \begin{bmatrix} 1 & 1 \\ -1 & 3 \end{bmatrix}$ in canonical form.

- c) Find the general solution of the system $X' = \begin{bmatrix} -1 & 0 \\ 1 & -2 \end{bmatrix} X$ and sketch the phase portrait.

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

- a) Prove that the eigenvectors of a 2×2 matrix corresponding to distinct real eigenvalues are linearly independent.

- b) Find the general solution of $X' = AX$ by obtaining canonical form of

$$A = \begin{bmatrix} 2 & 5 \\ -1 & 0 \end{bmatrix}.$$

- c) Find the general solution of $X' = \begin{bmatrix} 1 & 1 \\ -1 & 3 \end{bmatrix} X$.

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

- a) Let A , B and T be $n \times n$ matrices. Show that

i) If $B = T^{-1}AT$ then $\exp(B) = T^{-1}\exp(A)T$.

ii) $\exp(-A) = (\exp A)^{-1}$

iii) If $AB = BA$ then $(\exp A)B = B(\exp A)$

- b) Find the matrix T that puts $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ in its canonical form. Find the canonical form of A .

- c) Find exponential of $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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[5215] - 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 non-programmable calculator is allowed.*

Q1) Attempt any five of the following:

[10]

- a) Explain assignment operators.
- b) Evaluate expression $5\% 10 * 2 + 6 - 3$.
- c) Write declaration for the function named 'average' for integer type having three arguments x, y, z of integer type.
- d) Explain use of gets and puts.
- e) Write syntax of a for loop.
- f) Which of the following are valid identifiers
 - i) Breack
 - ii) Class1
- g) What is ASCII code? Give an example.

Q2) Attempt Any Two of the following:

[10]

- a) What is difference between white and do while loop. Explain.
- b) Write a short note on scanf statement. Illustrate it by giving an example.
- c) Write a C program to check whether the given number is even or odd.

P.T.O.

Q3) Attempt any two of the following:

[10]

- a) Write a short note on a switch statement.
- b) Write a note on a string and explain the functions `strlen ( )`, `strcpy ( )` and `strcat ( )`.
- c) Write a C program to find transpose of a given matrix.

Q4) Attempt any one of the following:

[10]

- a)
 - i) Write a short note on user defined function. Give an example.
 - ii) Write a C program to check whether the given number is palindrome or not.
- b)
 - i) Explain if - else statement with an example.
 - ii) Describe the output for the following C program.

```
# include <stdio.h>

main ( )
{
    int i = 0, x = 0;
    while (i < 20)
    {
        if (i % 5 == 0)
        {
            x += i;
            printf ("%d", x);
        }
        ++i;
    }
    printf ("\n x = %d", x);
}
```



Total No. of Questions : 4]

SEAT No. :

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P490

[5215]-310

T.Y. B.Sc.

MATHEMATICS

MT - 337(D) : Lattice Theory

(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 indicate full marks.*

Q1) Attempt any five of the following:

[10]

- a) Define order isomorphism between two ordered sets.
- b) Draw the diagram of the lattice of all subgroups of Klein 4-group V_4 .
- c) Find all down sets in $\bar{2}$, where $\bar{2}$ is an antichain of two elements.
- d) Define ideal in a lattice.
- e) Prove that every distributive lattice is modular.
- f) Draw a circuit diagram of $f = (z \wedge w) \wedge (x \vee y')$.
- g) Define Boolean lattice.

Q2) Attempt any two of the following:

[10]

- a) State and prove connecting lemma.
- b) Prove that every ideal of a lattice L is a sub lattice of L . Is converse true? Justify.
- c) Let L and K be two lattices and $f : L \rightarrow K$ a map. Prove that f is a lattice isomorphism if and only if f is an order isomorphism.

P.T.O.

Q3) Attempt any two of the following:

[10]

- a) Show that a lattice L is a chain if and only if every non empty subset of it is a sublattice.
- b) Let $\mathbb{N}$ be the lattice of all natural numbers under divisibility as a partial order relation and p be a prime number in $\mathbb{N}$. Show that the set $I = \{1, p, p^2, \dots\}$ is an ideal of $\mathbb{N}$.
- c) Draw lattice diagram of $3 \times (1 \oplus 2^2)$.

Q4) Attempt any one of the following:

[10]

- a)
 - i) Prove that homomorphic image of a distributive lattice is distributive.
 - ii) If L is a distributive lattice then prove that $a \vee (b \wedge c) = (a \vee b) \wedge (a \vee c)$ holds for all $a, b, c \in L$.
- b)
 - i) In a Boolean Algebra L , prove that $(a \wedge b)' = a' \vee b'$ and $(a \vee b)' = a' \wedge b'$.
 - ii) Put the following function in disjunctive normal form

$$f = (a' \wedge b) \vee [c \wedge (a' \vee b)]$$



Total No. of Questions : 4]

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[5215]-311

T.Y.B.Sc.

MATHEMATICS

MT-337 (E) : Financial Mathematics

(2013 Pattern) (Semester - III) (Paper-VII) (911E3) (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) *Use of non-programmable calculator is allowed.*

Q1) Attempt any five of the following:

[10]

- a) If S consist of the pair (q,p) such that $5q-3p=15$. Determine the supply function $q^s(p)$ and inverse supply functions $p^s(q)$.
- b) Suppose that, in the market described as follows: S consists of the pairs (q,p) such that $2p-3q=12$ and D consists of the pairs (q,p) such that $2p+q=20$, an excise tax of 2 per unit is imposed. Determine the new equilibrium market price and quantity.
- c) Explain when cobweb model is unstable?
- d) Define the term: perfect competition.
- e) Define the term: Monopoly.
- f) Define the term: Breakeven point.
- g) What is the Leontief matrix.

P.T.O.

Q2) Attempt any two of the following.

[10]

- a) Suppose the supply and demand sets for Glenbowley single malt whisky are as follows: S consists of the pairs (q, p) for which $q - 3p = -5$, and D consists of the pairs such that $q + 2p = 145$. Here, p is the price per bottle, measured in dollars, and q is the number of thousands of bottles sold. Determine the supply and demand functions q^S, q^D , and the inverse supply and demand functions p^S, p^D . Suppose now that the government imposes an excise tax of \$T per bottle. What will be the new selling price and quantity sold?
- b) An amount of \$2000 is invested and attracts interest at a rate equivalent to 8% per annum. Find the total after one year if the interest is compounded
- (i) annually (ii) quarterly
(iii) monthly (iv) daily
- (Assume the year is not a leap year.)
- c) Suppose that the supply and demand functions for a commodity are $q^S(p) = 3p - 21500$, $q^D(p) = 8500 - p$. Assuming that the suppliers operate according to the cobweb model, find a recurrence equation for the sequence p_t of prices. Find the explicit solution given that $p_0 = 7499$, and describe in words how the sequence p_t behaves.

Q3) Attempt any two of the following.

[10]

- a) Suppose that you have just inherited an asset whose current market value is \$2000. Assume that the market value will increase steadily at a rate of \$300 per annum, and that the interest rate on bank deposit will be compounded continuously at the equivalent annual rate of 6%. Explain why the present value of the amount realised by selling the asset after t years is $p(t) = (2000 + 300t) \exp(-0.06t)$, and determine the optimum time to sell.
- b) Find the maximum value of the function $f(x) = x^4 - 8x^3 + 16x^2 - 7$ in the interval $[1, 4]$.
- c) Show that if the demand function for a good is $q^D(p) = a - bp$ for some positive constants a and b , then the demand is inelastic in the range $0 < p < \frac{a}{2b}$.

Q4) Attempt any one of the following.

[10]

- A) a) Suppose that Quality klidgets Limited is an efficient small firm with cost function $c(q) = q^3 - 10q^2 + 100q + 196$ and suppose also that the maximum level of weekly production is $L=10$.

In this case verify that

- i) at startup, the marginal cost equals the average variable cost;
 - ii) at startup, the derivative of the average variable cost is 0;
 - iii) at breakeven, the marginal cost equals the average cost;
 - iv) at breakeven, the derivative of the average cost is 0.
- b) The supply function for a good is $q^s(p) = ap^3 + bp^2 + c$,
for some constants a, b, c . When $p = 1$, the quantity supplied is 1;
when $p = 2$, the quantity supplied is 11; when $p = 3$, the quantity
supplied is 35. Find the constants a, b, c .

- B) a) A factory makes two goods, grommets and widgets. To make \$1 worth of grommets requires \$0.1 worth of widgets, and to make \$1 worth of widgets requires \$0.15 worth of grommets and \$0.05 worth of widgets. There is an external demand for \$500 worth of grommets and \$1000 worth of widgets. What should be the total production of each commodity?

- b) Suppose we are given an input-output model with two industries,
for which the matrix of coefficients is $A = \begin{bmatrix} 0.2 & 0.2 \\ 0.1 & 0.3 \end{bmatrix}$.

Write down the eqⁿ which determines the production schedule $\bar{x}$ in terms of the external demand $\bar{d}$ and solve it.



Total No. of Questions : 4]

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P492

[5215]-312

[Total No. of Pages : 2

T.Y.B.Sc.

MATHEMATICS

MT- 337 (F): Number Theory

(2013 Pattern) (Paper-VII) (Semester-III) (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 $(a, m) = (b, m) = 1$, then prove that $(ab, m) = 1$.
- b) Find the number of positive integers ≤ 3600 that are not prime to 3600.
- c) If x, y, z is a primitive Pythagorean triplet. Show that both x, y cannot be even integers.
- d) Find the remainder when 11^{903} is divided by 13.
- e) Find the highest power of 7 dividing $2000!$
- f) For $n = 3000$, Evaluate $d(n)$ and $\sigma(n)$.
- g) By using the lemma of Gauss, find $\left(\frac{5}{19}\right)$.

Q2) Attempt any two of the following:

[10]

- a) Let p be an odd prime. Prove that if there exist an integer x such that $p|(x^2+2)$ then $p \equiv 1$ or $3 \pmod{8}$.
- b) Find all intergers x and y such that $147x + 258y = 369$.
- c) Given integers a and b , with $a > 0$, show that there exists unique integers q and r such that $b = aq + r$, where $0 \leq r < a$.

P.T.O.

Q3) Attempt any Two of the following :

[10]

- a) Solve the system of linear congruences $x \equiv 3 \pmod{11}$, $x \equiv 5 \pmod{19}$, $x \equiv 10 \pmod{29}$.
- b) If p is an odd prime and $(a, 2p) = 1$ then $\left(\frac{a}{p}\right) = (-1)^t$, where $t = \sum_{j=1}^{\frac{p-1}{2}} \left[\frac{ja}{p}\right]$.
- c) If $F(n) = \sum_{d|n} f(d)$ for every positive integer n , then show that

$$f(n) = \sum_{d|n} \mu(d) F\left(\frac{n}{d}\right).$$

Q4) Attempt any one of the following:

[10]

- a) i) Show that the positive primitive solutions of $x^2 + y^2 = z^2$ with y even are $x = r^2 - s^2$, $y = 2rs$, $z = r^2 + s^2$, where r and s are arbitrary integers of opposite parity with $r > s > 0$ and $(r, s) = 1$.
- ii) Show that $61! + 1 \equiv 63! + 1 \equiv 0 \pmod{71}$.
- b) i) An elephant worth Rs. 10, a horse Rs. 1 and 8 camels together Rs. 1. How many elephants, horses and camels totaling 100, can be bought for Rs. 100.
- ii) For every positive integer n , prove that $\sigma(n) = \prod_{p^\alpha || n} \left(\frac{p^{\alpha+1} - 1}{p - 1} \right)$. Hence find $\sigma(280)$.



Total No. of Questions : 4]

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[5215]-313

T.Y.B.Sc.

PHYSICS

**PH- 331: Mathematical Methods in Physics-II
(2013 Pattern) (Paper-I) (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.*

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

[10]

- a) State expression for $\vec{\nabla} \times \vec{F}$ in curvilinear co-ordinate system.
- b) What are co-ordinate axes?
- c) Draw experimental diagram of Michelson Morley experiment.
- d) The concept of simultaneity has only relative & not an absolute meaning. Comment.
- e) Define partial differential equation & state one example.
- f) State order & degree of differential equation $\frac{d^3 y}{dx^3} + \sqrt{\frac{d^2 y}{dx^2}} + x = 0$.
- g) State generating function for Hermite polynomial.
- h) Rodrigue's formula for Legendre polynomial is $p_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$.
Then find $P_0(x)$ & $P_1(x)$.
- i) Define time dilation.
- j) State Fuck's theorem.

P.T.O.

Q2) Attempt any two of the following: (5 marks each) **[10]**

- a) Prove that cylindrical co-ordinates are orthogonal.
- b) Calculate K.E. of moving electron with velocity $0.98 C$, where C is speed of light.
- c) Separate the variables of $\nabla^2 \psi = 0$ in spherical polar co-ordinate system

if
$$\nabla^2 = \frac{\partial^2}{d\gamma^2} + \frac{2}{\gamma} \frac{\partial}{\partial \gamma} + \frac{1}{\gamma^2 \sin \theta} \frac{\partial}{\partial \theta} \left(\sin \theta \frac{\partial}{\partial \theta} \right) + \frac{1}{\gamma^2 \sin^2 \theta} \frac{\partial^2}{\partial \phi^2}.$$

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

- a) Show that $x = 1$ is regular singular point of equation $x(x-1)y'' + [(1+a+b)x+c]y' - \alpha y = 0$.
- b) Prove that $P'_{n+1}(x) = (n+1)P_n(x) + xP'_n(x)$.
- c) Find the elements of arc length & volume element in spherical polar co-ordinate system.

Q4) A) Attempt any one of the following: **[8]**

- i) Obtain series solution by Frobenius method at $x = 0$ for $x^2 y'' + xy' + (x^2 - n^2)y = 0$ for the case $k = n$ & $a_1 = 0$.

- ii) a) Show that substitution of $\phi(x) = H_n(x)e^{-x^2/2}$ reduces the

equation $\frac{d^2 \phi}{dx^2} + (2n+1-x^2)\phi = 0$ to Hermite differential equation.

- b) Explain Length contraction on the basis of Lorentz transformation.

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

- i) A rocketship leaves the earth at speed $0.98C$. How much time does it take for minute hand of a clock in ship to make complete revolution as measured by observer on earth.
- ii) Given point $A(x = 2, y = 3, z = -1)$. Then find corresponding spherical polar co-ordinates.



Total No. of Questions :4]

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[5215] - 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 whenever 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) State Bragg's diffraction condition in direct lattice.
- c) Give any two applications of SEM.
- d) Give the names of two characterization techniques.
- e) Define mean free path.
- f) State Hall effect.
- g) Define mobility.
- h) Define Miller indices.
- i) What is Neel's temperature?
- j) Define superconductivity.

Q2) Attempt any two (five marks each)

[10]

- a) Obtain an expression for interplanar distance. Hence show that for simple

cubic system
$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}.$$

P.T.O.

- b) Show that Bragg's diffraction condition in the reciprocal lattice is $2\vec{K} \cdot \vec{G} + G^2 = 0$.
- c) Write a note on type - I and type - II superconductors.

Q3) Attempt any two (five marks each).

[10]

- a) In a unit cell of simple cubic structure, find the angle between the normals to the pair of planes whose Miller indices are
 - i) (100) and (010) and
 - ii) (121) and (111).
- b) X - rays with $\lambda = 1.54 \text{ \AA}$ are used to calculate the spacing of (200) planes in aluminium. The Bragg's angle for first order reflection is 22.4° . What is the size of unit cell of the aluminium crystal?
- c) Calculate magnetic susceptibility of a material assuming one electron and taking $m = 9.1 \times 10^{-31} \text{ kg}$, $R = 0.1 \text{ mm}$, $N = 5 \times 10^{28}/\text{m}^3$, and $e = 1.6 \times 10^{-19} \text{ coulomb}$.

Q4) a) Attempt any one (eight marks).

[8]

- i) Write detailed note on TGA and SEM.
- ii) Obtain an expression for energy levels and density of states in one dimension.

b) Attempt any one (two marks).

[2]

- i) Sketch (100) and (101) planes in simple cubic cell.
- ii) What are ferrites? Give two examples.



Total No. of Questions :4]

SEAT No. :

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[5215] - 315

T.Y.B.Sc.

PHYSICS

PH-333: Classical Mechanics (Paper-III)
(2013 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 labelled diagrams wherever necessary.*
- 4) Use of logtables and calculators is allowed.*

Q1) Attempt all of the following (1mark each)

[10]

- a) What is centre of mass of the system of particles?
- b) Find the angle of projection at which range of the projectile is maximum.
- c) Determine the reduced mass of system of two particles having equal masses.
- d) State keplers second law of planetary motion.
- e) What do you mean by elastic scattering?
- f) What is impact parameter?
- g) What are cyclic co-ordinates?
- h) What do you mean by degrees of freedom?
- i) Define poisson's bracket.
- j) What are canonical transformations?

P.T.O.

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

- a) Obtain the differential equation for the orbit in central force motion.
- b) What is inelastic scattering? Obtain Q- value equation in inelastic scattering.
- c) What are constraints? Give the classification of constraints.

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

- a) Estimate the duration of the year if the distance between sun and earth is suddenly reduced to half of the present distance.
- b) An electron moving with velocity of $\vec{V} = (2 \times 10^6) \hat{i} + (3 \times 10^6) \hat{j} \text{ m/s}$ through magnetic field of induction $\vec{B} = (0.04) \hat{i} - (0.12) \hat{j}$ in tesla. Find the force acting on the electron.

- c) Prove that the partial derivative of any poisson bracket satisfies

$$\frac{\partial}{\partial t} [u, v] = \left[\frac{\partial u}{\partial t}, v \right] + \left[u, \frac{\partial v}{\partial t} \right]$$

Q4) A) Attempt any one of the following : [8]

- a) State and explain the principle of rocket motion. Obtain an expression for instantaneous velocity of the rocket in vertical direction.
- b) What are the advantages of Hamiltonian formulation on Lagrangian formulation. Obtain Hamiltonian and Hamilton's equation of motion for a simple pendulum from its Lagrangian.

B) Attempt any one of the following. [2]

- a) What do you mean by geosynchronous orbit of a satellite?
- b) State the principle of virtual work.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P496

[5215] - 316

T.Y.B.Sc.

PHYSICS

**PH -334: Atomic and Molecular Physics
(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 logtable and calculator is allowed.*

Q1) Attempt all of the following (One mark each)

[10]

- a) What are Stoke's and antistoke's lines in Raman effect?
- b) Define reduced mass of a diatomic molecule.
- c) Give three types of molecular spectra.
- d) State Duane and Hunt's Law in X-rays.
- e) What is anomalous Zeeman effect?
- f) Define multiplicity of an atomic state.
- g) Determine values of L of two electron system with $l_1 = 3$ and $l_2 = 2$.
- h) What is quantum state of an electron?
- i) State Bohr's third postulate for hydrogen atom.
- j) Determine the values of S,L and J for the atomic state $^2D_{3/2}$

P.T.O.

Q2) Attempt any Two of the following:

- a) What is normal Zeeman effect? Obtain an expression for normal Zeeman effect in the form:

$$\nu = \nu_0 + \Delta m_l \frac{eH}{4\pi m}$$

where symbols have usual meanings. [5]

- b) Give the comparison of X-ray spectra and optical spectra. [5]
c) Discuss an experimental setup to observe the Raman effect. [5]

Q3) Attempt any Two of the following:

- a) Calculate the linear velocities of an electrons in first, fourth and tenth orbits of hydrogen atom.

