Total No. of Questions :4]

SEAT No. :

P819

[Total No. of Pages :2

[4817]-3001
T.Y.B.Sc.
MATHEMATICS
MT-331: Metric Spaces
(2013 Pattern) (New Course) (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.***

Q1) Attempt any <u>five</u> of the following: **[10]**

a) Does $d(x, y) = |\sin(x - y)|, x, y \in R$; define a metric for R? Justify.

b) Draw open sphere $S_1(0)$ in the metric space (R^2, d) where d is a metric for R^2 defined as $d(x, y) = |x_1 - y_1| + |x_2 - y_2|$ for $x = (x_1, x_2),\ y = (y_1, y_2) \in R^2$

c) Show that the set of rational numbers Q is dense in usual metric space R_u.

d) Let [a, b] and [c, d] be metric spaces with respect to usual metric. Show that [a, b] and [c, d] are homomorphic.

e) Show that an infinite subset of discrete metric space is not compact.

f) Give an example of complete metric space which is disconnected.

g) Find A^o and $\bar{A}$ for subset A = [0, 2) of usual metric space R_u.

Q2) Attempt any <u>two</u> of the following: **[10]**

a) Let (X, d) be a metric space and $x, y \in X$ be distinct points. Then prove that there exist open subsets U, V of X such that $x \in U,\ y \in V$ and $U \cap V = \phi$.

P.T.O.

b) Let (X, d) be a metric space and $\{F_\alpha / \alpha \in \wedge\}$ be family of closed subsets of X. Prove that $\bigcap_{\alpha \in \wedge} F_\alpha$ is a closed subset of X.

c) Let (X, d) be a metric space and $d^*: X \times X \to R$ be defined as

$d^*(x, y) = \frac{d(x, y)}{1 + d(x, y)}$; $x, y \in X$. Show that (X, d^*) is a metric space.

Q3) Attempt any <u>two</u> of the following: **[10]**

a) Let (X, d) (Y, ρ) and (Z, σ) be three metric spaces. Suppose $f: X \to Y$, $g: Y \to Z$ are continuous functions. Then prove that gof: $X \to Z$ is continuous function.

b) Show that any closed subset of compact metric space is compact.

c) Show that usual metric space R_u is complete.

Q4) Attempt any <u>one</u> of the following: **[10]**

a) Prove that a metric space (X, d) is totally bounded if and only if every sequence in X contains a Cauchy subsequence.

b) i) Let (X, d) be a metric space and A, B $\subseteq$ X. If d (A, B) > 0, then show that A and B are separated sets.

ii) Let (X, d) be a metric space and A, B $\subseteq$ X. Then show that $\overline{(A \cup B)} = \bar{A} \cup \bar{B}$. Is it true that $\overline{(A \cap B)} = \bar{A} \cap \bar{B}$? Justify.

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Total No. of Questions : 4]

SEAT No. :

P820

[Total No. of Pages : 3

[4817]-3002
T.Y. B.Sc.
MATHEMATICS
MT - 332 : Real Analysis - I
(2013 Pattern) (New Course) (Paper - II) (Semester - III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

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

a) Describe the following set of points in the plane geometrically, $A = \{\langle x \cdot y \rangle / x \leq y\}$.

b) Does the function $f : \mathbb{R} \to \mathbb{R}$ defined as $f(x) = e^x$ is one-one and onto?

c) Find $N \in I$ so that $\frac{1}{\sqrt{n+1}} < 0.03$, when $n \geq N$.

d) Give an example of a sequence $\{s_n\}_{n=1}^{\infty}$ which is not bounded but for which $\lim_{n\to\infty} \frac{s_n}{n} = 0$.

e) Find the limit superior and the limit inferior of the sequence $\left\{\left(1+\frac{1}{n}\right)^n\right\}_{n=1}^{\infty}$.

f) Prove that if $a_1 + a_2 + ...$ converges to S then $a_2 + a_3 + ...$ converges to $S - a_1$.

g) State comparison test for absolute convergence of the series of real numbers.

P.T.O.

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

a) If $A_1, A_2, \ldots$ are countable sets, then prove that $\bigcup_{n=1}^{\infty} A_n$ is countable.

b) If $\{s_n\}_{n=1}^{\infty}$ and $\{t_n\}_{n=1}^{\infty}$ are sequences of real numbers and $\lim_{n\to\infty} s_n = L$, $\lim_{n\to\infty} t_n = M$ then prove that $\lim_{n\to\infty}(S_n + t_n) = L+M$.

c) Use $\in$-N definition of the sequence of real numbers, prove that $\lim_{n\to\infty} \frac{2n}{(n+3)} = 2$.

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

a) If $\{s_n\}_{n=1}^{\infty}$ is a sequence of real numbers, then prove that $\liminf_{n\to\infty} .s_n \le \limsup_{n\to\infty} .S_n$.

b) Define Cauchy sequence. If the sequence of real numbers $\{s_n\}_{n=1}^{\infty}$ converges then prove that $\{s_n\}_{n=1}^{\infty}$ is a Cauchy sequence.

c) Prove that the sequence $\{t_n\}_{n=1}^{\infty}$ is convergent where $t_n = 1 + \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!}$ for $n \in I$.

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

a) i) If $\{a_n\}_{n=1}^{\infty}$ is a sequence of positive numbers such that $a_1 \ge a_2 \ge \ldots \ge a_n \ge a_{n+1} \ge \ldots$ and $\lim_{n\to\infty} a_n = 0$, then prove that the alternating series $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$ is convergent.

ii) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{n^4}{n!}$.

b) i) If the sequences $s=\{s_n\}_{n=1}^{\infty}, t=\{t_n\}_{n=1}^{\infty}$ are in class l^2; then prove that $\sum_{n=1}^{\infty} s_n t_n$ converges absolutely and $\left|\sum_{n=1}^{\infty} s_n t_n\right| \leq \left(\sum_{n=1}^{\infty} s_n^2\right)^{1/2} \left(\sum_{n=1}^{\infty} t_n^2\right)^{1/2}$.

ii) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{3}{4+2^n}$.

Total No. of Questions : 4]

SEAT No. :

P821

[Total No. of Pages : 3

[4817]-3003
T.Y. B.Sc.
MATHEMATICS
MT-333: Problem Course Based on MT-331 and MT-332
(2013 Pattern) (Semester-III) (Paper-III) (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) ***Answers to the two sections should be written on 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,d) be a metric space and A,B $\subseteq$ X. Is it true that $(A \cup B)^o = A^o \cup B^o$? Justify.

ii) Find ∂Q (boundary of Q) where Q is set of rationals in usual metric space R_u.

iii) 1) Give an example of a metric space which is connected but not complete.

2) Give an example of dense subset of R^2.

iv) Show that any two disjoint subsets of standard discrete metric space R_d are separated.

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

i) For $x = (x_1, x_2), y = (y_1, y_2) \in R^2$ let $d_1(x, y) = |x_1 - y_1| + |x_2 - y_2|$ and $d_2(x, y) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2}$ be metrics for R^2. Show that d_1 and d_2 are equivalent metrics.

ii) Let f:[0,1] $\to$ R be function given by $f(x) = \begin{cases} x \text{ if } x \text{ is rational} \\ 1-x \text{ if } x \text{ is not rational} \end{cases}$

then show that f is continuous only at $\frac{1}{2}$ in [0,1].

P.T.O.

Q2) Attempt <u>any two</u> of the following: **[10]**

a) Let $X \neq \phi$. For $x, y \in X$, if $d(x,y) = \begin{cases} 0 \text{ for } x = y \\ 1 \text{ for } x \neq y \end{cases}$ then show that d is a metric for X.

b) In a metric space (X,d), show that every subset of X is open if and only if every singleton set is open.

c) Let R^2 be metric space with usual metric

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

Then for A=Q×Q, B=$Q^C \times Q^C$ find A^o, B^o, $(A \cup B)^o$, $\overline{A}, \overline{B}$.

SECTION-II

(Real Analysis)

Q3) a) Attempt <u>any three</u> of the following: **[6]**

i) Let $f: R \to R$ be function defined by $f(x) = \sin x$. Then find $f\left(\pi/2\right)$ and $f^{-1}(\{1\})$.

ii) If $\lim_{n\to\infty} \frac{S_n - 1}{S_n + 1} = 0$ then show that $\lim_{n\to\infty} S_n = 1$.

iii) For what values of x, does series $\sum_{n=1}^{\infty} \frac{1}{n^x}$ converge?

iv) Does the sequence $\left\{\frac{1}{e^n}\right\}_{n=1}^{\infty} \in l^2$?

b) Attempt <u>any one</u> of the following: **[4]**

i) Show that (0,1) and [0,1] are equivalent intervals.

ii) If sequence $\{S_n\}_{n=1}^{\infty}$ converges to L, then show that sequence $\{|S_n|\}_{n=1}^{\infty}$ converges to $|L|$.