Given: $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$, $h = 6.64 \times 10^{-34} \text{ JS}$, $e = 1.6 \times 10^{-19} \text{ C}$ [5]

- b) Determine all the atomic terms for p-d electron system using L-S coupling and draw the necessary vector diagrams. [5]
c) Determine the ground state of Aluminium atom ($Z = 13$), and represent it in spectral notation. [5]

Q4) a) Attempt any one of the following:

- i) Show that the vibrational energy levels of diatomic molecule are given by an expression

$$E_v = \left(v + \frac{1}{2} \right) \frac{h}{2\pi} \sqrt{\frac{K}{\mu}}$$

Discuss the vibrational spectra. [8]

- ii) Discuss the different series in case of sodium spectra with energy level diagram. [8]

b) Attempt any one of the following:

- i) Give any two applications of Moseley's Law. [2]
ii) Give any two limitations of Bohr's theory of hydrogen atom. [2]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5215]-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) Define roundoff errors.
- b) What are keywords?
- c) What is user defined function?
- d) What is flow-chart?
- e) Why break statement used?
- f) What is the use of switch statement?
- g) Write general format of scanf function.
- h) Give uses of gets () & puts () functions.
- i) What is pixel?
- j) What are library functions?

Q2) Attempt any two of the following.

- a) What are the operators? Explain any four operators used in 'C' language.[5]
- b) Write 'C' program to draw line, circle, ellipse & bar. [5]
- c) Evaluate $\int_4^{5.2} \ln(x) dx$ using Trapezoidal rule with six steps. [5]

P.T.O.

Q3) Attempt any two of the following.

- a) State and explain any two storage classes. [5]
- b) What is an array? Explain with suitable examples. [5]
- c) Find the root of equation $x^4 - x - 10 = 0$ using Newton-Raphson method. [5]

Q4) A) Attempt any one of the following.

- a) i) Describe Simpson's $1/3^{\text{rd}}$ method of computing integral. [4]
- ii) What is meant by looping? Describe two forms of looping. [4]
- b) i) Write C program to convert temperature in Fahrenheit to Centigrade using $C = (F - 32) / 1.8$ [4]
- ii) What is algorithm? Explain with example. [4]

B) Attempt any one of the following.

- a) Distinguish between Low level & High level programming languages. [2]
- b) Find the output of the following 'C' program [2]

```
#include <stdio.h>

main ( )
{
    int digit = 0;
    while (digit <= 3)
    {
        printf ("%d\n", digit);
        ++ digit;
    }
}
```



Total No. of Questions : 4]

SEAT No. :

P498

[5215]-318

[Total No. of Pages : 12

T.Y. B.Sc.

PHYSICS

**PH - 336(A) : Astronomy and Astrophysics
(2013 Pattern) (Semester - III) (Paper - VI) (Elective - 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 diagram wherever necessary.*

Q1) Attempt all of the following: (1 mark each)

[10]

- a) What is meant by Chandrashekhar limit?
- b) Where do we use a coronagraph?
- c) What is Solar Flare?
- d) Distinguish between Absolute and Apparent luminosity of a stars.
- e) What is an Asteroid?
- f) Where does Gravitational condensation occur?
- g) What are binary stars?
- h) What is Bodes law used for?
- i) What is the disadvantage of a Newtonian telescope?
- j) What is the difference between absorption and Emission spectra?

Q2) Answer any two: (5 marks each):

[10]

- a) What are pulsars?
- b) Write a short note on the Hubble space telescope.
- c) How is rotational period of a stars obtained from its spectra?

P.T.O.

Q3) Answer any two: (5 marks each)

[10]

- a) What are the advantages of using Radio telescope?
- b) What is the difference between sydonic and syndered time?
- c) Explain the proton-proton cycle in stars.

Q4) a) Attempt any one:

[8]

- i) Which evidences support the Big Bang theory?
- ii) Describe the H-R diagram in detail.

b) Attempt any one:

[2]

- i) Write a short note on Doppler effect in light.
- ii) What is meant by Super Nova Explosion?



Total No. of Questions : 4]

P498

[5215]-318

T.Y. B.Sc.

PHYSICS

**PH - 336(B) : Elements of Material Science
(2013 Pattern) (Paper - VI) (Semester - III) (Elective - 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.*
- 3) Draw neat diagrams wherever necessary.*

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

[10]

- a) Define dielectric strength of material.
- b) Define hardness of material.
- c) What do you mean by degree of polymerization?
- d) State any two characteristics of polymers.
- e) What do you mean by single phase alloys?
- f) State lever rule regarding quantity of phases.
- g) State the properties of ceramic materials.
- h) What do you mean by isothermal cut?
- i) State any two examples of hard and soft ferrites.
- j) State any two types of smart materials.

Q2) Answer any two of the following:

[10]

- a) Explain Frenkel and Schottky defects.
- b) What do you mean by critical resolved shear stress? Derive an expression for Schmid's law.
- c) Explain any five applications of smart materials in brief.

Q3) Solve any two examples from the following: [10]

- a) The diffusivity of aluminium in copper is $2.6 \times 10^{-17} \text{ m}^2/\text{s}$ at 500°C and $1.6 \times 10^{-12} \text{ m}^2/\text{s}$ at 1000°C .
- i) Determine the value of D_0 and energy per atom (E) for this diffusion couple.
- ii) What is the diffusivity at 750°C ?
- b) Consider a syrup made with 18 gm of sugar ($\text{C}_6\text{H}_{12}\text{O}_6$ with $M = 180$ amu) and 18 gm of water (H_2O with $M = 18$ amu). Based on this 50/50 weight ratio, calculate the mass average molecular weight for syrup.
- c) Calculate CRSS for aluminium crystal to slip on the plane $[1\ 1\ 1]$ and in the direction $[1\ 1\ 0]$ with 3.5 MPa. stress applied in the direction $[1\ 1\ 1]$ plane.

Q4) a) Attempt any one of the following: [8]

- i) Draw and explain in brief the phase diagram of sugar-water solution.
- ii) Discuss AX structure of CsCl and ZnS type.

b) Attempt any one of the following: [2]

- i) State any two properties of smart materials.
- ii) Calculate the molecular weight of the polystyrene chain if the degree of polymerization of the polystyrene chain is 100.



Total No. of Questions : 4]

P498

[5215]-318

T.Y. B.Sc.

PHYSICS

**PH - 336(C) : Motion Picture Physics
(2013 Pattern) (Paper - VI) (Elective - I) (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) Define Shutter speed.
- b) What is aperture?
- c) List the constituents of developer.
- d) Give applications of slow and Fast motion.
- e) Explain the term equivalent exposur.
- f) State various Lens aberrations.
- g) What is angle of view?
- h) List any two light sources.
- i) What is point source? Give example.
- j) State basic principle of image intensifier.

Q2) Attempt any two of the following:

[10]

- a) Distinguish between freeze action and reverse action.
- b) Explain classification of printing papers.
- c) Explain different stages involving in the processing of colour and B/W printing.

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

- a) Explain contact printing in short.
- b) Explain indoor lighting setup in brief.
- c) Explain factors affecting the fixing process. State the chemical composition of fixer.

Q4) a) Attempt any one of the following: [8]

- i) Describe the projector and its essential parts. Explain intermittent and drive mechanism.
- ii) Explain developer and its constituents. Explain fixer, its effect and rate.

b) Attempt any one of the following: [2]

- i) Define depth of field.
- ii) State characteristics of films.



Total No. of Questions : 4]

P498

[5215]-318

T.Y. B.Sc.

PHYSICS

PH - 336(D) : Biophysics

(2013 Pattern) (Paper - VI) (Elective - I) (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 whenever necessary.*
- 4) Use of log tables and calculator is allowed.*

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

[10]

- a) Define surface tension.
- b) Define osmosis.
- c) What do you mean by EEG?
- d) What is X-ray?
- e) What are the properties of bioelectrodes?
- f) Define radioactivity.
- g) What do you mean by biostatistics?
- h) What are the different types of bioelectric signals?
- i) State the principle of spectrophotometer.
- j) Define Gibb's free energy.

Q2) Answer any two: (5 marks each)

[10]

- a) Describe the functional aspects of cytoplasm.
- b) Explain in detail the working of SEM and TEM.
- c) Describe the metal and glass electrodes with examples.

Q3) Attempt any two: (5 marks each)

[10]

- a) Explain DNA structure with suitable examples.
- b) Describe in detail the structure determination of biomolecules by NMR.
- c) Explain radio immunoassays with suitable examples.

Q4) a) Attempt any one:

[8]

- i) Describe in detail the electroretinography with suitable example.
- ii) Distinguish between animal and plant cell with suitable examples.

b) Attempt any one:

[2]

- i) What is biometry?
- ii) Define heart rate?



Total No. of Questions : 4]

P498

[5215]-318

T.Y. B.Sc.

PHYSICS

**PH - 336(E) : Renewable Energy Sources
(2013 Pattern) (Paper - VI) (Elective - I) (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 diagram whenever necessary.*
- 4) Use of log tables and calculator is allowed.*

Q1) Attempt all of the following: (1 mark each)

[10]

- a) Define diffuse radiations.
- b) Comment “Sun is thermonuclear Fusion reactor”.
- c) Define efficiency of solar cell.
- d) Define gasifier.
- e) What is wind data?
- f) State the types of solar cells.
- g) State any two disadvantages of wind energy.
- h) What are the constituents of biogas?
- i) State the limitations of renewable energy sources.
- j) State any two advantages of floating type biogas plant.

Q2) Answer any two:

[10]

- a) Compare between conventional and nonconventional energy sources.
- b) Calculate the input power of solar cell using following data:
 $V_{oc} = 400 \text{ mV}$, $I_{sc} = 40 \text{ mA}$, $F.F = 0.7$ and efficiency (η) = 12%.
- c) Explain the construction and working of biogas plant.

Q3) Attempt any two:

[10]

- a) What is biomass? Explain biomass conversion technologies.
- b) Explain vertical axis type wind mill.
- c) Explain solar radiations in the atmosphere.

Q4) a) Attempt any one:

[8]

- i) Write a note on flat plate collector. State the advantages and disadvantages of solar concentrators.
- ii) Explain I-V characteristics of solar cell and obtain the relation between F.F and efficiency of solar cell. State the applications of solar photovoltaic system.

b) Attempt any one:

[2]

- i) State the factors affecting bio-digestions.
- ii) Draw neat diagram of cabinet solar dryer.



Total No. of Questions : 4]

P498

[5215]-318

T.Y. B.Sc.

PHYSICS

PH - 336(F) : Applied Optics

(2013 Pattern) (Paper - VI) (Elective - I) (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 tables and calculators is allowed.*

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

[10]

- a) Write len's formula for thin len's.
- b) What is meant by resolving power of an optical instrument?
- c) What is double refraction?
- d) What is the unit of attenuation?
- e) Define nodel points.
- f) What is matrix?
- g) What is diffraction?
- h) What are the requirements for hologram?
- i) What is bolometer?
- j) What is the importance of coherence in holography?

Q2) Answer any two:

[10]

- a) Using Fermat's principle establish the laws of reflection of light.
- b) Write a short note one Wollstom prism.
- c) Obtain the system matrix for a thick lens.

Q3) Attempt any two:

[10]

- a) Give the requirements for holography and mention various properties of a hologram.
- b) Explain APD photodiode in detail.
- c) Calculate the NA and the acceptance angle of an optical fibre.

Given:- μ_1 (core) = 1.55

μ_2 (cladding) = 1.50

Q4) a) Attempt any one:

[8]

- i) Explain the principle, construction and production of interferences fringes with Fabry-Perot interferometer.
- ii) What is zone plate? Derive an expression for its focal length.

b) Attempt any one:

[2]

- i) Explain the terms:
 - 1) Fibre strength.
 - 2) Attenuation.
- ii) State the merits and demerits of single mode fibre over multimode fibre.



Total No. of Questions : 4]

SEAT No. :

P499

[5215]-319

[Total No. of Pages : 2

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 calculator and logarithmic table is allowed.
- 5) Actual calculations must be shown while solving problems.

Q1) Answer the following:

[10]

- a) Give the unit of rate constant 'K' for third order reaction.
- b) Define the term "Energy of activation".
- c) Explain the term transport number of an ion.
- d) What do you mean by infinite dilution solution.
- e) Define polarizability of molecule.
- f) If the observed dipole moment of HCl is 1.067 D and calculated dipole moment is 6.124 D. Estimate % ionic character.
- g) What are Stokes and anti-Stokes lines in Raman Spectra.
- h) State any two applications of Microwave spectra.
- i) Estimate number of components in the following system
$$\text{MgCO}_{3(s)} \rightleftharpoons \text{MgO}_{(s)} + \text{CO}_{2(g)}$$
- j) What do you mean by "Eutectic point".

Q2) a) Attempt ANY TWO of the following:

[6]

- i) Derive exponential form of Arrhenius equation.
- ii) Explain how specific conductance and equivalent conductance varies with concentration.
- iii) What is dipole moment? How dipole moment is measured by vapour temperature method.

P.T.O.

b) Solve ANY ONE of the following: [4]

- i) If bond length of $^1\text{H}^{79}\text{Br}$ molecule is $1.42\text{\AA}$. calculate the reduced mass and moment of inertia of HBr molecule. (Given: $N = 6.023 \times 10^{23}$)
- ii) For a gaseous reaction $2\text{HI} \rightarrow \text{H}_2 + \text{I}_2$, the half life periods are 40 hrs and 10 hrs. When initial concentration of hydrogen iodide are 5 mole/lit and 20 mole/lit respectively. Calculate order of reaction.

Q3) Attempt ANY TWO of the following: [10]

- a) Describe Hittorf's method for determination of transport number of ion.
- b) Derive the equation for rate constant of third order reaction for equal initial concentration of reactants.
- c) Discuss the phase diagram of sulphur system.

Q4) a) Derive the expression for the energy of transition from $J \rightarrow J + 1$ level in the rotational spectrum of simple diatomic molecule. [6]

OR

Attempt the following: [6]

- i) Explain any two applications of Kohlrausch's law of independent migration of ions.
- ii) Explain the following terms:
 - 1) Component
 - 2) Phase
 - 3) Degree of freedom

b) Solve the following (Any one): [4]

- i) Fundamental band in Infrared region for HF appears at 2907 cm^{-1} . Calculate force constant. (Given: $H=1, F=19, N=6.023 \times 10^{23}$)
- ii) A cell constant of conductivity cell is 0.86 cm^{-1} . If it is filled with 0.06 M NaCl solution gave resistance of 365 ohm . Calculate equivalent conductance of NaCl solution.



Total No. of Questions : 4]

SEAT No. :

P500

[5215]-320

[Total No. of Pages : 2

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) Marks are reserved for neat diagrams.
- 4) Use of log tables and calculators are allowed.
- 5) Atomic numbers : B-5, C-6, N-7, O-8, Ne-10, Mn-25, Fe-26, Co-27

Q1) Answer the following:

[10]

- a) Give oxidation state of Cr in $[\text{Cr}(\text{NH}_3)_6]\text{SO}_4$.
- b) What are possible geometries for coordination number 7?
- c) What type of isomerism is shown by $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$.
- d) Calculate EAN of $[\text{FeCl}_6]^{3-}$.
- e) Give molecular orbital electronic configuration of B_2 molecule.
- f) What type of hybridization is shown by $\text{K}_3[\text{Co}(\text{CN})_6]$?
- g) How many unpaired electrons are present in weak field octahedral d^6 system?
- h) What is the magnetic nature of O_2^+ ion?
- i) Give the symmetry symbol for d_{xy} , d_{yz} and d_{xz} orbitals.
- j) What is the effect of size of d-orbitals on 10 Dq value?

P.T.O.

Q2) A) Answer any two of the following: [6]

- a) Explain the non-existence of Ne_2 molecule.
- b) Write note on 'multiple bonding'.
- c) Write the formulae of following complexes/ions.
 - i) Dicyanoargentate (I) ion.
 - ii) Calcium dioxalatodiamminecobaltate (II)
 - iii) Tetraaquo copper (II) Sulphate.

B) Answer any two of the following: [4]

- a) Distinguish between sigma and pi molecular orbitals.
- b) Write note on 'Nephelauxetic effect'.
- c) Give merits and demerits of Sidgwick model.

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

- a) Discuss the formation of NO_2 molecule on the basis of MOT.
- b) Explain the formation of $[\text{Co}(\text{CN})_6]^{3-}$ ion without π -bonding on the basis of MOT.
- c) Discuss the application of CFT to tetrahedral complexes.

Q4) a) Compare the formation of N_2 and CO molecule on the basis of MOT. [6]

OR

a) Answer the following: [6]

- i) Discuss the factors affecting the stability of complexes.
- ii) For $[\text{Mn}(\text{NH}_3)_6]^{3+}$ complex ion, electron pairing energy is 28000 cm^{-1} . The value of $10Dq$ is 38500 cm^{-1} . Calculate the CFSE.

b) Answer any one of the following: [4]

- i) What do you mean by primary and secondary valency? Explain the concept with the help of suitable example.
- ii) Explain ligand and linkage isomerism with suitable examples.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :3

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[5215] - 321

T.Y.B.Sc.

CHEMISTRY

CH-333: Organic Chemistry (Paper-III)

(2013 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 the structure and neat diagrams if necessary.*

Q1) Answer the following:

[10]

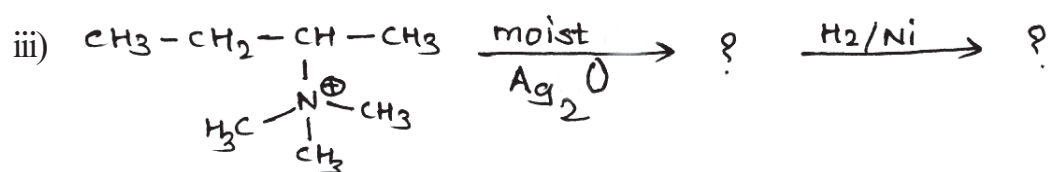
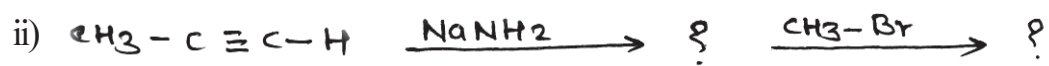
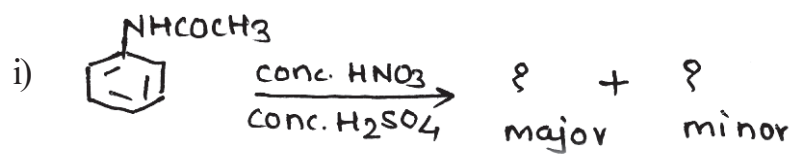
- a) Define acid catalysis.
- b) Cis - 1, 4 - dimethyl cyclohexane is optically inactive?
- c) Which is a good nucleophile amongst $\text{RS}^\ominus$ and $\text{RO}^\ominus$
- d) State Hofmann elimination.
- e) As crowding increase, the rate of S_N^2 reaction decrease. Why?
- f) What is benzyne intermediate?
- g) SO_3 is effective electrophile for sulphonation of benzene. Explain.
- h) Write the products of ozonolysis of 2 - methyl-1-propene.
- i) Write the cannizaro's reaction of benzaldehyde and formaldehyde.
- j) Write the reaction of 2 - butyne with H_2 in presence of Lindlar catalyst.

P.T.O.

- Q2) a)** Answer any two of the following: [6]
- i) Explain intramolecular Hydrogen bonding in determination of strengths of acid.
 - ii) Discuss Reformatsky reaction with suitable example.
 - iii) Discuss the mechanism of hydroxylation of cis - 2- butene. With KMnO_4
- b)** Answer any two of the following: [4]
- i) 2, 4, 6 - trinitro phenol is strongly acidic. Explain.
 - ii) Propyne on hydration gives acetone. Explain.
 - iii) Explain Markovnikoff rule with suitable example.
- Q3)** Attempt any two of the following. [10]
- a) Draw chair conformations of trans -1, 2 - dimethyl cyclohexane. comment on their stability and optical activity.
 - b) What is E1 elimination? Give the evidences of E1 elimination.
 - c) What is $\text{S}_{\text{N}}1$ reaction? Discuss the stereochemistry of $\text{S}_{\text{N}}1$ reaction.
- Q4) a)** Attempt any two of the following [6]
- i) Explain addition - elimination reaction of benzaldehyde with hydroxylamine and phenylhydrazine.
 - ii) What is Friedel - craft acylation? Give its advantages.
 - iii) Discuss the mechanism of hydroboration - oxidation of 1 - propene.

b) Predict the products with mechanism. (any two)

[4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P502

[5215]-322

T.Y. B.Sc.