Q4) Attempt <u>any two</u> of the following: **[10]**

a) If $S_1 = \sqrt{2}, \quad S_{n+1} = \sqrt{2}\ \sqrt{S_n}$ for $n \geq 2$ then prove that $\{S_n\}_{n=1}^{\infty}$ is convergent sequence.

b) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^{2n}}{e^n}$.

c) Show that the series $1-\frac{1}{1!}+\frac{1}{2!}-\frac{1}{3!}+$-------- converges absolutely.

Total No. of Questions : 4]

SEAT No. :

P822

[Total No. of Pages : 2

[4817]-3004
T.Y. B.Sc.
MATHEMATICS
MT - 334 : Group Theory
(2013 Pattern) (Semester-III) (Paper-IV) (New Course)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Attempt Any Five of the following: **[10]**

a) Are binary structures $\langle \mathbb{Q}, + \rangle$ and $\langle \mathbb{Z}, + \rangle$ isomorphic under usual addition? Justify your answer.

b) Draw subgroup diagram for the group of quaternians Q_8.

c) Find distinct orbits of permutation

$$\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 2 & 3 & 6 & 7 & 4 & 1 & 5 & 9 & 8 \end{pmatrix}.$$

d) Prove that every group of prime order is cyclic.

e) Find the order of (8, 4, 10) in the group $\mathbb{Z}_{12} \times \mathbb{Z}_{60} \times \mathbb{Z}_{24}$.

f) Prove that homomorphic image of an abelian group is abelian.

g) Define inner automorphism.

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

a) If G is a group then prove that:

i) inverse of each element is unique.

ii) for $a, b \in G$, $(ab)^{-1} = b^{-1}a^{-1}$.

iii) for all $a \in G$, $(a^{-1})^{-1} = a$.

b) Prove that every subgroup of cyclic group is cyclic.

c) Let $*$ be defined on Q^+ by $a * b = \frac{ab}{2}$. Then show that $(Q^+, *)$ is an abelian group.

P.T.O.

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

a) Prove that if $n \geq 2$ then the collection of all even permutations of {1, 2, 3, ---, n} form a subgroup of order $\frac{n!}{2}$ of the symmetric group Sn.

b) Let ϕ be a homomorphism of a group G into a group G′. Then prove that

i) If e is identity element in G then $\phi(e)$ is the identity element e' in G′.

ii) If $a \in$ G then $\phi(a^{-1}) = (\phi(a))^{-1}$.

iii) If H is subgroup of G then ϕ[H] is subgroup of G′.

c) Find all cosets of the subgroup <4> of $\mathbb{Z}_{12}$.

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

a) i) Let $G_1, G_2, ..., G_n$ be groups. For $(a_1, a_2, .., a_n)$ and $(b_1, b_2, .., b_n)$ in $\prod_{i=1}^{n} G_i$ define binary operation $(a_1, a_2, .., a_n)(b_1, b_2, .., b_n) = (a_1b_1, a_2b_2, .., a_nb_n)$. Then prove that $\prod_{i=1}^{n} G_i$ is a group under this binary operation.

ii) Show that the upper triangular 2 × 2 matrices with real number entries and no zeros on the diagonal form a subgroup of invertible 2 × 2 matrices with real number entries under multiplication of matrices.

b) i) State and prove Lagrange's theorem.

ii) Show that a factor group of cyclic group is cyclic.

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Total No. of Questions : 4]

SEAT No. :

P823

[Total No. of Pages : 2

[4817]-3005
T.Y. B.Sc.
MATHEMATICS
MT - 335 : Ordinary Differential Equations
(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 Any Five of the following: **[10]**

a) Solve the differential equation

$$(D^3 - D^2 - 4D + 4)\, y = 0.$$

b) Find the particular solution of

$$(D^2 - 1)\, y = e^{2x}.$$

c) Form the homogenous differential equation whose solution is x^2.

d) Verify that $y_1 = x^2$ is a solution of differential equation

$$x^2 y'' + xy' - 4y = 0\,.$$

e) Solve $(D - 2)\,(D + 1)\, y = 0$.

f) Show that $x = 2e^{4t}$, $y = 3e^{4t}$ and $x = e^{-t}$, $y = -e^{-t}$ are solutions of the homogenous system $\frac{dx}{dt} = x + 2y, \frac{dy}{dt} = 3x + 2y$.

g) Find all singular points in the finite plane of the differential equation

$$x(3 - x)\, y'' - (3 - x)\, y' + 4xy = 0\,.$$

P.T.O.