CHEMISTRY

CH - 334 :Analytical Chemistry

(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 log table and calculator is allowed.*

Q1) Answer the following.

[10]

- a) What is effect on degree of dissociation of acetic acid when sodium acetate is added to it?
- b) Define a term post-precipitation.
- c) Draw a label ideal polarogram.
- d) Define a term absorbance.
- e) What is the role of N_2 gas in polarographic analysis.
- f) Define a term interference in AAS.
- g) Give the solubility product equation for $Mg(OH)_2$
- h) Which reference material is used in differential T.A?
- i) Which elements can be determined by FES?
- j) Calculate the transmittance of a solution which absorbs 80% of the incident radiation.

Q2) a) Answer any two of the following.

[6]

- i) State Faradays first Law of electrolysis. Give the mathematical equation and significance of each term.
- ii) Draw and explain the pyrolysis curve for calcium oxalate.
- iii) Write short note on phototube.

P.T.O.

- b) Answer Any Two of the following. [4]
- Draw Schematic diagram of thermobalance and explain various components used in it.
 - When a current of 3 Amp B passed through AgNO_3 solution for 20 min. during electrolysis. Calculate the weight of Ag (Silver) deposited (ECE for Ag = 1.118×10^{-3})
 - Calculate the molar absorptivity of 1.8×10^{-5} M solution having 0.35 absorbance when placed in a cell of 1.5cm path length.

Q3) Answer Any Two of the following. [10]

- Draw a schematic diagram of dropping Mercury Electrode. Give the advantages and disadvantages of DME.
- Explain the advantages of AAS over FES.
- What is co-precipitation? What precautions can be taken to minimise co-precipitation.

Q4) a) What is Spectrophotometric titration? Describe various types of spectrophotometric titration curve with suitable example. [6]

OR

- Sketch ideal polarographic wave. Explain the term residual current and limiting current. [3]
 - Give principle of AAS. Explain the construction and working of hollow cathode lamp in AAS. [3]
- b) The solution of Cd^{2+} ions having concentration 5 millimoles /L. If drop rate is 6 seconds and rate of falling mercury is 4 Mg/s. What is the diffusion current flowing through the cell if diffusion coefficient of Cd^{++} ion is $7.0 \times 10^{-6} \text{ cm}^2 \text{ s}^{-1}$. [4]

OR

The solubility product of PbI_2 is 2.5×10^{-8} . What is the minimum concentration of iodide ion that must be added to a solution contain 1×10^{-3} moles per liter of Pb^{+P} ion so as to precipitate lead iodide. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P503

[5215]-323

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 diagram and flowsheet wherever necessary.*

Q1) Answer the following:

[10]

- a) Define the term selectivity.
- b) Give two important uses of ammonia.
- c) What is pickling?
- d) Define the term fire point.
- e) Which reagents are used for concentration of nitric acid.
- f) Define the term clinker.
- g) What are food additives?
- h) Define the term unit process.
- i) What is setting of cement?
- j) What are herbicides?

Q2) a) Answer any two of the following.

[6]

- i) Explain the terms, quality control and process control.
- ii) Write a note on purifying unit in contact process for manufacture of sulphuric acid.
- iii) Give uses of Neem oil.

P.T.O.

- b) Answer any two of the following. [4]
- i) Explain the term trade mark.
 - ii) What is reinforced concrete?
 - iii) What are safety precautions that should be taken in chemical industry.

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

- a) What are fuels? How are they classified? Give the applications of petrochemicals.
- b) Discuss food deterioration factors.
- c) Discuss various types of raw materials for manufacture of cement. Explain importance of proportioning of raw materials.

Q4) a) What are pesticides? Give synthesis and applications of DDT and Endosulphan. [6]

OR

- a) Explain with flow sheet the manufacture of ammonia by Bosch-Haber process.
- b) Give advantages and disadvantages of gaseous fuels. [4]

OR

- b) Explain different methods of food preservations.



Total No. of Questions : 4]

SEAT No. :

P504

[5215]-324

[Total No. of Pages : 10

T.Y. B.Sc.

CHEMISTRY

CH - 336(A) : Nuclear Chemistry

(2013 Pattern) (Semester - III) (913A3) (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 whenever necessary.
- 4) Use of logtables and calculator is allowed.

Q1) Answer the following:

[10]

- a) Which of the following nuclei is more stable?
 - i) $^{16}_8\text{O}$
 - ii) ^3_1H
 - iii) $^{238}_{92}\text{U}$
 - iv) ^2_1H
- b) Which are the different types of quarks?
- c) What are the limitations of liquid drop model?
- d) State the Magic numbers in Shell Model.
- e) State general characteristics of radioactive decay.
- f) What is the range of α particle in air?
- g) State the unit of radioactivity.
- h) Complete the following nuclear reaction
$$^{14}_7\text{N} + ^1_0\text{n} \rightarrow \dots + ^1_1\text{H}.$$
- i) What are photonuclear reactions?
- j) State Bethe's notations.

Q2) a) Answer any two of the following:

[6]

- i) What is reaction cross section? State its unit.
- ii) What is the value of N/Z ratio for stability? Discuss stability on the basis of their N/Z ratio.
- iii) Write short notes on Geiger-Nuttall's law.

P.T.O.

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

i) Calculate the binding energy of ${}^4_2\text{He}$ atom

Given: mass of proton : 1.007825 amu
mass of neutron : 1.008665 amu
mass of ${}^4_2\text{He}$: 4.0026 amu

ii) Define:

- 1) Half life
- 2) Decay constant

iii) Show that Half life = $\frac{0.693}{\lambda}$

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

- a) Explain different types of radioactive decay processes with examples.
- b) State and explain semi-empirical mass equation. What are the applications of semi-empirical mass equation?
- c) Explain conservation of proton, neutron and momentum in nuclear reactions with examples.

Q4) a) Explain periodicity in nuclear properties in shell model. What are the limitations of shell model? [6]

OR

State the different types of nuclear reactions.

b) Write short notes on nuclear isomerism and isomeric transition. [4]

OR

A sample of radioactive iodine gave with geiger counter 3791 counts per minutes at certain time interval and 816 counts per minutes exactly after 60 minutes, Calculate half life of iodine.



Total No. of Questions : 4]

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[5215]-324

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.

Q1) Answer the following:

[10]

- a) Define the term : Polymer.
- b) Explain the term : Colourants.
- c) Calculate the molecular weight of polyvinyl chloride (PVC) whose D_p is 2080.
- d) Write an important linkage of polyamide polymer.
- e) Draw the correct structures of following polymers.
 - i) Polypropylene.
 - ii) Polyvinyl alcohol.
- f) Give two important applications of nylon.
- g) 'Sand is the best example of organic polymer'. State whether the statement is true or false.
- h) Convert the IUPAC name poly -(1-nitrile-ethylene) into correct structure.
- i) The vulcanisation of rubber had invented by _____.
- j) Name any two commonly used UV stabilizers.

Q2) a) Attempt any two of the following:

[6]

- i) 'Fillers are often added for making polymer articles'. Explain.
- ii) 'Polymers are the gift for us in day to day life'. Explain.
- iii) Write a note on - Silicone polymers.

- b) How will you distinguish between the following (Any two). [4]
- Organic polymers and Inorganic polymers.
 - Linear polymers and Cross-linked polymers.
 - Homopolymers and Co-polymers.

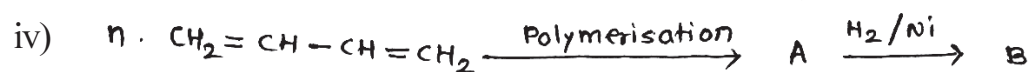
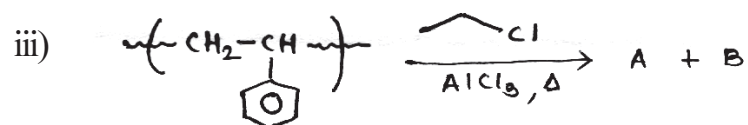
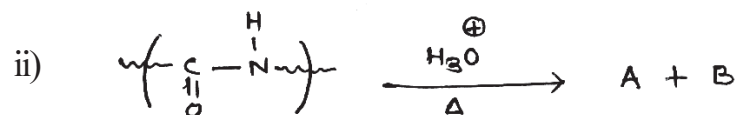
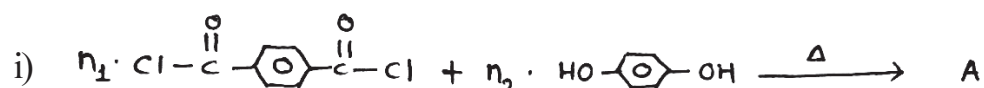
Q3) Attempt any two of the following: [10]

- What is meant by step polymerisation reactions? Give the detailed account for polycondensation reactions.
- Explain the meaning of chain polymerisation. Give full account on co-ordination polymerisation-Ziegler Natta catalyst.
- Explain in detail the emulsion polymerisation technique.

Q4) a) Attempt any two of the following: [6]

- Write a short note on - Bulk polymerisation.
- Give brief account of hydrogenation reaction of polymers.
- Calculate the molecular weight ($\overline{M}_n$) of polymer when 1.175 gm of polymer sample requires 27.9ml of 0.0255N alcoholic KOH for complete neutralisation whose functionality is 3.

b) Complete the following polymeric reactions: [4]



Total No. of Questions : 4]

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[5215]-324

T.Y. B.Sc.

CHEMISTRY

**CH - 336(C) : Introduction to Biochemistry & Molecular Biology
(2013 Pattern) (Paper - VI) (Semester - III) (New Syllabus)**

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.*

Q1) Answer the following:

[10 × 1 = 10]

- a) Name one structural protein.
- b) Define Acid number.
- c) Write MM equation.
- d) Give one significance of mitochondria.
- e) Name one hormone of Adrenal medulla.
- f) Give one example of oxidoreductase.
- g) What are fat soluble vitamins? Give one example.
- h) Write the Zwitter ion form of alanine.
- i) List out any two unsaturated fatty acid.
- j) Give one example of a non reducing sugar.

Q2) a) Answer any two of the following:

[2 × 3 = 6]

- i) What are amphipathic lipids? Give examples.
- ii) Give reaction of amino acid with ninhydrin and its significance.
- iii) Differentiate between apo and Holoenzyme.

b) Give the structures of any two of the following: [2 × 2 = 4]

i) One Aromatic amino acid.

ii) Lactose.

iii) Cholesterol.

Q3) Attempt any two of the following: [2 × 5 = 10]

a) Explain principle, procedure for desalting of proteins by gel filtration.

b) Differentiate between prokaryotes and eukaryotes.

c) Discuss the types and features of lipoproteins.

Q4) a) Classify proteins based on functions with examples. [6]

OR

Describe the structural organisation and functions of cell membrane.

b) List out the B complex vitamins and their coenzymes. [4]

OR

Write short notes on enzyme specificity.



Total No. of Questions : 4]

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[5215]-324

T.Y. B.Sc.

CHEMISTRY

**CH - 336(D) : Environmental & Green Chemistry
(New Course) (2013 Pattern) (Paper - VI) (Semester - III)
(Elective - I) (913D3)**

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 diagrams must be drawn wherever necessary.*

Q1) Answer the following:

[10]

- a) Define the term 'Threshold Limit Value (TLV).
- b) Give the name of any two major component of atmosphere.
- c) Define Oxidising Smog.
- d) What are humic substances.
- e) Define Pathogens.
- f) Name any two biotic components.
- g) Define Lithosphere.
- h) Draw the structure of M-hydroxy benzaldehyde.
- i) Define contaminant.
- j) Arrange following in order of greater health risk
Diethyl sulphoxide, Benzene, CCl_4 .

Q2) a) Attempt any two of the following in details.

[6]

- i) Explain stratosphere.
- ii) Explain Organophosphate and Carbamate pesticides.
- iii) Explain Environmental Chemistry.

- b) Solve any two of the following: [4]
- i) Organic particulate matter.
 - ii) Composition of water resources.
 - iii) Give green chemistry of Adepic acid using Non-hazardous D-glucose & a biocatalyst Modified E-coli.

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

- a) Explain mechanism of Ozone depletion.
- b) Define chemical oxygen demand & Explain the Methods for C.O.D. analysis.
- c) Describe basic principle of Green Chemistry.

Q4) a) What is sources & sink of carbon monoxide (CO)? Explain chemical processes and concentration profile of Carbon Monoxide (CO). [6]

OR

Explain in detail scientific areas for practical application of Green Chemistry.

- b) Write note on any one: [4]
- i) Biosphere.
 - ii) Green catalyst.



Total No. of Questions : 4]

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[5215]-324

T.Y. B.Sc.

CHEMISTRY

CH - 336(E) : Agriculture Chemistry

(2013 Pattern) (Paper - VI) (Semester - III) (Elective - I) (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) *Draw the diagrams wherever necessary.*

Q1) Answer the following:

[10]

- a) What is pryanishnikov triangle?
- b) Define particle density.
- c) What is calcarious soil?
- d) What is TDS? How is it measured?
- e) Define Aminization.
- f) Define the term 'Biofertilizers'.
- g) Define insecticides.
- h) Define macronutrients.
- i) What are attractants?
- j) What is ESP?

Q2) a) Attempt any TWO of the following:

[6]

- i) Explain about acidic soil.
- ii) Give classification of fungicides.
- iii) What is the role of nitrogen in the plants?

- b) Attempt any TWO: [4]
- i) Explain 'reclamation of soil'.
 - ii) Explain the role of sulphur in the plants.
 - iii) Explain the role of Mixed fertilizers.

Q3) Attempt any two: [10]

- a) Discuss about soil structure.
- b) Describe Farm Yard Manure (FYM) in detail.
- c) Discuss 'Sources of Water'.

Q4) a) Attempt any two: [6]

- i) Discuss deficiency symptoms of potassium.
- ii) Draw vermiculture box. Discuss about vermiculture.
- iii) Discuss about 'Soil Water'.

b) Attempt any two: [4]

- i) Explain 'Soil temperature'.
- ii) Discuss surface soil and subsoil.
- iii) Explain 'microorganisms in the soil'.



Total No. of Questions : 4]

SEAT No. :

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[Total No. of Pages : 2

T.Y.B.Sc.

BOTANY

BO- 331: Cryptogamic Botany

(Algae, Fungi, Bryophytes and Pteridophytes)

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

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) Give any two importance of Algae.
- b) What are cryptogams?
- c) Enlist the parts of sporophyte of Polytrichum.
- d) What is karyogamy?
- e) Give the names of sex organs in Chara.
- f) What is synangium?
- g) Give any two importance of fungi.
- h) Why Bryophytes are called as amphibians of plant kingdom?
- i) What is Mycelium?
- j) What is pteridophyta?

Q2) Attempt any two of the following:

[10]

- a) Describe the internal structure of sporophyte of Anthoceros.
- b) Explain the thallus structure and taxonomic position of Nostoc.
- c) Describe the cell structure of Saccharomyces.

P.T.O.

Q3) Write notes on any two:

[10]

- a) Male conceptacle of Sargassum.
- b) Asexual reproduction in Cercospora.
- c) Classification of pteridophytes according to K.R. Sporne up to classes (1975).

Q4) Describe external and internal morphology of gametophyte of Marchantia. **[10]**

OR

Describe external morphology and anatomy of stem in Selaginella.



Total No. of Questions : 4]

SEAT No. :

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[5215]-326

[Total No. of Pages : 2

T.Y. B.Sc.

BOTANY

BO - 332 : Cell and Molecular Biology

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

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) Differentiate between prokaryotic and Eukaryotic cells.
- b) Enlist two functions of cellwall.
- c) Write any two points compairing cell wall and plasma membrane.
- d) What are functions of lampbrush chromosome?
- e) Distinguish between purines and pyrimidines.
- f) Enlist any two concern branches of cell biology.
- g) What is semiconservative DNA replication?
- h) Define genetic code.
- i) What is indusible enzymes?
- j) What is function of promotor?

Q2) Answer any two of the following:

[10]

- a) Describe the functions of golgi apparatus.
- b) Explain Chargaff's law.
- c) Give the structural differences between prokaryotic and eukaryotic genes.

P.T.O.

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

[10]

- a) Functions of mitochondrion.
- b) Ultrastructure of Nucleus.
- c) Griffith's experiment.

Q4) Give the ultrastructure, chemical composition and functions of chloroplast. **[10]**

OR

Describe the process of mRNA processing in eukaryotes.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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T.Y.B.Sc.

BOTANY

BO-333: Genetics and Evolution

(2013 Pattern) (Semester - III) (Paper - III) (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 alleles.
- b) State law of segregation.
- c) What is self incompatibility?
- d) Define crossing over.
- e) What are holandric genes?
- f) What is nullisomy?
- g) Define translocation.
- h) What are quantitative traits?
- i) Define back cross.
- j) What is mean by mendelian population?

P.T.O.

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

- a) Explain evidences of evolution from Fossil records.
- b) Give in detail chloroplast inheritance in 4 o'clock plant.
- c) Describe the types of linkage with example.

Q3) Write note on (any two) **[10]**

- a) Colour blindness in human.
- b) Masking genes.
- c) Allopolyploids in Raphano - brussica.

Q4) What is duplication? Give its types, cytology and position effect. **[10]**

OR

What is Evolution? Describe in detail the theory of natural selection. (Darwinism). **[10]**



Total No. of Questions : 4]

SEAT No. :

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[5215]-328

[Total No. of Pages : 2

T.Y. B.Sc.

BOTANY

**BO - 334 :Spermatophyta and Palaeobotany
(2013 Pattern) (Semester - III) (Paper - IV) (New Course)**

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) Enlist any two characters of Gymnosperms.
- b) Give any two similarities of Gnetum with angiosperms.
- c) What is Latin diagnosis?
- d) Write an example of artificial system of classification.
- e) Give type of inflorescence of family Lamiaceae.
- f) Write any one example of family Acanthaceae.
- g) Give any one economic importance of subfamily Papilionaceae.
- h) What are fossils?
- i) Give any two orders of Gymnosperms according to Chamberlain (1934).
- j) Write any two salient features of Sphenopsida.

Q2) Attempt any Two of the following.

[10]

- a) State any five assumptions of Hutchinson system.
- b) Describe flower of Cannaceae.
- c) Write external features of Lepidodendron.

P.T.O.

Q3) Write notes on any Two of the following.

[10]

- a) Gnetalean theory.
- b) Petrification.
- c) Salient features of Lycopsidea.

Q4) Describe external and internal morphology of male and female cone of Pinus.

[10]

OR

Give distinguishing characters, floral formula and floral diagram of family Rhamnaceae and Apocynaceae.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5215]-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 olericulture.
- b) Give any two branches of horticulture.
- c) Give the plant source of vitamin B₁.
- d) Give any two examples of primary spices.
- e) What is vegetative propagation?
- f) What is notching.
- g) Name any two systems of training.
- h) Give any two physical properties of soil.
- i) Define garden.
- j) Write any two techniques of drying of flowers.

Q2) Attempt any two of the following.

[10]

- a) Write on scope of horticulture.
- b) Describe objectives of pruning.
- c) Describe grading and bunching of cut flowers.

P.T.O.

Q3) Write notes on any two of the following.

[10]

- a) Japanese garden
- b) Role of plant growth regulators in horticulture.
- c) Classification of horticultural crops.

Q4) Give an account of Tomato with reference to soil, climatic requirements, commercial varieties, harvesting and post harvest management. **[10]**

OR

What is floriculture? Give importance of floriculture. Add a note on various methods of cultivation of Aster **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5215]-330

T.Y. B.Sc.

BOTANY

**BO - 336 : Computational Botany
(2013 Pattern) (Paper - VI) (Semester - III)**

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) Define variable.
- b) What is relative growth rate (RGR)?
- c) Give any two properties of normal distribution curve.
- d) Differentiate primary and secondary data.
- e) Give any two objectives of classification of data.
- f) What is simple ratio?
- g) Give any two merits of sampling.
- h) Define percent frequency.
- i) Give the formula to calculate null hypothesis.
- j) Define crop growth rate (CGR).