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

a) If $f(D) = (D - a)^r \phi(D)$, then prove that $\frac{1}{f(D)} e^{ax} = \frac{1}{\phi(a)} \frac{x^r}{r!} e^{ax}, \phi(a) \neq 0$.

b) Explain the method of un determined coefficients to solve linear differential equation with constant coefficients.

c) Solve by the method of undetermined coefficient $(D^2 - 4D + 4)\, y = e^x$.

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

a) Explain the method of variation of parameter to solve second order differential equation $\frac{d^2y}{dx^2} + P(x)\frac{dy}{dx} + Q(x)y = R(x)$.

b) Solve $\frac{d^2y}{dx^2} - y = e^x$ by method of reduction of order.

c) Verify that $y_1 = x$ is one solution of $x^2y'' + 2xy' - 2y = 0$ and then find y_2 and the general solution.

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

a) i) If W(t) is the wronskian of the two solutions of the homogenous system of differential equations then prove that W(t) is either identically zero or nowhere zero on [a, b].

ii) Find general solution of the system $\frac{dx}{dt} = x + y, \frac{dy}{dt} = 4x - 2y$.

b) Find power series solution of the differential equation $y'' + 4y = 0$ near the ordinary point $x = 0$.

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Total No. of Questions : 4]

SEAT No. :

P824

[Total No. of Pages : 3

[4817]-3006
T.Y. B.Sc.
MATHEMATICS
MT - 336 : Problem Course Based on MT-334 and MT-335
(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.***
3) ***Separate section should be written in separate answer books.***
4) ***Tie answer books of both sections together.***

SECTION-I

(Group Theory)

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

i) Are binary structures $\langle \mathbb{R}, + \rangle$ and $\langle \mathbb{R}, \cdot \rangle$ isomorphic? Justify your answer.

ii) Give an example of group G and its two subgroups H & K such that $H \cap K$ is subgroup of G but $H \cup K$ is not subgroup of G.

iii) Show that $\mathbb{Z}_{15} \times \mathbb{Z}_{26}$ is cyclic group and find its any one generator.

iv) Let D be the additive group of all differentiable functions from $\mathbb{R}$ into $\mathbb{R}$ and let F be the additive group of all functions from $\mathbb{R}$ into $\mathbb{R}$. Then show that the function $\phi : D \to F$ defined by $\phi(f) = \frac{d}{dx}(f(x))$, is homomorphism. Also find its kernel.

b) Attempt Any One of the following: **[4]**

i) Let $G = \mathbb{Q} - \{1\}$ with binary operation $*$ defined by $a * b = a + b - ab$. Then show that (G, $*$) is a groub. Is (G, $*$) abelian? Justify your answer.

ii) Compute the factor group $\frac{\mathbb{Z}_4 \times \mathbb{Z}_6}{\langle (0, 2) \rangle}$.

P.T.O.

Q2) Attempt Any One of the following: **[10]**

a) i) Show that if H and K are subgroups of an abelian group G then HK = {hk / h ∈ H, k ∈ K} is a subgroup of G.

ii) Express $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 2 & 3 & 6 & 7 & 4 & 1 & 5 & 9 & 8 \end{pmatrix}$.

as 1) Product of disjoint cycles.

2) Product of transpositions.

Identify σ as even or odd permutation. Also find the order of σ.

b) i) Let F be the additive group of continuous functions with domain [0, 1] and let $\mathbb{R}$ be the additive group of real numbers. Then show that map σ : F $\rightarrow$ $\mathbb{R}$ defined by $\sigma(f) = \int_0^1 f(x)dx$ for $f \in$ F, is a homomorphism. Is σ one-to-one map? Justify your answer.

ii) Prove that left (or right) cosets of subgroup of abelian group forms a partition of group G.

SECTION-II

(Ordinary Differential Equations)

Q3) a) Attempt Any Three of the following: **[6]**

i) Solve $(D^2 + 4)\, y = 0$.

ii) Find the particular integral of the differential equation $(D-1)^2\, y = e^x$.

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

iv) Show that the series $y = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$ is a solution of the differential equation $y'' + y = 0$.

v) Show that $x = e^{4t}$, $y = e^{4t}$ and $x = e^{-2t}$, $y = -e^{-2t}$ are linearly independent solution of the homogenous system.

$$\frac{dx}{dt} = x + 3y, \frac{dy}{dt} = 3x + y.$$

b) Attempt Any One of the following: **[4]**

i) Solve the differential equation

$$(D^2 + 1)\, y = e^{2x}.$$

ii) Use method of undetermined coefficients to solve the differential equation

$$(D^2 - 4D + 4)\, y = e^{x}.$$

Q4) Attempt Any Two of the following: **[10]**

a) Solve the equation

$$(D^2 + 1)\, y = \sec x \tan x$$

by method of variation of parameters.

b) Classify all singular points in the finite plane

$$x^2(x^2 - 4)\, y'' + 2x^3 y' + 3y = 0.$$

c) Find power series solution of $y' + y = 0$.

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Total No. of Questions : 4]

SEAT No. :

P825

[Total No. of Pages : 4

[4817]-3007
T.Y. B.Sc.
MATHEMATICS (Paper - VII & VIII)
MT - 337 (A) : Operations Research
(2013 Pattern) (Semester - III) (New Course) (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.***

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

a) Define a feasible & infeasible solutions of a LPP.

b) What is the degeneracy in TP? How is it resolved?

c) Write the dual of following LPP.

Minimize $Z = 15x_1 + 12x_2$

Subject to $x_1 + 2x_2 \geq 3$

$2x_1 - 4x_2 \leq 5$

$x_1, x_2 \geq 0$

d) What do you mean by unbalanced TP? Give an example of unbalance TP.

e) Find one basic feasible solution of the following LPP

Maximize $Z = 3x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 9$

$x_1, x_2 \geq 0$

f) Define Initial basic feasible solution of a TP.

P.T.O.

g) Find the basic feasible solution to the following transportation problem, using North - West Corner rule.

		Sink					
		A	B	C	D	E	Supply
Origin	P	2	11	10	3	7	4
	Q	1	4	7	2	1	8
	R	3	9	4	8	12	9
Demand		3	3	4	5	6	

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

a) Reddy Mikks produces both interior & exterior paints from two raw materials, M_1 & M_2. The following table provides the basic data of the problem.

Raw Material	Tons of raw material per ton of		Maximum daily availability per ton
	Exterior paint	Interior paint	
M_1	6	4	24
M_2	1	2	6
Profit per ton ($ 1000)	5	4	

A market survey indicates that the daily demand for interior paint cannot exceed that for exterior paint by more than 1 ton. Also, the maximum daily demand for interior paint is 2 tons. Formulate the above problem as LPP.

b) Solve the following LPP Graphically

Maximize $Z = 30x_1 + 20x_2$

$$2x_1 + x_2 \leq 8$$
$$x_1 + 3x_2 \leq 8$$
$$x_1, x_2 \geq 0$$

c) Solve the following LPP by Simplex Method.

Maximize $Z = 3x_1 + 2x_2$

$$2x_1 + x_2 \leq 2$$

$$3x_1 + 4x_2 \geq 12$$

$$x_1, x_2 \geq 0$$

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

a) Find Initial basic feasible solutions of the following Transportation Problem (T.P.) by Vogel Approximation Method (V.A.M.)

Source	Destination				Supply
	D_1	D_2	D_3	D_4	
S_1	11	13	17	14	250
S_2	16	18	14	10	300
S_3	21	24	13	10	400
Demand	200	225	275	250	

b) Solve the following assignment model by Hungarian method.

		Operator			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	8	3
	C	10	7	3	2
	D	5	11	9	7

c) A Project work consist of four major jobs for which an equal number of contractors have submitted tender. The Tender amount quoted (in lack of rupees) is given in the following matrix.

		Jobs				
		I	II	III	IV	
Contractors	A	42	35	28	21	7
	B	30	25	20	15	5
	C	30	25	20	15	5
	D	24	20	16	12	4
		6	5	4	3	

Find the assignment which maximize the total cost of the project, when each contractor has to be assigned at least one job.