Q2) Attempt Any Two of the following:

[10]

- a) What is mode? Give its merits and limitations.
- b) Define variance? Give an account of coefficient of variance.
- c) What is chi-square test (χ^2)? Give its significance.

P.T.O.

Q3) Write short notes on Any Two of the following: [10]

- a) Lottery method for achieving randomness.
- b) Bar diagram.
- c) Binomial distribution.

Q4) What is correlation? Describe different types of correlation. [10]

OR

Define seed germination. Give an account of Absolute Growth Rate (AGR) and Leaf Area Index (LAI).



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5215]-331

T.Y.B.Sc.

ZOOLOGY

ZY- 331: Animal Systematics and Diversity-V
(2013 Pattern) (New Course) (Paper-I) (Semester-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 odontophore.
- b) State the function of Pecten.
- c) State any two characters of Rhyncocephalia.
- d) Define heterodont dentition.
- e) Define mesonephros kidney.
- f) Define holophytic nutrition.
- g) State the habitat of Pila.
- h) State the function of hyoid apparatus in calotes.
- i) State the function of receptaculum seminalis.
- j) State any two types of scales in calotes.

Q2) Attempt any two of the following:

[10]

- a) Sketch and label shell and operculum of Pila.
- b) Describe dorsal view of brain in calotes.
- c) Describe the structure of heart of frog.

P.T.O.

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

[10]

- a) Describe any two accessory respiratory organs in fishes.
- b) Describe ascon type of canal system.
- c) Radula in Pila.

Q4) Describe structure of heart in Pila. Add a note on course of circulation. **[10]**

OR

Describe the digestive system of calotes.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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[5215] - 332

T.Y.B.Sc.

ZOOLOGY

ZY - 332 : Mammalian Histology

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

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:

[10]

- a) Define rugae.
- b) Define histology.
- c) What is corpus albicans?
- d) What are Payer's patches?
- e) Define cementum.
- f) Name any two types of mucosal papillae.
- g) What is J.G. complex?
- h) What is nephron?
- i) Name any two cells of gastric gland.
- j) Name the types of cells found in adenohypophysis.

Q2) Attempt any two of the following:

[10]

- a) Sketch & Label T.S. of testis.
- b) Describe taste bud.
- c) Describe skeletal tissue.

P.T.O.

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

[10]

- a) Muscular tissue.
- b) Histological structure of adrenal gland.
- c) Histological structure of liver.

Q4) Describe the basic histological structure of alimentary canal.

[10]

OR

Describe the histological structure of skin.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

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[5215] - 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) State example of compound lipid.
- b) What is AKU?
- c) What are amino acids?
- d) Define buffer.
- e) What is hyperglycemia?
- f) State HH equation.
- g) What is LB plot?
- h) Define regulatory enzyme.
- i) State biological significance of lipid.
- j) State any two examples of monosaccharides.

P.T.O.

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

- a) Explain the concept of acid & base with suitable example.
- b) Explain racemisation in carbohydrates.
- c) What is irreversible enzyme inhibition?

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

- a) Physical properties of colloids.
- b) Homopoly saccharides.
- c) Atherosclerosis.

Q4) What are proteins? Discuss the types of bonds responsible for protein structures. **[10]**

OR

What are enzymes? Explain the influence of substrate and enzyme concentration on an enzyme catalysed reaction.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5215]-334

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 agricultural waste.
- b) Enlist acidic pollutants.
- c) Define Environmental pollution.
- d) What is LCSo?
- e) Define rare species.
- f) State any two radioactive substances.
- g) What are bioindicators?
- h) What are Particulate pollutants.
- i) Define atmosphere.
- j) What are autotrophs?

Q2) Attempt any two of the following?

[10]

- a) Explain renewable sources.
- b) Describe greenhouse effect.
- c) Describe types of toxicants.

P.T.O.

Q3) Write notes on any two of the following.

[10]

- a) Non conventional energy sources.
- b) Any two environmental challenges in India.
- c) Wildlife conservation.

Q4) What is water pollution? Explain the sources and effects of water pollution on ecosystem. **[10]**

OR

Define ecosystem. Explain fresh water ecosystem.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5215]-335

T.Y.B.Sc.

ZOOLOGY

ZY-335:Parasitology

(2013 Pattern) (New Course) (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) Define parasite.
- b) Define ectoparasite.
- c) State any one control measure for mite.
- d) Write the name of vector of malaria.
- e) Give any two symptoms of small pox.
- f) Write the habitat of Taenia Solium.
- g) Define commensalism.
- h) What is definitive host?
- i) What is accidental parasite?
- j) Define protozoology.

Q2) Attempt any two of the following.

[10]

- a) Explain ecological specificity in host parasite relationship.
- b) Describe the control measures of amoebiasis.
- c) Explain mutualism with suitable example.

P.T.O.

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

[10]

- a) Eradication programmes of cholera.
- b) Control measures of arthropod vectors of malaria.
- c) Parasitological significance of rabies.

Q4) Give a detail account of life cycle, pathogenecity and control measures of head louse.

[10]

OR

Describe in detail the life cycle of Ascaris Lumbricoides.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 4

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[5215]-336

T.Y. B.Sc.

ZOOLOGY

**ZY - 336 (a) : General Pathology
(2013 Pattern) (Paper - VI) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following:

[10]

- a) Define Ischaemia.
- b) Define embolism.
- c) Define surgery.
- d) What is melanosis?
- e) What is fatty degeneration?
- f) What is neoplasia?
- g) Enlist 2 bacterial diseases.
- h) Define disease.
- i) What is general pathology?
- j) Define metastatic calcification.

Q2) Attempt the following: Any Two

[10]

- a) Describe types of necrosis.
- b) Describe renal function test.
- c) Describe gout in detail.

P.T.O.

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

- a) Causes of haemorrhage.
- b) Types of inflammation.
- c) Moist gangrene.

Q4) What is hyperemia? Explain causes and effects of hyperemia. [10]

OR

What is leukemia? Explain types of lymphocytic leukemia.



Total No. of Questions : 4]

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[5215]-336

T.Y. B.Sc.

ZOOLOGY

ZY - 336 (b) : Cell Biology

(2013 Pattern) (Paper - VI) (Semester - III)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following:

[10]

- a) Define cell.
- b) What is pinocytosis?
- c) What are suicide bags?
- d) State biochemical composition of microtubules.
- e) What is heterophagy?
- f) What is unit membrane?
- g) State effects of free radicals on cell.
- h) Give two functions of Golgi complex.
- i) Define somatic mutation.
- j) What is synapsis?

Q2) Attempt Any Two of the following:

[10]

- a) Describe generalised structure of prokaryotic cell.
- b) State chemical composition and functions of nucleolus.
- c) Explain fluid mosaic model of plasma membrane.

Q3) Write short notes on Any Two of the following:

[10]

- a) Active transport.
- b) Apoptosis.
- c) Intrinsic causes of cancer.

Q4) Describe ultrastructure and functions of Endoplasmic Reticulum and mitochondrion. **[10]**

OR

Describe mitotic cell division. Add a note on the role of centriole in the cell division.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P517

[5215]-337

T.Y.B.Sc.

GEOLOGY

GL- 331: Mineralogy

(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) *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 biaxial minerals?
- b) Define pleochroism.
- c) What are accessory plates?
- d) What is sign of elongation?
- e) What is refractive index?
- f) What are aluminosilicates?
- g) What are fibrous zeolites?
- h) What are precious stones?
- i) What is rhodochrosite?
- j) Give composition of ilmenite.

Q2) Explain the following (any two):

[10]

- a) Silicate structure and properties of olivine.
- b) Phenomenon of isomorphism.
- c) Chemical composition and paragenesis of apatite.

P.T.O.

Q3) Write notes on (any two):

[10]

- a) Mineralogy, properties and uses of graphite as a refractory mineral.
- b) Chemical composition and physical properties of minerals of garnet group.
- c) Crystal structure and uses of sphalerite.

Q4) Give silicate structure, chemical composition, physical and optical properties, paragenesis and alteration products of Felspar. OR Pyroxene mineral group.

[10]



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P518

[5215] - 338

T.Y.B.Sc.

GEOLOGY

GL - 332 : Igneous Petrology

(2013 Pattern) (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 questions in 2 or 3 lines.

[10]

- a) Give the density of magma.
- b) Define Granitic texture.
- c) Name any two derivative magmas.
- d) Give the names of mineral involved in corona structure.
- e) Give the name of the rock show amygdoidal structure.
- f) Give the name of minerals present in discontinuous reaction series.
- g) Give the names of Volatile constituent present in a magma.
- h) Give the reason for the formation of expansion crack.
- i) Give the name of rocks which show glassy texture.
- j) Give the temp - pressure condition favourable for the generation of magma.

Q2) Write notes on any two.

[10]

- a) Crystallisation of Fo-Fa system.
- b) Significance of Porphyritic and Glomeroporphyritic texture.
- c) Origin and Occurrence of Aplite.

P.T.O.

Q3) Answer the following any two.

[10]

- a) Shand's classification.
- b) What is meant by Thermal diffusion of a magma.
- c) Give the chemical composition and origin of Peridotite rock.

Q4) Describe in detail the crystallisation of Ab-An-Di system and its significance.**[10]**

OR

- (a) Significance of rock kindred **[5]**
- (b) Types of magma - Primary and Secondary. **[5]**



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P519

[5215] - 339

T.Y.B.Sc.

GEOLOGY

GL-333: Sedimentary Petrology

(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) Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following in 2/3 lines.

[10]

- a) Name any two branches of sedimentary petrology.
- b) What is mineral stability?
- c) Name any two heavy minerals.
- d) Define clastic texture.
- e) State difference between bedding and laminations.
- f) Draw neat labelled diagram showing ripple marks.
- g) What are quartz arenites?
- h) Name any two types of cross bedding.
- i) Name any two sedimentary facies.
- j) What is sphericity of grains?

P.T.O.

Q2) Write notes on (Any 2) [10]

- a) Goldich stability series.
- b) Physical weathering.
- c) Organic sedimentary structures.

Q3) Write notes on (Any 2) [10]

- a) Primary sedimentary structures and significance of cross bedding.
- b) Placers and syngenetic sedimentary ores.
- c) Climatic control on sedimentation.

Q4) Describe Dunham's classification of Limestones. [10]

OR

Describe the classification of sedimentary depositional environments. [10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P520

[5215]-340

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) *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 tensional force.
- b) Define stress.
- c) What are class II folds?
- d) What is flow folding?
- e) Explain the significance of linear parallelism of stretched pebbles.
- f) Define brittle deformation.
- g) Explain the concept of strain ellipsoid.
- h) What is strike slip fault?
- i) Explain extensional fractures.
- j) Significance of intersecting planar features.

Q2) Write notes on (Any two).

[10]

- a) Define rupture strength, Ultimate strength.
- b) Reckie's Principle.
- c) Explain the concept of foliations, with suitable examples.

P.T.O.

Q3) Write notes on (Any two).

[10]

- a) Relation of stress ellipsoid and ruptures.
- b) Mechanics of Reverse faulting.
- c) Boudinage and Mullions.

Q4) Explain Fleuty's Classification of folds.

[10]

OR

Write a note on flexure folding.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P521

[5215]-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) What are khondalites?
- b) Name subdivisions of cuddapah supergroup.
- c) Where is Daling group exposed?
- d) Give subdivisions of Bhilwara supergroup.
- e) As per recent Geological time scale, give the classification of Proterozoic Eon into Era.
- f) Name the older Greenstone belt of Dharwar craton.
- g) Give tectonic elements of ocean.
- h) Give subdivisions of kaladgi supergroup.
- i) What is E parchean unconformity?
- j) Closepet Granite.

Q2) Write short note (Any two):

[10]

- a) Sakoli Group.
- b) Global Precambrian History.
- c) Precambrians of western lesser Himalaya

P.T.O.

Q3) Write short note (Any Two):

[10]

- a) Lithostratigraphy of Betal belt.
- b) Current classification of Precambrian formations.
- c) Stratigraphic succession of Delhi supergroup.

Q4) Give detailed General stratigraphy of singhbhum-odisha craton in a tabular form.

[10]

OR

Give the geographic distribution, classification with stratigraphic succession, lithology of vindhyyan supergroup.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P522

[5215]-342

T.Y. B.Sc.

GEOLOGY

GL - 336 : Applied Geology - I

(2013 Pattern) (Paper - VI) (Semester - 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 in 2/3 lines:

[10]

- a) What are Silk Goles?
- b) What is black body?
- c) Define remote sensing.
- d) What is principal point?
- e) What is atmospheric scattering?
- f) Give the spectral bandwidth of Near IR.
- g) What is tip?
- h) Define sensor.
- i) What is point feature?
- j) What is rock outcrop?

Q2) Answer in short (any two):

[10]

- a) Explain in brief the role of lithology in land form development.
- b) Explain applications of remote sensing in ground water survey.
- c) Give significance of Trellis drainage pattern.

P.T.O.

Q3) Answer in short (any two): **[10]**

- a) Give the advantages of aerial photos.
- b) Give the classification of aerial photographs based on film-filter combination.
- c) Briefly explain IRS - Oceansat Satellite.

Q4) Give brief history of Remote Sensing satellites. **[10]**

OR

What is aerial photography? Discuss the various factors to be considered while planning the aerial photography.



Total No. of Questions : 4]

SEAT No. :

P523

[5215]-343

[Total No. of Pages : 3

T.Y.B.Sc.

STATISTICS (Principal)

ST - 331: Distribution Theory

(2013 Pattern) (Paper-I) (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 and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:

A) Choose correct alternative in each of the following:

[1 each]

a) If $X \sim \beta_1 (m, n)$ then for fixed n and $m < 1$ the mode of X is

- | | |
|--------|-------|
| i) 1 | ii) m |
| iii) 0 | iv) n |

b) If $X \sim \text{LN}(0, \mu, \sigma^2)$ then $\text{Var}(X)$ is

- | | |
|--|---|
| i) $e^{2\mu+\sigma^2}(e^{\sigma^2}-1)$ | ii) $e^{2\mu-\sigma^2}(e^{\sigma^2}-1)$ |
| iii) $e^{2\mu+\sigma^2}(e^{\sigma^2}+1)$ | iv) $e^{2\mu-\sigma^2}(e^{\sigma^2}+1)$ |

c) If $X \sim W(\alpha, \beta)$ then the distribution of $Y = (X/\alpha)^{\beta-1}$ is

- | | |
|---|-----------------------------|
| i) Exponential with mean 1 | ii) Gamma (α, β) |
| iii) Weibull $(1, \frac{\beta}{\beta-1})$ | iv) Cauchy $(0, 1)$ |

P.T.O.

- d) 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 i^{th} order statistic $X_{(i)}$ is

$$\begin{aligned} \text{i)} \quad & [1 - F_X(x)]^r * [F_X(x)] & \text{ii)} \quad & \sum_{r=i}^n \binom{n}{r} [F_X(x)]^r [1 - F_X(x)]^{n-r} \\ \text{iii)} \quad & \sum_{r=i}^n \binom{n}{r} [F_X(x)]^r [F_X(x)]^{n-r} & \text{iv)} \quad & \sum_{r=i}^n [F_X(x)]^r [1 - F_X(x)]^{n-r} \end{aligned}$$

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

- a) If $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then $E[X] = \mu_1$.
b) If $X \sim C(\mu, \lambda)$ then distribution of X is positively skewed.

C) Define the following: **[1 each]**

- a) Bi-variate normal distribution.
b) Weibull distribution.

D) Attempt the following: **[1 each]**

- a) State the additive property of Cauchy distribution.
b) If $X \sim \beta_1(1, 1)$ then find harmonic mean of X .

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

- a) If $X \sim L(\mu, \lambda)$ then obtain quartile deviation of X .
b) If $X \sim W(\alpha, \beta)$ then obtain r^{th} raw moment of X . Hence obtain $E[X]$.
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 sample median if n is odd.

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

- a) If $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find conditional distribution of Y given $X = x$. Further state the variance of the conditional distribution.
b) 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 $P(U > 1, V > \frac{1}{2})$.
c) Let $X \sim \beta_1(m, n)$ distribution. Obtain the distribution of $U = \frac{X}{1-X}$.

Q4) Attempt any one of the following:

a) i) If $X \sim \beta_2(m, n)$ then find $E[X]$. [3]

ii) Let $X \sim C(0,1)$. Derive the distribution of $\frac{1}{X}$ and X^2 . [7]

b) i) If X_1, X_2, X_3, X_4 are i.i.d LN $(0, \mu, \sigma^2)$ variates. Obtain the distribution of $U = \frac{X_1 X_2}{X_3 X_4}$. [4]

ii) If $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find mgf of (X, Y) . [6]



Total No. of Questions : 4]

SEAT No. :

P524

[5215]-344

[Total No. of Pages : 3

T.Y.B.Sc.

STATISTICS (Principal)

ST - 332 : Theory of Estimation

(2013 Pattern) (Semester-III) (Theory) (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 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 $N(\mu, \sigma^2)$, μ known then _____.

A) $\frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2$ is an unbiased estimator of σ^2 .

B) $\frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$ is an unbiased estimator of σ^2 .

C) $\frac{1}{n} \sum_{i=1}^n (X_i - \mu)^2$ is an unbiased estimator of σ^2 .

D) $\frac{1}{n-1} \sum_{i=1}^n (X_i - \mu)^2$ is an unbiased estimator of σ^2 .

ii) If $X_1, X_2, \dots, X_n$ is a random sample from $U(0, \theta)$ then _____.

A) $X_{(n)}$ is a biased and sufficient estimator of θ .

B) $X_{(n)}$ is an unbiased and sufficient estimator of θ .

C) $X_{(n)}$ is an unbiased and not sufficient estimator of θ .

D) $X_{(n)}$ is a biased and insufficient estimator of θ .

P.T.O.

- iii) If T_n is a consistent estimator of θ and $a_n \rightarrow 0$ as $n \rightarrow \infty$ then
- $T_n + a_n$ is a consistent estimator of θ .
 - $a_n T_n$ is a consistent estimator of θ .
 - $\frac{T_n}{a_n}$ is a consistent estimator of θ .
 - $(a_n - 1)T_n$ is a consistent estimator of θ .
- iv) Pivotal quantity used for the construction of confidence interval for σ^2 based on a random sample of size n from $N(\mu, \sigma^2)$ follows _____ distribution.
- normal
 - t
 - chi-square
 - F
- b) State whether each of the following statements is true or false: **[1 each]**
- Unbiased estimator is unique.
 - If $X_1, X_2, \dots, X_n$ is a random sample from $C(\mu, 1)$ then $\sum_{i=1}^n X_i$ is a maximum likelihood estimator of μ .
- c) Answer the following. **[1 each]**
- Define the relative efficiency of estimator T_1 with respect to estimator T_2 .
 - Define minimum variance bound unbiased estimator (MVBUE).
 - Distinguish between point estimation and interval estimation.
 - State the Pitman-Koopman form of probability distribution which admits sufficient statistic.

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

- If $X_1, X_2, \dots, X_n$ is a random sample from a Poisson (λ) then show that $T = \bar{X}^2 - \frac{\bar{X}}{n}$ is an unbiased estimator of λ^2 .
- If $X_1, X_2, \dots, X_n$ is a random sample from $N(\mu, \sigma^2)$ find the sufficient statistic for μ when σ^2 is known.
- If $X_1, X_2, \dots, X_n$ is a random sample from $U(-\theta, \theta)$ find the maximum likelihood estimator (MLE) of θ .

Q3) Attempt any two of the following:

[5 each]

- a) If $X_1, X_2, \dots, X_n$ is a random sample from Poisson (λ), examine whether $\bar{X}$ is MVBUE.
- b) If T is a MVBUE of θ then show that T is a MLE of θ .
- c) If $X_1, X_2, \dots, X_n$ is a random sample from $N(\mu, \sigma^2)$ when σ^2 is known, construct 95% confidence interval for μ .

Q4) Attempt any one of the following.

- a)
 - i) State and prove Cramer - Rao inequality. **[7]**
 - ii) Explain the importance and use of Cramer-Rao lower bound (CRLB) in obtaining efficiency of an estimator. **[3]**
- b)
 - i) If T_n is a consistent estimator of θ then show that the $\phi(T_n)$ is also consistent estimator of $\phi(\theta)$, provided ϕ is continuous function. **[5]**
 - ii) Suppose $X_1, X_2, \dots, X_n$ is a random sample from $N(\mu, \sigma^2)$, $T_1 = \bar{X}$ and $T_2 =$ sample median with $\text{var}(T_2) = \frac{\pi\sigma^2}{2n}$. Find the efficiency of T_1 in relation T_2 and interpret. **[5]**



Total No. of Questions :4]

SEAT No. :

P525

[Total No. of Pages :3

[5215] - 345

T.Y.B.Sc.

STATISTICS (Principal)

ST-333: Sampling Methods

(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) *Use of scientific calculator and statistical table is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :

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

- a) In simple random sampling with replacement (SRSWR), standard error of sample mean is

i) $\sqrt{\left(\frac{N-1}{Nn}\right)S^2}$

ii) $\sqrt{\left(\frac{N-n}{Nn}\right)S^2}$

iii) $\sqrt{\left(\frac{N-n}{N}\right)S^2}$

iv) $\sqrt{\left(\frac{N-1}{N}\right)S^2}$

- b) Ratio estimator of population mean is more efficient than estimator of population mean obtain by SRSWOR method if

i) $\rho < \frac{1}{2} \frac{C_x}{C_y}$

ii) $\rho > \frac{1}{2} \frac{C_x}{C_y}$

iii) $\rho < -\frac{1}{2} \frac{C_x}{C_y}$

iv) $\rho = \frac{1}{2} \frac{C_x}{C_y}$

P.T.O.

c) For the population with linear trend $\text{var}(\bar{y}_{sys})$ is,

i) $\frac{b^2}{12}(k^2 - 1)$

ii) $\frac{b^2}{12}(k - 1)(N + 1)$

iii) $\frac{b^2}{12}(N + 1)(k + 1)$

iv) $\frac{b^2}{12n}(k - 1)(N + 1)$

d) In stratified random sampling estimator of population total is

i) $\bar{y}_{st}$

ii) $N \bar{y}_{st}$

iii) $n \bar{y}_{st}$

iv) $\frac{N}{n} \bar{y}_{st}$

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

a) Regression estimator is always efficient than ratio estimator.

b) In case of SRSWR method sample mean sum of square is an unbiased estimator of population mean sum of square.

C) a) A population of 1000 units is divided into two strata. The strata sizes are $N_1 = 400$, $N_2 = 600$. If $n = 100$, determine the sample size n_1 and n_2 under proportional allocation. **[1]**

b) Describe a real life situation where stratified random sampling can be used. **[1]**

D) a) State an unbiased estimator of population mean in case of systematic sampling and also state variance of same estimator. **[1]**

b) From the population of 4000 persons, a random sample of 80 persons is drawn. If the number of literates in the sample is 40, obtain the estimate of number of literate persons in the population. **[1]**

Q2) Attempt any two of the following :

[5 each]

a) In SRSWOR, obtain confidence interval for population mean, when S^2 is unknown.

- b) Prove that in stratified random sampling $\bar{y}_{st} = \frac{\sum_{i=1}^k N_i \bar{y}_{n_i}}{N}$ is an unbiased estimator of population mean. Also derive an expression of its variance.
- c) State regression estimator of the population mean. Compare its efficiency with ratio estimator.

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

- a) Prove that systematic sampling is more efficient than SRSWOR, if mean square within the sample is larger than population mean sum of square.
- b) With usual notations by ignoring finite population correction. Prove that

$$\text{var}(\bar{y}_{st})_{NA} \leq \text{var}(\bar{y}_{st})_{PA}.$$

- c) Describe the method of determining the sample size in case of SRSWOR for proportional, so as to meet desired margin of error and confidence coefficient.

Q4) Attempt any one of the following :

- a) i) For the population with linear trend $Y_i = a + bi, i = 1, 2, \dots, N$, obtain the expression for variance of an estimator of population mean for systematic sampling. **[5]**
- ii) Obtain the variance of an estimator of the population mean in case of SRSWOR. **[5]**
- b) i) Explain reliability and validity test of questionnaire by using internal consistency method with the help of Cronbach's coefficient alpha. **[5]**
- ii) The values $\{(x_i, y_i), i = 1, 2, 3, 4, 5\}$ in a sample of size 5 are as follows,

x_i	1	2	2	3	3
y_i	3	5	8	6	7

The population total of 50 observations is known to be 100. Obtain ratio and regression estimator of population mean. **[5]**



Total No. of Questions : 4]

SEAT No. :

P526

[5215]-346

[Total No. of Pages : 3

T.Y.B.Sc.

STATISTICS (Principal)

ST - 334 : Design of Experiments

(2013 Pattern) (Semester - III) (Paper-IV) (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) Choose the correct alternative in each of the following: **[1 each]**

- a) In an LSD with 5 treatments, the degrees of freedom for error will be
 - i) 15
 - ii) 12
 - iii) 10
 - iv) 16
- b) In the model of a design of experiments, the error component is assumed to follow the following distribution.
 - i) gamma
 - ii) exponential
 - iii) normal
 - iv) Weibull
- c) The principle of local control is used in
 - i) CRD and RBD
 - ii) CRD
 - iii) RBD
 - iv) CRD and LSD
- d) All the main effects and interaction effects of a 2^3 factorial experiment are
 - i) Non-linear orthogonal contrasts.
 - ii) Linear non-orthogonal contrasts.
 - iii) Not contrasts.
 - iv) Linear orthogonal contrasts.

P.T.O.

- B) State whether the following statements are true or false: **[1 each]**
- The purpose of carrying out confounding in factorial experiment is to reduce the block size.
 - ANOCOVA is carried out when the observed variable is correlated with con-comittant variable.
- C) Define the following terms: **[1 each]**
- Experimental unit.
 - Treatment.
- D) i) Write the expression for factorial effect A for a 2^2 factorial experiment with factors A and B. **[1]**
- ii) Give the expression for total sum of squares of a CRD with 't' treatments replicated n_i times, for $i = 1, 2, \dots, t$. **[1]**

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

- State the mathematical model used in CRD with the underlying assumptions. Also estimate the parameters involved using least squares method.
- Obtain the expectation of mean sum of squares due to error for RBD.
- Compute the relative efficiency of LSD with respect to the corresing RBD by using

- rows as blocks
- columns as blocks,

based on the following information:

Treatment. S. S = 183.5

Row. S. S = 149.3

Column. S. S = 172.8

Total. S. S = 568.2

Number of rows = 4.

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

- Explain what is ANOCOVA with one real life situation. Also state the least squares estimates of parameters of RBD with ANOCOVA.
- Explain Yate's procedure to obtain factorial effect totals in a 2^3 factorial experiment.
- Write a note on Kruskal Wallis H-test.

Q4) Attempt any one of the following:

- a)
 - i) Give analysis for testing the significance of regression coefficient β and test for the equality of treatment effects for ANOCOVA in CRD.
 - ii) Explain Tukey's procedure for comparing pairs of treatment means in RBD. **[7+3]**
- b)
 - i) Explain what is meant by confounding in factorial experiments, differentiate between total and partial confounding. Also give the layout of a replicate divided into 2 blocks in a 2^3 factorial experiment, where interaction effect ABC is confounded.
 - ii) Describe Scheffe's method for comparing treatment contrasts in LSD. **[6+4]**



Total No. of Questions : 4]

SEAT No. :

P527

[5215]-347

[Total No. of Pages : 3

T.Y.B.Sc.

STATISTICS (Principal)

**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: **[1 each]**

- a) The following is a valid identifier
 - i) minimum
 - ii) 7C
 - iii) float
 - iv) first. name
- b) If x and y are integers assigned values as 7 and 4 respectively, then the value of the expression $(x+y)/4$ is
 - i) 3
 - ii) 2
 - iii) 0
 - iv) 2.75
- c) Which of the following is not an assignment expression?
 - i) $a += 1$
 - ii) $a \% = b$
 - iii) $a *= b + 1$
 - iv) $a == b$
- d) A recursive call of function means
 - i) function calls itself.
 - ii) function is not called.
 - iii) function is not used.
 - iv) function calls another function

P.T.O.

- B) State whether each of the following statement is True or False: **[1 each]**
- The function strcmp is used to compare the two strings.
 - Commas cannot be included within the numeric constant.
- C) i) Write an expression in C for the following arithmetic expression **[1]**
- $$\sqrt{a^2 - b^2 + 2ab}$$
- ii) What will be the output of the following segment when executed?
- ```
int x=10, y=20;

if ((x < y) || (x + 5) > 10)

printf ("%d", x);

else

printf ("%d", y);
```
- [1]**
- D) i) Explain use of sizeof ( ) operator giving one example. **[1]**
- ii) Explain the use of conditional operator (?:) giving one example. **[1]**

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

- Explain the syntax and one illustration for each of the following.
  - scanf ( )
  - switch ( )
- Write a C program to get and print the roots of a given quadratic equation  $ax^2 + bx + c = 0$ , if they exist.
- Draw a flowchart to obtain arithmetic mean and variance of n given observations.

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

- Write a C program to combine given two strings using string function.
- What do you mean by two dimensional array? Explain the declaration and initialization of one dimensional array by giving syntax and an illustration.
- Write a C program to generate Fibonacci series like 0,1,1,2,3,5,8..... upto given n number of terms.

**Q4)** Attempt any one of the following:

- a) i) What is user defined function in C? Write a function to find factorial of given integer number. [6]
- ii) Write a C program to evaluate simple interest. [4]
- b) i) Define 'Pointer'. Give one illustration. How it is declared and assigned? [3]
- ii) Write a C program to arrange the given n observations in increasing order of magnitude to find the median of the observations. [7]



Total No. of Questions : 4]

SEAT No. :

P528

[5215]-348

[Total No. of Pages : 3

T.Y. B.Sc.

STATISTICS (Principal)

ST - 336 : Introduction to Regression Analysis  
(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 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) Suppose a multiple linear regression model with two regression ( $X_1, X_2$ ) is fitted to a data set containing 22 observations. If one wishes to test whether  $\beta_2$  is significant, the degrees of freedom associated with t-test is:

- |         |        |
|---------|--------|
| i) 20   | ii) 22 |
| iii) 21 | iv) 19 |

- b) One of the variance stabilizing transformations, the arcsin transformation is given by:

- |                                 |                           |
|---------------------------------|---------------------------|
| i) $y' = \sin(y^2)$             | ii) $y' = \sin(\sqrt{y})$ |
| iii) $y' = \sin^{-1}(\sqrt{y})$ | iv) $y' = \sin^{-1}(y^2)$ |

- c) In simple linear regression, standard error of  $\hat{\beta}_1$  is given by:

- |                                                 |                                                     |
|-------------------------------------------------|-----------------------------------------------------|
| i) $\frac{\sigma}{\sum x_i^2 - n\bar{x}^2}$     | ii) $\frac{\sigma^2}{\sum x_i^2 - n\bar{x}^2}$      |
| iii) $\frac{\sum x_i^2 - n\bar{x}^2}{\sigma^2}$ | iv) $\frac{\sigma}{\sqrt{\sum x_i^2 - n\bar{x}^2}}$ |

P.T.O.

d) For a non-linear regression model  $y = \beta_0 x^{\beta_1}$ , the suitable transformation to linearise the model is:

i)  $y' = \log y, x' = \log x$       ii)  $y' = \ln y$

iii)  $x' = \log x$       iv)  $y' = \frac{1}{y}, x' = \ln x$

B) State whether the following statements are true or false: **[1 each]**

i) The variance covariance matrix of the residuals is given by  $\sigma^2 (I - H)$ .

ii) The likelihood ratio statistic  $G$ , is used for testing  $H_0: \beta_1 = \beta_2 = \dots = \beta_k = 0$  in logistic regression model (with  $n$  data points and  $K$  regressors). Under  $H_0$ ,  $G$  follows Chi Sq distribution  $(\chi^2_{n-p})$  with  $(n - p)$  degrees of freedom.

C) Define the following terms: **[1 each]**

i) odds ratio  $\psi$ .

ii) Studentised residual.

D) Answer the following: **[1 each]**

i) State logistic regression model with single regressor.

ii) What are outliers?

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

a) Discuss in brief AIC and BIC.

b) Write short note on Forward selection method for a regression model.

c) Describe the procedure of testing significance of individual regressors in multiple regression model.

**Q3)** Attempt any Two of the following:

**[5 each]**

- a) In a simple regression problem with sample size 25, the slope was found to be 2.10 and standard error estimate ( $\hat{\sigma}$ ) is equal to 10.70. The quantity  $\sum x_i^2 - n\bar{x}^2 = 400.52$ .
- i) Compute the standard error of the regression slope coefficient ( $\beta_1$ ).
- ii) Test whether the regression coefficient is different from zero at a significance level 0.05
- b) Explain the procedure to fit the multiple linear regression model  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$ .
- c) Write a short note on method of weighted least squares for fitting linear regression models.

**Q4)** Attempt any one of the following:

- a) i) Explain the procedure of testing significance of the regressors of multiple logistic regression model. **[5]**
- ii) In simple linear regression model  $Y = \beta_0 + \beta_1 X + \varepsilon$  with  $E(\varepsilon) = 0$ ,  $\text{Var}(\varepsilon) = \sigma^2$  and  $\varepsilon$  uncorrelated, show that  $\beta_1$  is an unbiased estimator of model parameter  $\beta_1$ . Also derive an expression for  $\text{Var}(\hat{\beta}_1)$ . **[5]**
- b) i) Write a short note on plots of residuals against the fitted values. **[5]**
- ii) In a 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]**



Total No. of Questions : 4]

SEAT No. :

**P529**

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[Total No. of Pages : 2

**T.Y.B.Sc.**

**GEOGRAPHY**

**Gg- 331: Fundamentals of Human Geography (Part-I)**  
**(2013 Pattern) (Paper-I) (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 sketches and diagrams wherever necessary.*
- 4) *Use of Map stencils is allowed.*

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

- a) Who put forward the concept of Welfare Approach in Human Geography?
- b) Name two traditional approaches to Human Geography.
- c) What is neo-determinism? Who gave this new concept to human geography?
- d) Define human race.
- e) What do you understand by the term "Australopithecus"?
- f) Where are the Pygmies found? To which race do they belong to?
- g) What percentage of human population lives in Northern Hemisphere?
- h) In which continent do we find the highest density of population?
- i) Discuss two pull factors responsible for Migration.
- j) Name two countries in the third stage of the Demographic Transition.
- k) What do you understand by developed countries and underdeveloped countries? Give examples.
- l) What is cultural diffusion?
- m) Name the minor cultural realms of the world.

**P.T.O.**

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

- a) Nature of Human Geography.
- b) Differences between Regional and Systematic Approach in Geography.
- c) Importance of sanitation in our daily lives.
- d) Haggerstrand's Diffusion Model.

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

- a) Throw light on the population policy of India.
- b) Describe the minor cultural realms.
- c) What are Millennium Development Goals? Throw light on the importance of nutrition in achieving them.
- d) Discuss the reasons of low HDI in African countries.

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

- a) Differentiate between the various human races on the basis of their physical traits.
- b) Discuss the changing trends in population policies of the developed and underdeveloped nations of the world.



Total No. of Questions : 4]

SEAT No. :

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**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) *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) What is consequential element in tourism?
- b) What is winter resort?
- c) What is absolute location?
- d) State any two cultural attraction of tourism from Maharashtra.
- e) What is market accessibility?
- f) State any two impacts of soil on tourism.
- g) Mention any two wildlife sanctuaries from India.
- h) What is national culture?
- i) State the difference between travel and tourism.
- j) Mention any two types of tourist activity.
- k) What is meant by 'tourist satisfaction'?
- l) Mention any two purposes of travel.
- m) What is ITDC?

**P.T.O.**

**Q2)** Write short notes (Any two):

**[10]**

- a) Tourism as a regional resource.
- b) Seasonality and tourism.
- c) Vegetation and tourism
- d) Heritage preservation.

**Q3)** Answer the following questions in 100 words (Any two):

**[10]**

- a) What is the role of man-made objects in tourism?
- b) Why are lakes, attraction of tourism?
- c) What is the impact of cultural diversity on tourism?
- d) Differentiate between international and domestic tourists.

**Q4)** Answer the following questions in 200 words (Any one):

**[10]**

- a) Describe, with suitable examples, the impact of coasts and volcanic is lands on tourism.
- b) Discuss the spatial patterns of supply and demand in tourism.



Total No. of Questions :4]

SEAT No. :

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**T.Y.B.Sc.**

**GEOGRAPHY**

**Gg-333: Fundamentals of Geoinformatics (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 or three sentences (any ten) **[10]**

- a) What is GIS?
- b) What is buffer analysis?
- c) Define remote sensing.
- d) What is pixel?
- e) Who is the father of GIS?
- f) What is a focal function?
- g) Mention any two elements of GIS.
- h) Which is the first India's satellite?
- i) What is layer?
- j) Write any two characteristics of raster data.
- k) What do you understand data model?
- l) Mention any two grid operation used in GIS.
- m) Mention any four application areas of remote sensing.

**P.T.O.**

**Q2)** Write short notes on (any two) :

**[10]**

- a) Functions of GIS.
- b) Topographical map as data source in GIS.
- c) Input as a GIS task.
- d) Compare the spatial and non - spatial data management.

**Q3)** Answer the following questions in 100 words (any two)

**[10]**

- a) Describe query analysis.
- b) Explain the scope and importance of GIS.
- c) Explain raster data model.
- d) Discuss the role of GIS in environment studies.

**Q4)** Answer the following questions in 200 words (any one)

**[10]**

- a) Explain how remote sensing and GIS are helpful in urban and regional planning.
- b) Give an account of vector data analysis.



Total No. of Questions : 4]

SEAT No. :

**P532**

**[5215]-352**

[Total No. of Pages : 2

**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 indicate full marks.*
- 3) Draw neat sketches and diagrams wherever necessary.*
- 4) Use of maps stencils is allowed.*

**Q1)** Answer the following questions in two or three sentences (any ten): **[10]**

- a) Name the states of India which shares an international border with China.
- b) State the latitudinal and longitudinal extent of India.
- c) Write the name of physiographic divisions of the Himalaya.
- d) State any two characteristics of the north Indian plains.
- e) Name the highest peak of western Ghat.
- f) Name the states of India which covers part of eastern Ghat.
- g) What is the length of coastline of India.
- h) Name the place of origin of river Tapi.
- i) Name the drought prone regions of India.
- j) State any two characteristics of Indian monsoon.
- k) Name the state of India which shares maximum area under vegetation cover?
- l) State any two causes of deforestation in India.
- m) Name the region covers black cotton soils in India.

**P.T.O.**

**Q2) Write Short Notes (Any Two):**

**[10]**

- a) Historical background of India.
- b) The coastal low lands of India.
- c) Origin of Indian monsoon.
- d) Forest conservation in India.

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

**[10]**

- a) Name the physiographic regions of India and explain any one in details.
- b) Discuss various seasons of Indian climate with associated weather conditions.
- c) Write an account of the Narmada river system.
- d) Explain the geopolitical importance of Indian ocean with reference to India-China relationship.

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

**[10]**

- a) Explain major drainage systems of east flowing rivers of India.
- b) Describe major soil types of India giving suitable examples.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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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) *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 understand by the process of Sheeting?
- b) What do you understand by the term Pedogenesis?
- c) Write the importance of soil atmosphere.
- d) What is Azonal soil?
- e) What is soil porosity?
- f) What is a wilting point of a Soil?
- g) Define the term weathering.
- h) What is bulk density of soil?
- i) Define the process of Illuviation.
- j) What is soil texture?
- k) Define the term soil permeability.
- l) Name any two secondary minerals.
- m) What do you understand by the term field capacity?