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

a) Solve the following LPP by Big-M method.

Minimize $Z = 4x_1 + 3x_2$

Subject to

$$2x_1 + x_2 \geq 10$$
$$-3x_1 + 2x_2 \leq 6$$
$$x_1 + x_2 \geq 6$$
$$x_1, x_2 \geq 0$$

b) Find the optimal solution of the following T.P.

	1	2	3	4	Supply
1	10	2	20	11	15
2	12	7	9	20	25
3	4	14	16	18	10
Demand	5	15	15	15	

Total No. of Questions : 4]

SEAT No. :

P826

[Total No. of Pages : 2

[4817]-3008
T. Y. B. Sc.
MATHEMATICS
MT - 337 B : Dynamical Systems
(Semester-III) (2013 Pattern) (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 any five of the following: **[10]**

a) Define equilibrium point for system of first order differential equations.

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

c) Give an example of a system of differential equations for which $(t, 1)$ is a solution.

d) State whether the system X' = AX where $A = \begin{bmatrix} 0 & \beta \\ -\beta & 0 \end{bmatrix}$ is a center. Justify.

e) Let A be an $n \times n$ matrix. Show that $\exp(-A) = (\exp A)^{-1}$.

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

g) Find eigenvalues and eigenvectors of $A = \begin{bmatrix} 1 & 3 \\ 1 & -1 \end{bmatrix}$.

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

a) If V_0 is an eigenvector of $A_{n \times n}$ with associated eigenvalue λ, then show that $X(t) = e^{\lambda t} V_0$ is a solution of the system X' = AX.

P.T.O.

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

c) Sketch the direction field of the following system:

$x' = y$,

$y' = -x$.

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

a) Show that the system X' = AX where $A=\begin{bmatrix} 0 & \beta \\ -\beta & 0 \end{bmatrix}$ has general solution

$$X(t)=C_1\begin{pmatrix} \cos\beta t \\ -\sin\beta t \end{pmatrix}+C_2\begin{pmatrix} \sin\beta t \\ \cos\beta t \end{pmatrix}.$$

b) Let A be a 2×2 matrix which has two real distinct eigenvalues λ_1, λ_2 with associated eigenvectors V_1, V_2. Show that $T^{-1}AT=\begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix}$ is the canonical form of matrix A.

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

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

a) Let A be an $n \times n$ matrix. Show that the initial value problem X' = AX with $X(0) = X_0 \in \mathbb{R}^n$ has unique solution $X(t) = \exp(tA)\, X_0$.

b) Find the canonical form of $A=\begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 1 \\ -1 & -1 & 2 \end{bmatrix}$.

c) Compute exponential of the matrix $\begin{bmatrix} 5 & -6 \\ 3 & -4 \end{bmatrix}$.

Total No. of Questions : 4]

SEAT No. :

P827

[Total No. of Pages : 2

[4817]-3009
T. Y. B. Sc.
MATHEMATICS (Paper - VII & VIII)
MT - 337 C : 'C' Programming - I
(Semester-III) (New Course) (2013 Pattern) (Elective)

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) Determine the value of the following expression. 0234 + 002 + 1234

b) Determine which of the following are valid integer constants:

0678, O X A B C D

c) Determine which of the following are valid identifiers : auto, float.

d) Explain the meaning of the following declaration

int *a*, F(int *a*);

e) Define a one-dimensional, three element character array called 'Foo'. Assign the characters 'N', 'E', 'W' to the array element.

f) What is the difference between 2 and '2'.

g) Find the value of the expression : 2 * 4% 3 – 5/ 2 * 3.

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

a) Explain the use of function print *f*.

b) Write a note on do-while loop.

c) Write a program to find sum and average of given numbers.

P.T.O.

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

a) Write a note on one-dimensional array.

b) Explain the use of switch statement.

c) Write a program to find length of string.

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

a) i) Define a function to find gcd of two numbers.

ii) Explain the use of unary operations: ++, – –

b) i) Write a note on if-else statement.

ii) Write a program to reverse a string.