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

- a) Components of soil.
- b) Distinguish between weathering and Pedogenesis
- c) V. Dokuchaev as father of Soil.
- d) Parent material as a factor of soil formation.

**P.T.O.**

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

- a) Discuss the factors affecting water holding capacity of soil.
- b) Describe characteristics of secondary minerals.
- c) What is Ion exchange?
- d) Give a classification of zonal soils.

**Q4)** Answer the following questions in 200 words (any one): **[10]**

- a) What do you understand by Hydrogen Ion Concentration? Discuss the effects of Hydrogen Ion Concentration on seed germination.
- b) Give an account of Genetic structure of a Soil profile.



Total No. of Questions : 4]

SEAT No. :

**P534**

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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 indicate full marks.*
- 3) *Draw neat sketches and diagrams 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 emission?
- b) What are panchromatic photographs?
- c) Define photo Nadir.
- d) Mention any two types of scattering.
- e) What is multispectral photo?
- f) What do you understand by principal point on an aerial photo?
- g) Give the percentage side overlap of a stereo pair photograph.
- h) What is a stereogram?
- i) Name the instrument used for 3D visualization of an air photo pair.
- j) Give the spectral range of visible spectrum.
- k) Define wave frequency.
- l) Define Rayleigh scattering.
- m) Give any two applications of remote sensing for environmental studies.

**P.T.O.**

**Q2)** Write short notes (any two):

**[10]**

- a) Electromagnetic spectrum.
- b) Characteristics of Stereo pairs.
- c) Central perspective projection.
- d) Any one application of remote sensing.

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

**[10]**

- a) Explain in brief projections used in aerial photographs.
- b) Discuss in brief any one imaging system.
- c) Explain in brief how incoming solar radiation interacts with the atmosphere.
- d) Explain the meaning of depth perception and pseudoscopic image in remote sensing.

**Q4)** Answer the following in 200 words (Any One):

**[10]**

- a) Give an account of types of aerial photographs.
- b) Explain the parameters of annotation note on an aerial photograph.



Total No. of Questions : 4]

SEAT No. :

**P535**

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[Total No. of Pages : 2

**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 diagrams wherever necessary.*

**Q1)** Attempt the following:

**[5]**

A) Match the following:

- |                            |                           |
|----------------------------|---------------------------|
| a) <u>Rickettsia</u>       | i) Opportunistic pathogen |
| b) <u>Acinetobacter</u>    | ii) Animal disease        |
| c) Tuberculosis            | iii) Nagler reaction      |
| d) Clostridium perfringens | iv) DOTS                  |
| e) Anthrax                 | v) Q fever                |

B) Name the pathogen associated with the following:

**[5]**

- a) Toxic shock syndrome.
- b) Thayer martin medium.
- c) Tool in biological warfare.
- d) Cetrimide agar.
- e) TCBS agar.

**P.T.O.**

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

- a) Diagrammatically represent: Gastrointestinal system.
- b) Write the cultural and biochemical characteristics of E.coli.
- c) What are different modes of transmission of infections?

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

- a) Cohort studies.
- b) Toxins produced by Staphylococcus aureus.
- c) Pathogens and diseases of respiratory system.

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

- a) Describe the pathogenicity of diseases caused by Pneumococci.
- b) Explain the pathogenesis and laboratory diagnosis of Treponema.



Total No. of Questions : 4]

SEAT No. :

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**T.Y.B.Sc.**

**MICROBIOLOGY**

**MB - 332 : Genetics & Molecular Biology - I**  
**(2013 Pattern) (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) *Draw neat labelled diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Answer the following.

A) Match the following :

**[5]**

- |                           |                               |
|---------------------------|-------------------------------|
| i) DNA-A protein          | a) Eukaryotic mRNA            |
| ii) CAAT box              | b) 5'–3' exonuclease activity |
| iii) DNA pol I            | c) Prepriming protein         |
| iv) Introns               | d) Eukaryotic promoter        |
| v) Eukaryotic RNA pol III | e) t RNA synthesis            |

B) Attempt the following :

**[5]**

- i) uvr-d is a \_\_\_\_\_
  - a) Helicase
  - b) Polymerase
  - c) Primase
  - d) Endonuclease
- ii) Eukaryotic m RNA's have
  - a) 5' Cap
  - b) 3' tails
  - c) Introns
  - d) All of the above
- iii) Unusual modified bases are found in
  - a) mRNA
  - b) tRNA
  - c) rRNA
  - d) DNA

**P.T.O.**

- iv) Give statements of Mendel's laws.
- v) State True or false - Recombination frequency increases with decreasing distance between the genes.

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

- a) Mismatch repair system.
- b) Southern blot technique.
- c) Eukaryotic mRNA structure.

**Q3)** Write short notes on any two of the following. **[10]**

- a) Isolation & purification of genomic DNA.
- b) Safety guidelines for Recombinant DNA technology lab set up.
- c) Initiation of bacterial translation.

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

- a) What is Recombination? Give its significance in mapping of genes?  
Explain D S B model of Recombination with the help of a diagram?

OR

- b) What is Central dogma?  
Explain in detail Initiation, elongation & Termination of Bacterial transcription.



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

- a) Match the following **[5]**
  - 1) Sodium dodesyl sulfate      i) Hexokinase
  - 2) Nuclear Magnetic Resonance    ii) DEAE - Cellulose
  - 3) Anionic Exchanger      iii) Atomic structure of protein
  - 4) Isoenzyme      iv) NAD
  - 5) Nicotinic acid      v) Anionic detergent
- b) Draw the proper structure of Thiamin. **[1]**
- c) Enlist any two examples of cationic exchanger. **[1]**
- d) State True or False. **[2]**
  - i) Gel filtration chromatography is also known as molecular sieve chromatography.
  - ii) Line weaver plot is an example of double reciprocal plot
- e) Define Km. **[1]**

**P.T.O.**

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

- a) Explain structure, occurrence and biochemical role of vitamin Riboflavin.
- b) Explain how zymogens are activated by proteolytic modification with suitable example.
- c) Describe with suitable example spectrofluorometric method of enzyme assay.

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

- a) Write concept and applications of an immobilized enzymes.
- b) Derive an equation for Hanes plot with graphical representation.
- c) Explain any one physical method for determination of amino acid residues at active site.

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

- a) What is feedback inhibition? Describe various types of feed back inhibition.
- b) Describe principle, working and applications of affinity chromatography.



Total No. of Questions : 4]

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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]**

- |                              |                        |
|------------------------------|------------------------|
| i) Innate immunity           | 1) Autoantigens        |
| ii) ABO blood group antigens | 2) Antigen binding     |
| iii) V domains               | 3) Phagocytic cells    |
| iv) Primary immune response  | 4) Haemopoiesis        |
| v) Bone marrow               | 5) Isoantigens         |
|                              | 5) Predominance of IgM |

***b) State true or false:-*** **[2]**

- i) Dendritic cells are rich in MHC II molecules.***
- ii) Extracellular antigens are processed by MHC I pathway.***

***c) Attempt the following:-*** **[3]**

- i) Write any one acute phase reactant.***
- ii) Which is the domain encoded by V, D and J gene segments?***
- iii) Define -haptens.***

***Q2) Attempt any Two:*** **[10]**

- a) Illustrate diagrammatically: Structure of thymus.***
- b) Compare in tabular form: Active and passive immunities.***
- c) Comment on: Prevention of allograft rejection.***

***P.T.O.***

**Q3)** Write short notes any Two:

**[10]**

- a) Adjuvants.
- b) Lymphatic system and lymph circulation.
- c) Antigenic nature of immunoglobulins.

**Q4)** Attempt any One:

**[10]**

- a) Describe T Lymphocytes w.r.t. formation, differentiation, subsets and their activation.
- b) Explain activation of complement by classical pathway and role of complement in immunity.



Total No. of Questions : 4]

SEAT No. :

**P539**

[5215]-359

[Total No. of Pages : 2

**T.Y.B.Sc.**

**MICROBIOLOGY**

**MB-335: Fermentation Technology - I  
(2013 Pattern) (Semester - III) (Paper-V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to 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 following.

- a) Define following. [2]
  - i) Copy right
  - ii) Revertant
- b) State True or False [3]
  - i) Toxicity test is conducted with auxotrophic mutant.
  - ii) Strain improvement is a process of modifying media.
  - iii) Altered permeability mutants are isolated by using minimal medium.
- c) Match the following and write correct pairs. [5]

| A                                          | B                                        |
|--------------------------------------------|------------------------------------------|
| i) Liquid-liquid extraction                | i) Recombinant DNA technology            |
| ii) Effective method of strain improvement | ii) Factorial Design                     |
| iii) Media optimization                    | iii) Construction of Research Laboratory |
| iv) Non-recurring expenses                 | iv) Use of solvent                       |
| v) Pilot plant                             | v) Scale-up process                      |

**Q2)** Write short Answers (Any two):

**[10]**

- a) Explain levels of fermentation.
- b) Describe filtration in recovery process.
- c) Describe continuous sterilization.

**P.T.O.**

**Q3) Write any two:**

**[10]**

- a) List various types of IPR and comment on patent.
- b) Define strain improvement and explain isolation of an auxotrophic mutant by any one method.
- c) Explain in brief media optimization by plackett and Burman design.

**Q4) Write any one:**

**[10]**

- a) List various methods of quantification of fermentation products, and explain in detail Bioassay.

OR

- b) Enlist different quality tests for fermentation products, and explain Ame's Test in detail.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P540**

**[5215]-360**

**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]

- |                      |                                  |
|----------------------|----------------------------------|
| a) Blue milk         | i) 1.5% fat                      |
| b) Single toned milk | ii) <u>Pseudomonas Syncyanea</u> |
| c) Phosphatase       | iii) 3.0% fat                    |
| d) Yellow milk       | iv) CQC                          |
| e) Double toned milk | v) <u>Pseudomonas Synxantha</u>  |

B) Fill in the blanks: [2]

- a) The full form of NDRI is \_\_\_\_\_.
- b) Water activity is \_\_\_\_\_ factor of food affecting Microbial growth.

C) Write any two advantages of Tetrapak. [1]

D) Define: [2]

- a) Perishable foods.
- b) D-value

**P.T.O.**

**Q2)** Write short note on (any two): **[10]**

- a) Composition of milk.
- b) Use of chemicals and antibiotics in food preservation.
- c) Starter cultures with suitable examples.

**Q3)** Attempt any two: **[10]**

- a) Describe spoilage of sea foods and canned foods.
- b) Enlist probiotic characteristics of lactic acid bacteria.
- c) Describe MBRT test and give its significance.

**Q4)** Attempt any one: **[10]**

- a) Explain spoilage of milk with respect to sweet curdling and ropiness.
- b) Describe food poisoning by Staphylococcus aureus.



Total No. of Questions : 4]

SEAT No. :

**P541**

[5215]-361

[Total No. of Pages : 2

**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL- 331: Advanced Digital Systems Design**

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

*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)** Attempt all of the following:

- a) State the significance of question mark “?” in number specification of verilog. [1]
- b) What is the role of output buffer in PLA? [1]
- c) Write the function of system task “\$finish” in verilog. [1]
- d) What is Mealy Sequential Machine Model? [1]
- e) State various methods of timing control in verilog. [2]
- f) List different types of SPLD's. [2]
- g) Write any two properties of equivalent states. [2]
- h) List bit-wise operators used in verilog. [2]

**Q2)** Attempt any two of the following:

- a) State and explain “Looping statements in verilog” with examples. [4]
- b) What are the programmable Logic Devices? Write its advantages. [4]
- c) What is merger graph? Write the procedure to draw the merger graph.[4]

**P.T.O.**

**Q3)** Attempt any two of the following:

- a) What is data flow modeling? Explain it with suitable example. [4]
- b) Draw the general structure of FPGA. Describe it in brief. [4]
- c) Write short note on “ASM” symbols. [4]

**Q4)** Attempt any two of the following:

- a) Explain with the help of block diagram, traffic light controller system. [6]
- b) i) Describe “initial and always” statements in verilog with examples. [3]  
ii) Explain the following data types: Nets and Registers in verilog. [3]
- c) Draw general flow chart of design for logic circuits and explain it in detail. [6]

OR

Attempt all of the following:

- a) Write program in verilog for half adder using Gate level modeling. [4]
- b) Draw the logic diagram of PAL having 4 inputs, 8 product terms and 4 outputs. [4]
- c) Reduce the given state table using implication chart state reduction technique. [4]

| Present state | Next state, output |       |
|---------------|--------------------|-------|
|               | x = 0              | x = 1 |
| a             | a, 0               | b, 0  |
| b             | d, 0               | e, 1  |
| c             | e, 0               | b, 1  |
| d             | g, 0               | f, 0  |
| e             | a, 0               | b, 0  |
| f             | d, 0               | g, 1  |
| g             | d, 0               | f, 1  |



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P542**

**[5215]-362**

**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 the following.

- a) What do you mean by assembler? [1]
- b) On power up, which bank is activated by the  $\mu C$  8051. [1]
- c) What is the size of SP register. [1]
- d) If (A) = 55H, What will be the content of A after execution of CPL A instruction? [1]
- e) Indicate the selection mode with the instruction "Mov TMOD. # 20H.[2]
- f) What is emulator? [2]
- g) List various SFR<sub>s</sub> used in 8051  $\mu C$ . [2]
- h) State any two merits of LCD over LED. [2]

**Q2)** Attempt any two of the following.

- a) Which are the various addressing modes of 8051  $\mu C$ . Explain it with suitable example. [4]
- b) Explain PSW register of 8051  $\mu C$  in brief. [4]
- c) Draw and explain the interfacing action of stepper motor with 8051  $\mu C$ . [4]

**Q3)** Attempt any two of the following.

- a) Write an assembly language program to find the 2's complement of the 8 bit number.
- b) Interface 16 K byte of RAM to 8051  $\mu C$ , Give its memory map. [4]
- c) Draw and explain the internal block diagram of 8051 microcontroller. [4]

**P.T.O.**

**Q4)** Attempt any two of the following.

- a) Explain the need of following software development tools.
  - i) Simulator.
  - ii) Debugger. [6]
- b) Write a short note on interrupt system of 8051  $\mu$ C. [6]
- c) Explain I/O port functions of 8051  $\mu$ C in detail. [6]

OR

**Q4)** Attempt all of the following.

- a) Write a program to add Two 16 bit numbers. Place the result in register R4 and R5. [4]
- b) Interface 4 $\times$ 4 matrix keyboard to 8051  $\mu$ C. Explain its action with the help of flow chart. [4]
- c) Find register A content after each of the following instruction is executed  
MOV A, # 56H.  
SWAP A  
RR A  
RR A [4]

☆ ☆ ☆

Total No. of Questions : 4]

SEAT No. :

**P543**

**[5215]-363**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**ELECTRONIC SCIENCE**

**EL - 333 : Analog Circuit Design & Applications of Linear IC'S  
(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) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Attempt all of the following:

- a) What is input offset voltage of op-amp? [1]
- b) What are important parameters of op-amp that influence the performance of circuit? [1]
- c) State applications of differentiator? [1]
- d) List different blocks of PLL. [1]
- e) Define LTP and UTP of schmitt trigger. [2]
- f) What are advantages of active filter over Passive Filter? [2]
- g) Draw the circuit diagram of astable multivibrator using op-amp. [2]
- h) If  $R_1 = 240\Omega$ ;  $R_2 = 710\Omega$ ;  $I_{ADJ} = 100\mu A$  &  $V_{ref} = 1.25V$ , what is the output voltage of voltage regulator IC LM317? [2]

**Q2)** Attempt any two of the following:

- a) Explain the working of precision half wave Rectifier. [4]
- b) What are earth loops? How to avoid earth loops in case of Op-amp? [4]
- c) Explain the working of astable multivibrator using timer IC 555. [4]

**P.T.O.**

**Q3)** Attempt any two of the following:

- a) Explain the working of peak detector. [4]
- b) Explain the working of voltage comparator IC LM 311. [4]
- c) What is voltage regulator? What are different types of adjustable voltage regulators? What are advantages of adjustable voltage regulators over the fixed voltage regulator? [4]

**Q4)** Attempt any two of the following:

- a)
  - i) What is selection criteria for op-amp in DC & low frequency applications? [3]
  - ii) What is selection criteria for op-amp in high frequency applications? [3]
- b)
  - i) Explain the working of log amplifier with a diode as log element. [3]
  - ii) Explain the working of inverting schmitt trigger. [3]
- c) Explain the block diagram of IC LM 723. [6]

OR

Attempt all of the following:

- a) For astable multivibrator using timer IC 555  $R_A = 2K\Omega$ ,  $R_B = 5K\Omega$  &  $C = 0.1\mu F$ . Determine its frequency and duty cycle. [4]
- b) Determine frequency of VCO by using IC 566, if  $R_1 = 1K\Omega$ ,  $C_1 = 0.01\mu F$ ,  $R_2 = 5K\Omega$  &  $R_3 = 10K\Omega$  supply voltage  $V_+ = 12V$ . [4]
- c) Design a second order low pass active filter for lower cut off frequency  $F_L = 1KHz$ . [4]



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

**P544**

**[5215] - 364**

**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL -334: Principles of Semiconductor Devices**

**(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 is allowed.*

**Q1)** Attempt All of the following.

- a) What is Photoelectric effect? [1]
- b) Define fermi level. [1]
- c) What do you mean by current transfer ratio? [1]
- d) How the rectifying contacts are formed? [1]
- e) 'BJT' is bipolar device'. Comment [2]
- f) What do you mean by emitter injection efficiency? [2]
- g) Define the term lattice and crystal structures. [2]
- h) State the meaning and importance of work function in schottky diode.[2]

**Q2)** Attempt any two of the following.

- a) What is epitaxial growth? Explain the technique of growing epitaxial layer using molecular beam epitaxy. [4]
- b) Define luminescence, photoluminescence, cathodo luminescence, electro luminescence. [4]
- c) State the necessity of bonding forces. Discuss different types of bonding forces in solid. [4]

**P.T.O.**

**Q3)** Attempt any two of the following.

- a) What is reverse breakdown? Explain the zener breakdown process with the help of suitable diagram. [4]
- b) Discuss the process of development of space charge region in the PN junction. [4]
- c) With the help of neat labeled diagram explain the structure of bipolar junction transistor. Draw the I-V characteristics of the BJT. [4]

**Q4)** Attempt any two of the following.

- a) Define the terms- conductivity, mobility, drift of carriers, diffusion of carriers. [6]
- b) What is schottky effect? Explain schottky barrier with the help of a band diagram. [6]
- c) With the help of a suitable diagram explain the working of MOS transistor. [6]

OR

Attempt All of the following.

- a) Explain the avalanche breakdown in bipolar junction transistor. [4]
- b) Write a note on effect of negative bias on the resistance of conducting channel of JFET. [4]
- c) With the help of a neat labeled diagram explain the construction of GaAs MESFET. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P545**

**[5215]-365**

**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) Why do we need to use comment in program? [1]
- b) Explain meaning of 'Scanf' Statement. [1]
- c) Define an array. [1]
- d) Explain the term 'get c'. [1]
- e) Explain function strcat ( ). [2]
- f) Explain fprintf and fscanf function in 'C' [2]
- g) What is use of # include directive in 'C'? [2]
- h) What are formal and actual parameters? [2]

**Q2)** Attempt any two of the following.

- a) Write a program to read data from keyboard, write it to a file 'X' again read the same data from file 'X' and display it. [4]
- b) Describe the structure of C program. [4]
- c) Define function. Explain its general format. [4]

**P.T.O.**

**Q3)** Attempt any two of the following.

- a) What is difference between 'while' and 'do-while' statement in 'C'? [4]
- b) Write a program to print the address of variables along with its values. [4]
- c) Write algorithm to arrange n elements in ascending order using bubble sort algorithm. [4]

**Q4)** Attempt any two of the following.

- a) What is recursion? Write recursive function to evaluate factorial of n. [6]
- b) Write a program to print sum of first ten natural numbers using 'while' loop [6]
- c) Write algorithm using quick sort to arrange 10 numbers in ascending order. [6]

OR

**Q4)** Answer all of the following:

- a) What is algorithm? Explain its symbols for operations in 'C'. [4]
- b) Explain 'for' statement with suitable example. [4]
- c) How to initialize one dimensional and two dimensional array? [4]



Total No. of Questions :4]

SEAT No. :

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**P546**

**[5215] - 366**

**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 calculator is allowed.*

**Q1)** Attempt all of the following:

- a) State the names of optical sources. [1]
- b) State any two methods used for fabrication of fiber optic cable. [1]
- c) What do you mean by Meridional Ray? [1]
- d) What is attenuation? [1]
- e) State the condition for TIR in fiber optic cable. [2]
- f) What is fiber splice? State different splicing techniques. [2]
- g) "Repeaters are used in fiber optic communication" Comment. [2]
- h) "Optic fiber communication system is required for video signal transmission" Comment. [2]

**Q2)** Attempt any two of the following:

- a) State the different types of fibers based on Index profile and explain it in detail. [4]
- b) With the neat diagram explain the working of semiconductor LASER diode. [4]
- c) Discuss any two losses in fiber optic cable. [4]

**P.T.O.**

**Q3)** Attempt any two of the following:

- a) Explain the attenuation measurement in fiber optic cable. [4]
- b) With the neat diagram explain the Snell's law and critical angle. [4]
- c) Draw the block diagram of fiber optic communication and explain each block. [4]

**Q4)** Attempt any two of the following:

- a) Draw and explain block diagram of optical link used in point to point communication based on power budget consideration and write expression for optical power budget. [6]
- b) Define the term Numerical aperture and explain the method for the measurement of Numerical aperture of fiber optic cable. [6]
- c) Write a short note on structures of LED and state the advantages and disadvantages. [6]

OR

**Q4)** Attempt all of the following:

- a) A Silica fiber with core RI of 1.5 and cladding RI of 1.47. calculate critical angle, Numerical aperture and acceptance angle. [4]
- b) When  $3 \times 10^{11}$  photons each with a wavelength of  $0.90 \mu\text{m}$  are incident on a photodiode, on average  $1.6 \times 10^{11}$  electrons are collected at the terminals of the device. Determine the quantum efficiency and the responsivity of the photodiode at  $0.90 \mu\text{m}$ . [4]
- c) A multimode fiber with a core refractive index of  $n_1=2$  having relative refractive index difference of 4% and operating at wavelength  $0.8 \mu\text{m}$ . Estimate the critical radius of curvature at which large bending loss occurs. [4]



Total No. of Questions :4]

**P546**

**[5215] - 366**

**T.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL - 336 (B) : Electronic Product Design and Entrepreneurship  
(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 calculator is allowed.*

**Q1)** Attempt all of the following:

- a) Define the term entrepreneurship. [1]
- b) What is decision? [1]
- c) State any two non-government sources of finance. [1]
- d) What is maintainability of electronic products? [1]
- e) Explain the term fund flow. [2]
- f) State merits of co-operative societies. [2]
- g) What is techno-commercial feasibility of product? [2]
- h) Explain the concept of small business. [2]

**Q2)** Attempt any two of the following:

- a) State and explain considerations of consumer product. [4]
- b) Explain the basic problems of women entrepreneurship. [4]
- c) Explain break even point analysis. [4]

**Q3)** Attempt any two of the following:

- a) Explain the features of sole proprietorship. [4]
- b) A single stage transistor amplifier uses 4-resistors, 1-transistor, 1-power transformer and 4-diodes with failure rates 0.61, 0.6, 0.6, 0.2 and 0.18 per  $10^6$  hours respectively. Calculate MTBF for this circuit. [4]
- c) Explain the concept of marketing strategy. [4]

**Q4)** Attempt any two of the following:

- a) Explain in detail content of project report for starting business. [6]
- b) Explain capacitive touch screen technology with neat diagram. State their features. [6]
- c) State merits and demerits of joint stock company. [6]



Total No. of Questions : 4]

SEAT No. :

**P547**

[5215]-367

[Total No. of Pages : 2

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**Ds. No. :- 301: Indias Foreign and Defence Policy (Compulsory)  
(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.*

**Q1)** Answer in 2 or 4 sentences each:-

**[16]**

- a) Define “Defence policy”.
- b) What do you mean by “panchsheel”?
- c) State the meaning of “Determinant Factors”.
- d) What do you know about operation Shakti of 1998?
- e) Write an objectives of Indias Foreign policy.
- f) What do you understand by “Buddha is laughing”?
- g) State the meaning of “Nuclear Doctrine”.
- h) State any two principles of Indias Foreign policy.

**Q2)** Answer in 8 or 10 sentences: (Any two)

**[8]**

- a) Explain any one determinant factor of Indias defence policy.
- b) Write in brief the characteristics of Indias Foreign policy.
- c) Why India conducted her First Nuclear Tept in 1974.

**P.T.O.**

**Q3)** Write short notes on: (Any two)

**[8]**

- a) Look East policy of India.
- b) Concept of Defence policy.
- c) Operation Shakti of 1998 & its impact on South Asia.

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

**[8]**

- a) Explain in brief the determinant factors of Indias Foreign policy.
- b) Highlight on Indias defence policy “from 1947 to 1998”.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 1

**P548**

**[5215]-368**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 302 : Defence Economics**

**(2013 Pattern) (Theory) (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) State the meaning of defence planning.
- b) Define economic power.
- c) What do you mean by war time economy?
- d) Define war potential
- e) State the meaning of Defence versus Development.
- f) Write full form of DPSU.
- g) State the meaning of mobilization of resources for war.
- h) Define strategic planning.

**Q2)** Answer in 8 to 10 Sentences each (any two). **[8]**

- a) Explain determinants of defence expenditure.
- b) Describe elements of war potential.
- c) Explain merits of war time economy.

**Q3)** Write short notes on (any two). **[8]**

- a) Domestic sources of war finance.
- b) Problems of Indian economy.
- c) Merits of peace time economy.

**Q4)** Answer in 18 to 20 sentences (Any one). **[8]**

- a) Explain rational of arms production in the Third world countries.
- b) Describe relationship between war and economy.

Total No. of Questions : 4]

SEAT No. :

**P549**

**[5215]-369**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 303 : Research Methodology**

**(2013 Pattern) (Semester - III) (Theory) (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 2 to 4 Sentences each:

**[16]**

- a) Write any two characteristics of good Research.
- b) Define scientific Research.
- 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 are the objectives of social science Research?
- h) What are the sources of primary data?

**Q2)** Answer in 8 to 10 Sentences each (any two):

**[8]**

- a) Explain importance of selection of research problem.
- b) Describe differences between research methods and methodology.
- c) Explain conceptualization in research survey of literature.

**P.T.O.**

**Q3)** Write short notes on (any two): **[8]**

- a) Features of good research design.
- b) Development of working hypothesis.
- c) Criteria for good research.

**Q4)** Answer in 18 to 20 sentences (Any one): **[8]**

- a) Explain Role of Research in security studies.
- b) Describe Research process in flow chart.



Total No. of Questions : 4]

SEAT No. :

**P550**

**[5215]-370**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 304 :Science, Technology and National Security**

**(2013 - Pattern) (Semester - III) (Paper - IV) (Theory)**

*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 Technology.
- b) Write full form of C4ISR.
- c) Define armament technology.
- d) What do you mean limited war?
- e) State the meaning of Battlefield information system.
- f) Write the meaning of surprise first strike.
- g) Write any two characteristics of Air-Craft career.
- 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 science on armament technology.
- b) Describe transfer of technology and its impact.
- c) Discuss role of DPSU in India's Defence production.

**P.T.O.**

**Q3)** Write short notes on (any two).

**[8]**

- a) Surveillance and Intelligence.
- b) Evolution of the Defence Industrial Base in India.
- c) Advantages of foreign collaboration.

**Q4)** Answer in 18 to 20 Sentences (Any one).

**[8]**

- a) Explain impact of military technology in contemporary warfare.
- b) Describe relationship between science, technology and national security.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P551**

**[5215]-371**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS:- 305: Defence Planning and Management in India  
(2013 Pattern) (Semester - III) (Theory) (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) Define Defence management.
- b) What do you mean by team building in Defence Management?
- c) Define budgetary perspectives.
- d) State the meaning of military industrial complex.
- e) State the meaning of Battlefield information system.
- f) Write any two functions of military leadership.
- g) What is supply chain management?
- h) What do you mean by battle dynamism?

**Q2)** Answer in 8 to 10 Sentences each (any two):

**[8]**

- a) Explain salient features of management.
- b) Describe scope of Defence management.
- c) Explain management of DPSU.

**P.T.O.**

**Q3)** Write short notes on (any two):

**[8]**

- a) Management of integrated Defence.
- b) Elements of war potential.
- c) Principles of Defence Management.

**Q4)** Answer in 18 to 20 Sentences (Any one):

**[8]**

- a) Explain role of war principles in corporate management.
- b) Describe role of leadership in defence management and development.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :4

**P552**

**[5215] - 372**

**T.Y.B.Sc. (Optional)**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 306 (A) : Military and Media**

**(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 do you mean by mass communication?
- b) Define communication management.
- c) Write any two challenges to Defence journalism.
- d) Write any two laws of Defence journalism.
- e) Write any two steps of scientific inquiry.
- f) Write any two methods of report presentation.
- g) Define scientific inquiry.
- h) State the meaning of hypothesis in journalism.

**Q2)** Answer in 8 to 10 Sentences each (any two).

**[8]**

- a) Explain characteristics of defence journalism.
- b) Discuss challenges to defence journalism.
- c) Describe theory of communication.

**P.T.O.**

**Q3)** Write short notes on (any two)

**[8]**

- a) Ingredients of defence journalism.
- b) Laws in communication.
- 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.



Total No. of Questions :4]

**P552**

**[5215] - 372**

**T.Y.B.Sc. (Optional)**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 306 (B) : Armed Conflict and Human Rights  
(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) State the meaning of gender equality.
- b) What do you mean by good governance?
- c) Define directive principles.
- d) Define right to development.
- e) Define insurgency.
- f) Define economic security.
- 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 role of civil society in 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) Peace Keeping Force.
- 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 humanitarianism and conflict.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

**P553**

**[5215]-373**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 307 (A) : Disaster Management**

**(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 indicate full marks.*

**Q1)** Answer in 2 to 4 Sentences each.

**[16]**

- a) Define Disaster.
- b) Write the meaning of natural disaster.
- c) State the meaning of weapon of mass destruction.
- d) What are the limitations of Disaster management?
- e) What do you mean by Manmade Disaster?
- f) Define Environmental Disaster.
- g) What do you mean by Population burden?
- h) Define Sustainable development.

**Q2)** Answer in 8 to 10 Sentences each (any two).

**[8]**

- a) Explain characteristics of Accidental Disaster.
- b) Discuss importance of study of disaster management.
- c) Describe Global warming and its impact on society.

**Q3)** Write short notes on (any two).

**[8]**

- a) Bhopal GasTragedy 1984.
- b) Latur Earthquake.
- c) Ambegaon (Malin) Pune land slide.

**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.



**P.T.O.**

Total No. of Questions : 4]

**P553**

**[5215]-373**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 307 (B) : Global Security-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 indicate full marks.*

**Q1)** Answer in 2 to 4 sentences each.

**[16]**

- a) Define “Terrorism”
- b) State the meaning of “Global warming”
- c) Write the meaning of “Conflict”.
- d) When “Israel” came into existence?
- e) What do you understand by Taliban?
- f) State the meaning of “Ethnicity”
- g) Write any two example of escalation point.
- h) Why Chinese attacked on India in 1962?

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

**[8]**

- a) How Global warming is a threat to Human being?
- b) Write a few lines on “Iraq & I.S.I.S.”
- c) Which preventive measures you would like to suggest against Global warming?

**Q3)** Write short notes on (any two): **[8]**

- a) Afghanistan as a victim of Taliban.
- b) Nature of India - China border dispute.
- c) Kashmir Issue : As a Threat to Global Security.

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

- a) Write an essay on “Terrorism as a threat to Global Security”.
- b) Explain that how the conflict between North Korea & South Korea a serious threat to Global Security?



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :4

**P555**

**[5215] - 375**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS.No. - 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 or 4 sentences each:

**[16]**

- a) Who was the chief organizer of SEATO?
- b) What was the basic aim of USSR for WARSAW?
- c) What do you understand by GATT?
- d) Write the names of members of SAARC countries.
- e) State the long form of OPEC.
- f) Write the Chinas status in SAARC.
- g) State the long form of NATO.
- h) Why India rejected the membership of SEATO?

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

**[8]**

- a) Explain the concept of European Union.
- b) Write in short problems of SAARC.
- c) Discuss in brief the objectives of SAFTA.

**P.T.O.**

**Q3)** Write short notes on [Any Two]

**[8]**

- a) NAFTA
- b) ASEAN
- c) Concept of Regional Security System.

**Q4)** Answer in 16 to 20 sentences (Any One)

**[8]**

- a) Explain the role of super powers in West Asian politics with special reference to “OPEC”.
- b) Analyse the merits & demerits of W.T.O.



Total No. of Questions :4]

**P555**

**[5215] - 375**

**T.Y.B.Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**DS.No. - 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) What do you mean by B.I.O.T.
- b) To whom we called nose of Indian sub-continent.
- c) What do you understand by power Rivalry?
- d) Why it is predicted that third world war take place in Indian Ocean?
- e) Where the Andaman & Nicobar Islands situated?
- f) Define “Maritime Threat”.
- g) Which country is the largest one at the rim of Indian Ocean.
- h) Why Pakistan called “South Asian Ocean” to Indian Ocean?

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

**[8]**

- a) Why “Indian Ocean” having a name of Indian Ocean?
- b) Explain the concept of “Zone of Peace”.
- c) Write a few lines on “Location of Andaman & Nicobar Islands”.

**Q3)** Write short notes on (Any Two)

**[8]**

- a) Naval strategy of China.
- b) Concept of Littoral Countries.
- c) India's Indian Ocean policy.

**Q4)** Answer in 16 to 20 sentences (Any One)

**[8]**

- a) Explain the super powers rivalry in Indian Ocean & its implications on Indias Maritime Security.
- b) Highlight on strategic importance of Diego-Garcia Islands for U.S.A.



Total No. of Questions :4]

SEAT No. :

**P556**

[Total No. of Pages :2

**[5215] - 376**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV: 301:Terrestrial Ecosystems and Management**

**(2013 Pattern) (Semester - III) (Theory) (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) Mention any two ways for carbon sequestration
- b) Write any two objectives of ecodevelopment programme.
- c) What are keystone species?
- d) Write any two applications of remote sensing in ecosystem management
- e) What are hotspots of biodiversity?
- f) Mention any two characteristics of tropical grasslands.
- g) What is importance of biogeocycles?
- h) Which are ways to manage forest fires?
- i) What is significance of point framemethod of sampling?
- j) What is meant by 'species Association'?

**P.T.O.**

**Q2)** Write a short note on Any Two of the following: [10]

- a) Ecotone and Edge Effect
- b) Community Based Forest Management in Orissa
- c) Ecotourism

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

- a) Discuss parasitism and mutualism with suitable examples.
- b) Explain the general structure terrestrial communities.
- c) Write an account on importance of ecosystem services in human development.

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

- a) Discuss various methods of terrestrial ecosystem management with suitable example
- b) What is meant by sustainable management of resources? Discuss role of  
1) Local Government and 2) People in it

& & &

Total No. of Questions : 4]

SEAT No. :

**P557**

[5215]-377

[Total No. of Pages : 2

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 302 : Wildlife Biology**

**(2013 Pattern) (Semester-III) (Paper-II) (92423) (Theory)**

*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 an 'Umbrella Species'?
- b) What is environmental significance of wetlands?
- c) Give an example of simple marine food chain.
- d) Define the term 'Wildlife' as per wildlife Act.
- e) What are algae?
- f) What is the importance of 'Radio tagging'?
- g) Write scientific names of any two Gymnosperms.
- h) What is meant by 'Adaptive Evolution'?
- i) Write any two objectives of camera trapping.
- j) What are Keystone Species?

**Q2)** Write a short note on Any Two of the following.

**[10]**

- a) Conservation of Genetic Resources.
- b) Population Assessment Techniques for Mammals.
- c) Terrestrial Ecosystems as Wildlife Habitats.

**P.T.O.**

**Q3)** Answer Any Two questions from the following.

**[10]**

- a) Write an account on reasons behind Human-Wildlife conflicts.
- b) Discuss in detail on role of RS and GIS in wildlife management.
- c) What are vertebrates ? Add a note on diversity of vertebrates.

**Q4)** Attempt Any One of the following.

**[10]**

- a) Discuss in detail on importance of biodiversity hotspots. Also add a note on reasons for formation of biodiversity.
- b) What is importance of aquatic ecosystems as wildlife habitats? Also add a note on threats associated with them.



Total No. of Questions : 4]

SEAT No. :

**P558**

**[5215]-378**

**[Total No. of Pages : 2**

**T.Y. B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 303 : Water Quality (Theory)**

**(2013 Pattern) (New Course) (Paper - III) (Semester - III)**

***Time : 2 Hours]***

***[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) Enlist two examples of cationic detergents.
- b) Define COD.
- c) Define ballast water.
- d) Enlist any two primary water treatment methods.
- e) What is point source water pollution.
- f) What are the causes of eutrophication.
- g) Give two examples of pesticides.
- h) Write full form of MPCB.
- i) Define Sewage.
- j) When Yamuna Action Plan (YAP) launched?

***Q2)*** Write a short note on (**any two**):

**[10]**

- a) Water vector habitat diseases.
- b) Thermal Pollution.
- c) Estuarine pollution.

***P.T.O.***

**Q3)** Answer **any two** from the following:

**[10]**

- a) Explain the role of Science in Solving Water Crisis.
- b) What are the preventive and curative measures for water borne diseases?
- c) Briefly explain effects of oil on marine biota.

**Q4)** Attempt **any one** of the following questions:

**[10]**

- a) What are the sources of heavy metals in aquatic environment add a note on biotransformation of heavy metals.
- b) Explain the principle and theory of BOD.



Total No. of Questions : 4]

SEAT No. :

**P559**

**[5215]-379**

[Total No. of Pages : 2

**T.Y. B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 304 :Issues in Environmental Science - I  
(2013 Pattern) (Semester - III) (Paper - IV) (92443)**

*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 carbon credit?
- b) Give examples of any two Biodiversity Hotspot in India.
- c) What are bioresources?
- d) Write full form of WTO.
- e) What is Global warming?
- f) Mention impacts of Green Revolution.
- g) What is Ecological restoration?
- h) Define the term 'Pastoralism'.
- i) Write any two examples of Biological weapons.
- j) Write benefits of Eco-housing.

**Q2)** Write a short note on ANY TWO of the following.

**[10]**

- a) Effects of Chernobyl Disaster.
- b) Methods of E-waste management.
- c) LCA.

**P.T.O.**

**Q3)** Answer ANY TWO questions from the following.

**[10]**

- a) In view of Environment education, explain the role of media and communication.
- b) Discuss parameters of sustainable development.
- c) Discuss controversies of GM Plants.

**Q4)** Attempt ANY ONE of the following.

**[10]**

- a) Define the concept ozone depletion. Discuss in detail causes and effects of ozone depletion.
- b) Why citizen's participation is important in Environmental issues? Discuss role of National Advisory Board.



Total No. of Questions : 4]

SEAT No. :

**P560**

**[5215]-380**

**[Total No. of Pages : 2**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 305 : Environmental Governance and Equity Law and Ethics  
(2013 Pattern) (92453) (Theory) (Paper - V) (Semester - III)**

*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) Which act is called as 'Umbrella Act'?
- b) Write the full form of PIL.
- c) What is Ecomark scheme?
- d) Mention any two Fundamental rights in India.
- e) What is CBD?
- f) Write elements of Environmental governance.
- g) Write any two functions of state water laboratory.
- h) What is Environmental Ethics?
- i) Mention main objective of Wildlife Act 1972.
- j) Give any two outcomes of Earth Summit 1992.

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

**[10]**

- a) Role of Green Tribunals.
- b) National Forest Policy.
- c) Motor vehicle regulations.

**P.T.O.**

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

- a) Discuss theories of Environmental Ethics.
- b) Explain functions of Pollution Control Board under Water Act, 1974.
- c) Discuss principles of 'Stockholm Declaration'.

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

- a) Discuss in detail significant provisions under the Air (Prevention and Control of Pollution) Act, 1981.
- b) Discuss the need of Environmental governance in India. Add a note on importance of Public participation in governance.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

**P561**

**[5215] - 381**

**T.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**ENV - 306 : Environmental Biotechnology - I**

**(2013 Pattern) (Semester - III) (Theory) (Paper - VI) (New Course)**

*Time : 2 Hours]*

*[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 ex-situ bioremediation.
- b) Define bioconversion.
- c) Mention botanical name of neem plant.
- d) Write full form of VAM.
- e) Enlist two names of microorganism involved in bioleaching.
- f) Define Allomones.
- g) What is green manure?
- h) Enlist two names of nitrogen fixing bacteria.
- i) Define phytoremediation.
- j) What is gasohol?

**Q2)** Write a short note on (any two)

**[10]**

- a) Bioleaching of metals.
- b) Hog fuel.
- c) Pyrolysis.

**P.T.O.**

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

- a) Which ingredients are used in the formulation process of biopesticides.
- b) Explain the process of vermicomposting.
- c) Biogas production : Anaerobic digestion.

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

- a) What are the sources of hydrogen used as gaseous fuel? Discuss its future importance.
- b) Write an essay on operation of biosafety guidelines in india.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P562**

**[5215]-383**

**T.Y.B.Sc. (Vocational)**

**BIOTECHNOLOGY**

**VOC-Biotech-335 : Plant and Animal Biotechnology**

**(2013 Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Answer the following :

**[10]**

- a) Define organogenesis.
- b) Give two limitations of somaclonal variants.
- c) What is the role of factor VIII protein?
- d) Name commonly used cell lines in ATC?
- e) Define androgenesis.
- f) What are secondary metabolites?
- g) Give two applications of embryo culture?
- h) What is a comatic embryo?
- i) Give names of two auxins commonly used?
- j) Define monoclonal antibodies?

**Q2)** Answer any two of the following:

**[10]**

- a) Explain direct and indirect organogenesis.
- b) What is meant by in vitro fertilization? Explain.
- c) Define somaclonal variation? Explain genetic basis of somaclonal variation.

**P.T.O.**

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

**[10]**

- a) Embryo rescue.
- b) Artificial seed.
- c) Production of Plasminogen activator.

**Q4)** What are stem cells? Explain production of transgenic mice using embryonic stem cell technology.

**[10]**

OR

Discuss the biological method of gene transfer in plants.



Total No. of Questions : 4]

SEAT No. :

**P563**

[5215]-384

[Total No. of Pages : 2

**T.Y.B.Sc.**

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

**Video Recording and Playback Systems  
(2013 Pattern) (Semester - III) (Paper-V)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) Attempt All questions.*
- 2) Give suitable examples wherever necessary.*
- 3) Figures to the right indicate full marks.*

**Q1)** Answer the following: [1]

- a) State the primary colours used in colour TV. [1]
- b) State the aspect ratio used in SDT and HDTV. [1]
- c) What is the difference between audio & video R/P heads? [1]
- d) State the horizontal scanning frequency used in India. [1]
- e) 'Interlaced scanning is used to avoid flicker in the picture'. Comment.[2]
- f) State applications of O.B Van. [2]
- g) 'Synchronization is necessary to produce a stable picture on TV screen;. Comment. [2]
- h) Give the track survey for VHS System. [2]

**Q2)** Answer any two of the following:

- a) With a neat block diagram explain the scanning and synchronization system in a TV receiver. [4]
- b) Explain the working of colour TV camera. What is the use of dichroic mirrors? [4]
- c) What are Y,U and V signals in the PAL colour standard? Why is it inconvenient to transmit R, G and B signals separately? [4]

**P.T.O.**

**Q3)** Answer any two of the following.

- a) Why is it necessary to convert video signal into FM before recording it on magnetic tape? [4]
- b) Explain the principle of plasma TV display. [4]
- c) Explain the working of magnetic video disc machine. [4]

**Q4)** Answer any two of the following.

- a) Explain with block diagram working of replay electronics in a VCR. [6]
- b) Explain the working of a colour TV receiver. What is colour burst? [6]
- c) Compare film and video tape recording. [6]



Total No. of Questions : 4]

SEAT No. :

**P564**

**[5215]-385**

**[Total No. of Pages : 2**

**T.Y.B.Sc. (Vocational)**

**ELECTRONIC EQUIPMENT MAINTENANCE**

**Troubleshooting and Repair of Audio and Video Equipment**

**(2013 Pattern) (Semester-III) (Paper-V) (Theory) (New Course)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Answer all the following.

- a) State the advantages of FM over AM. [1]
- b) What is satellite receiver? [1]
- c) What is smart phone? [1]
- d) State the advantages of DVD over CD. [1]
- e) What is blue-ray disc player? [2]
- f) What is home theatre? [2]
- g) List the basic hardware tools required for repair of Laptop. [2]
- h) State any two faults and its causes in home theatre. [2]

**Q2)** Answer any two of the following.

**[2×4=8]**

- a) Explain with neat labelled diagram the working of PA system.
- b) Write the advantages and disadvantages of digital TV.
- c) Explain with neat labelled diagram the working of set top box.

**Q3)** Answer any two of the following.

**[2×4=8]**

- a) Explain with neat diagram the working of VCD player.
- b) Discuss the common faults and their causes in DVD player.
- c) Write the common faults and their remedies in dot matrix printers.

**P.T.O.**

**Q4)** Answer the following.

**[2×6=12]**

- a) State any six tools and their functions required for repairing of television.
- b) Explain the functional block diagram of LCD monitor. state any three common faults in it.

OR

- a) State any six faults and their causes in smart phone.
- b) Explain the alignment procedure of AM receiver. List the tools and equipments required for it.



Total No. of Questions : 4]

SEAT No. :

**P565**

[5215]-386

[Total No. of Pages : 2

**T.Y.B.Sc. (Vocational)**

**INDUSTRIAL MICROBIOLOGY**

**VOC-IND-MIC-335 : Pollution Control Technology  
(2013 Pattern) (Semester-III) (Theory) (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) *All questions carry equal marks.*
- 4) *Draw neat labeled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

**Q1)** Answer the following as directed:

**[10]**

For (a) to (d) state whether the statement given is True or False:

- a) COD measures only inorganic oxidizable matter in wastewaters.
- b) BOD is a measure of dissolved oxygen in the water.
- c) MLSS can be used as a parameter to indirectly measure the microbial biomass in biological treatment processes.
- d) Significant increase in biomass does not take occur in biological treatment unit processes such as activate sludge and trickling filter.

For (e) to (j) choose the best correct option:

- e) Values of MLSS can be converted to values of MLVSS using the factor,
  - i) 0.1
  - ii) 0.4
  - iii) 0.8
  - iv) 1.0
- f) Approximately.....% of activated sludge solids are recycled to the aeration tank.
  - i) 95
  - ii) 80
  - iii) 40
  - iv) 10
- g) Type I sedimentation is also known as:
  - i) Hindered settling
  - ii) Unhindered settling
  - iii) Zone settling
  - iv) Compaction

**P.T.O.**

- h) Hydraulic shock loading of a biological treatment system refers to above normal:
- i) Active biomass
  - ii) Influent flow rate
  - iii) Sedimentation rate
  - iv) Mixing of the reactor contents
- i) Bar screens are a part of.....
- i) Primary treatment
  - ii) Secondary treatment
  - iii) Tertiary treatment
  - iv) Post-secondary treatment
- j) If the BOD of a sample is 120 mg/L, it means that:
- i) the DO of the sample is between 100 and 300 mg/L
  - ii) the sample contains more than 200 mg/L suspended solids
  - iii) the sample contains biodegradable organic matter equivalent that needs 120 mg of oxygen for oxidation
  - iv) the sample cannot be treated using biological systems.

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

- a) Draw a diagram of a typical trickling filter system and explain why it cannot be used for treating high BOD high volume wastewaters.
- b) Explain the working of an anaerobic digester and the microbial consortium in it.
- c) Describe a working of a grit chamber as used in wastewater treatment systems.

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

- a) Justify that maintaining a constant F/M ratio is the most important operating parameter for a biological treatment process.
- b) Explain the significance of determining the value for breakpoint chlorination in wastewater treatment process.
- c) Draw of flow - chart for any process used for removal of nitrogen in wastewater treatment.

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

- a) Draw a diagram of typical settler-clarififier used in wastewater treatment processes. Explain the different mechanisms of sedimentation that are involved in separation of solids in the process.
- b) Describe the malfunctions that are possible in operation of trickling filters. Also state the possible remedies.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

**P566**

**[5215] - 387**

**T.Y.B.Sc. (Vocational)**

**COMPUTER HARDWARE & NETWORK ADMINISTRATION**

**Network Concepts - I**

**(2013 Pattern) (Semester - III) (Paper - V) (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.*

**Q1)** Attempt all of the following :

**[10×1=10]**

- a) Specify the Port used for SMTP Mail Transfer.
- b) What is a VPN?
- c) What is a File Server?
- d) Specify the use of DNS?
- e) Why do we need a DOS?
- f) Give the importance of HTTP protocol in internet world.
- g) Windows XP is used only as a Network Operating System. State True or False.
- h) Which Network Topologies are widely used today?
- i) Which type of Server is used to host a Website?
- j) What is a Mail Server?

**P.T.O.**

**Q2)** Attempt any Two of the following : **[2×5=10]**

- a) Client Server Technology is used Widely today. Why?
- b) Explain in brief various Protocols and their applications.
- c) Users and Groups are create in a Domain. Explain its importance.

**Q3)** Attempt any Two of the following : **[2×5=10]**

- a) Explain the various Communication Medias used in Computer Networks?
- b) What is a DHCP Server? Explain its need.
- c) Differentiate between: Personal Desktop and Server.

**Q4)** Attempt any One of the following : **[1×10=10]**

- a) With Correct Diagram explain the working of OSI Model.
- b) List any 5 Linux Commands with proper syntax and state the use of each command.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

**P567**

**[5215] - 388**

**T.Y.B.Sc. (Vocational)**

**SEED TECHNOLOGY**

**Seed Pathology and Entomology**

**(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) Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following :

**[10]**

- a) What seed pathology deals with?
- b) Give one example of storage grain pest.
- c) What is meant by seed infection?
- d) Give one example of seed borne fungi.
- e) Mention one method employed for testing seed health.
- f) Mention one stage in the life cycle of insect pest.
- g) Write one distinguishing character of order Isoptera.
- h) Define entomology.
- i) Mention important symptom developed on pulses due to insect pest.
- j) What is seed transmission?

**P.T.O.**

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

- a) Give an account on the history of seed pathology.
- b) Write an account on the entry points of seed infection.
- c) Explain the problems in seed storage due to pests.

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

- a) Relation of insects with plants.
- b) Order Lepidoptera.
- c) Influence of seed borne diseases.

**Q4)** What are seed borne and storage fungi? Point out the differences between them. **[10]**

OR

Describe the life cycle of grain pest of cereals and damages caused by it. **[10]**



Total No. of Questions : 4]

SEAT No. :

**P568**

[5215]-390

[Total No. of Pages : 2

**T.Y.B.Sc. (Vocational)**

**BIOTECHNOLOGY**

**Microbial Biotechnology and Fermentation**

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

*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 barophiles? Give an example.
- b) What is meant by QC and QA.
- c) Name two oriental fermented foods.
- d) Mention any two principles of Microbial biotechnology.
- e) Name the growth phases of bacteria.
- f) Name the components of fermentation media.
- g) What is a fed-batch reactor?
- h) Name two organism which are used for production of protease enzyme.
- i) Mention the steps used for recovery of Baker's yeast.
- j) Give any two applications of whole cell immobilization.

**P.T.O.**

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

- a) Types of fermenters.
- b) Basophiles.
- c) Downstream processing.

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

- a) Discuss the growth linked and non growth linked products.
- b) Explain in short about bioleaching.
- c) Describe strain improvement in detail.

**Q4)** Describe in detail the process of production and recovery of streptomycin antibiotic. **[10]**

OR

Describe the types of bioremediation. Explain any one example of bioremediation in detail.



Total No. of Questions : 4]

SEAT No. :

**P569**

[5215]-391

[Total No. of Pages : 2

**T.Y.B.Sc. (Vocational)**

**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION**

**(2013 Pattern) (Paper-VI) (Semester-III) : Television Software**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt the following:

**[10]**

- a) Explain the difference between a close shot and a long shot, with suitable sketches.
- b) When are compact shots and an extreme close ups useful?
- c) What is the difference between a script and a screenplay?
- d) Write a concept of a film which you have seen recently.
- e) What is exposure and what parameters should be considered while setting it?

**Q2)** Attempt ANY TWO of the following:

**[10]**

- a) Give suitable examples and discuss various camera movements.
- b) What is the difference between zooming and track movements? Explain with suitable examples.
- c) What is sound designing? How is it useful?

**P.T.O.**

**Q3)** Attempt ANY ONE of the following:

**[10]**

- a) Write a script for a 1-minute social advertisement on 'Plastic-free Campus'.
- b) Write a script for a 1-minute social advertisement on 'managing e-waste'.

**Q4)** Write short notes on ANY TWO:

**[10]**

- a) Role of the cinematographer in film making.
- b) What is composition? What are the various elements of composition? Discuss their significance.
- c) Role of an editor in film making.



Total No. of Questions : 4]

SEAT No. :

**P570**

[5215]-392

[Total No. of Pages : 2

**T.Y.B.Sc. (Vocational)**  
**ELECTRONIC EQUIPMENT MAINTENANCE**  
**Electronic Instrumentation**  
**(2013 Pattern) (Semester-III) (Paper-VI) (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) *Draw neat diagrams wherever necessary.*

**Q1)** Answer the following:

- a) Define 'Resolution'. [1]
- b) What are active transducers? [1]
- c) What is calibration? [1]
- d) Express impedance in complex form. [1]
- e) What are dynamic characteristics of instrument? [2]
- f) Classify instrument-analog voltmeter. [2]
- g) What is meant by distortion? [2]
- h) Explain in brief-hysteresis. [2]

**Q2)** Answer any two:

**[2×4=8]**

- a) Write a short note on 'traceability'.
- b) Explain photoconductive type transducer.
- c) Discuss optical encoder.

**P.T.O.**

**Q3) Answer any two:**

**[2×4=8]**

- a) Write brief note on chopper amplifier.
- b) Explain absolute motion devices.
- c) What is load cell? Explain hydraulic load cell.

**Q4) Answer any two:**

**[2×6=12]**

- a) What is digital signal processing? State its advantages.
- b) Write a short note on PLC.
- c) State six advantages of digital voltmeter.

OR

- a) Explain the principle of digital phase meter.
- b) Discuss time domain and frequency domain analysis of signal spectrum.
- c) Write a note on logic analyzer.

**[3×4=12]**



Total No. of Questions : 4]

SEAT No. :

**P571**

[5215]-393

[Total No. of Pages : 2

**T.Y.B.Sc. (Vocational)**

**INDUSTRIAL MICROBIOLOGY**

**VOC-IND-MIC - 336: Animal and Plant Tissue Culture**

**(2013 Pattern) (Semester-III) (Paper-VI) (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) *All questions carry equal marks.*
- 4) *Draw neat labeled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

**Q1)** Answer as directed:

**[10]**

- a) Define / Explain in one line: Hybridoma.
- b) Define / Explain in one line: role of serum in ATC medium.
- c) Mark True / False: Human fibroblast cell lines transformed by Epstein Barr Virus exhibit contact inhibition and develop into a monolayer.
- d) Mark True / False: Eagle's Minimum Essential Medium was designed by modification of M 199 medium.
- e) Mark the correct choice:

Following are the indications for passaging a fibroblast cell line, EXCEPT:

- i) change in color of medium from pink to purple
- ii) cytoplasmic granulation
- iii) detachment and rounding of cells
- iv) disintegration of cells with accumulation of cell debris
- f) Write two examples of Plant growth hormones.

**P.T.O.**

- g) Enlist the micronutrient requirement of plant cell.
- h) State True or False 'Totipotency is the characteristic feature of plant cells only'.
- i) Plant cell doubling time is \_\_\_\_\_.
- j) Explain organogenesis.

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

- a) Explain use of different microcarriers for mass cultivation of animal cells.
- b) Discuss the advantages and disadvantages of mechanical disaggregation techniques.
- c) How animal cells are employed for industrial production of cytokines?

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

- a) Describe the non vector dependent methods of gene transfer to plants.
- b) What is callus culture? With the help of a diagram, describe the steps involved.
- c) What is suspension culture? Comment on the antibodies production by plants.

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

- a) With the help of diagrams, explain preparation of monoclonal antibodies.
- b) Diagrammatically represent Ti plasmid of *Agrobacterium tumefaciens* and discuss in detail the role of disarmed Ti plasmid as a vector in development of transgenic plants.



Total No. of Questions : 4]

SEAT No. :

**P579**

**[5215]-394**

[Total No. of Pages : 2

**T.Y. B.Sc. (Vocational)**

**COMPUTER HARDWARE & NETWORK ADMINISTRATION**

**Computer/IT Service Management**

**(2013 Pattern) (Semester - III) (Paper - VI) (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.*

**Q1)** Attempt all of the following:

**[10×1=10]**

- a) What is SOD?
- b) What is a incident?
- c) RFP stands for-
- d) Who manages a Helpdesk?
- e) Use of Freeware software on Multiple PCs is not allowed. State True or False.
- f) Specify any one ISO Standard for Information Security.
- g) CEO stands for-
- h) Database Maintenance is done by a Database Administrator. State True or False.
- i) What is COBIT?
- j) What is SLA?

**Q2)** Attempt any TWO of the Following.

**[2×5=10]**

- a) What is the need of different Types of Access Controls?
- b) Write a note on ITT?
- c) Explain in brief the concept of “Change Management Process”

**P.T.O.**

**Q3)** Attempt any TWO of the Following.

**[2×5=10]**

- a) Where do make use of Social Engineering concept?
- b) What is an 'IS Audit'?
- c) "TESTING" is important before IT Product Delivery - Explain.

**Q4)** Attempt any One of the Following.

**[1×10=10]**

- a) Explain:
  - i) Working of Help Desk.
  - ii) Problem Escalation Procedure.
- b) Why do we need to do 'Study of Requirements' before working out a Software Licensing Strategy.



Total No. of Questions : 4]

SEAT No. :

**P572**

[5215]-395

[Total No. of Pages : 2

**T.Y.B.Sc. (Vocational)**

**SEED TECHNOLOGY (Paper-II)**

**VOC-ST :- 312: Seed Farm Management Processing & Storage  
(2013 Pattern) (Paper-VI) (Semester-III) (New 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) Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following:

**[10]**

- a) Define farm management.
- b) Give any one component of seed marketing.
- c) Define seed drying.
- d) What is seed treatment?
- e) What is seed bagging?
- f) Give any one factor involved in the selection of a farm business.
- g) What is seed storage?
- h) Give diagrammatic representation of seed flow during processing.
- i) Enlist seed treating equipments.
- j) Define general farming.

**P.T.O.**

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

- a) Explain any two methods of seed treatment.
- b) Write an account on comparison of general & specialized farming.
- c) Write an account on role of different seed organizations in seed marketing.

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

- a) Basic requirement of seed storage.
- b) Agriculture economics vs Farm management.
- c) Receiving the seed in seed processing unit.

**Q4)** What is seed processing? Explain in detail any two steps involved in seed processing. **[10]**

OR

Describe in detail factors involved in the selection of a farm business. **[10]**