Total No. of Questions : 4]

SEAT No. :

P828

[Total No. of Pages : 2

[4817]-3010
T. Y. B. Sc.
MATHEMATICS
MT - 337 D : Lattice Theory
(Semester-III) (2013 Pattern) (New) (Paper - VII)

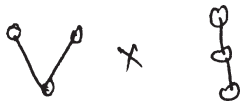
Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

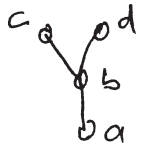
Q1) Attempt any <u>five</u> of the following: **[10]**

a) Draw the diagram of the product



b) Show that order isomorphism of ordered sets in a one-one function.

c) Write all down sets of the ordered set



d) Give an example of a lattice which is modular but not distributive.

e) Show that every finite lattice is complete.

f) True or false? Justify: The union of two ideals is an ideal.

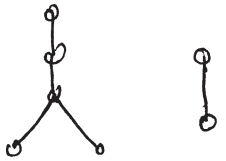
g) Define Boolean lattice.

Q2) Attempt any <u>two</u> of the following: **[10]**

a) State and prove Knaster-Tarski fix point theorem.

P.T.O.

b) Let P be a 7 element ordered set as shown in the following figure.



i) Explain why $|O(P)| \neq 28$

ii) Find the correct value for |O(P)|.

c) Prove that non-empty intersection of two sublattices is a sublattice. Show that the union of two sublattices may not be a sublattice.

Q3) Attempt any <u>two</u> of the following: **[10]**

a) Show that two lattices L and M are distributive if and only if L × M is distributive.

b) Show that every chain is distributive lattice.

c) Draw the lattice of subgroups of the group.

$\mathbb{Z}_2 \times \mathbb{Z}_4$.

Q4) Attempt any <u>one</u> of the following: **[10]**

a) i) Prove that lattice L is non modular if and only if L has a sublattice isomorphic to N_5. (i.e. $N_5 \rightarrowtail L$).

ii) In a bounded distributive lattice, prove that the complement of an element is unique, if it exist.

b) i) Write the DNF of the following function.

$$f(x, y, z) = \left[\left(x \wedge y' \right)' \vee z' \right] \wedge (x' \vee z)'.$$

ii) In a Boolean algebra B, prove that

1) $(a \vee b)' = a' \wedge b'$ &

2) $(a')' = a, \forall a, b \in B$.

Total No. of Questions : 4]

SEAT No. :

P829

[Total No. of Pages : 3

[4817]-3011
T. Y. B. Sc.
MATHEMATICS
MT - 337 E : Financial Mathematics
(Semester-III) (2013 Pattern) (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 scientific non-programmable calculators are allowed.***
4) ***Use of graph papers are allowed.***

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

a) Suppose the demand set D and supply set S are given by

$D = \{(q, p) \mid q + 5p = 40\}$ and

$S = \{(q, p) \mid 2q - 15p = -20\}$

Find the point of equilibrium.

b) If I am offered either Rs. 6000 now or Rs. 10,000 in seven years time, which should I accept, given the fixed interest rate of 8%?

c) A firm has cost function $(c_q) = 1500 + 15q - 3q^2 + q^3$. Show that its marginal cost is always positive.

d) Calculate the elasticity of demand when the demand function is given by $q^D(p) = 70 - 4p$. For what values of p is your expression valid.

e) Explain the terms small firm and efficient small firm.

f) Explain the terms arbitrage portfolio and returns matrix.

g) Determine whether the cobweb model predicts stable or unstable equilibrium for the market with $q^S(p) = 2p - 3$, $q^D(p) = 18 - p$.

P.T.O.

Q2) Attempt <u>any two</u> of the following: **[10]**

a) Suppose the market for a commodity is governed by supply and demand sets defined as follows. The supply set S is the set of pairs (q, p) for which $q - 6p = -12$ and the demand set D is the set of pairs (q, p) for which $q + 2p = 40$. Sketch S and D and determine the equilibrium set $E = S \cap D$, the supply and demand functions q^S, q^D and the inverse and demand functions p^S, p^D.

b) Show that the present value of an annuity of I for N years given the fixed interest rate *r,* is

$$P = \frac{I}{(1+r)} + \frac{I}{(1+r)^2} + \frac{I}{(1+r)^3} + ... + \frac{I}{(1+r)^N}.$$

c) Consider a market in which the supply and demand sets are

$S = \{(q, p) \mid q = 3p - 7\}$, $D = \{(q, p) \mid q = 38 - 12p\}$.

Write down the recurrence equations which determine the sequence p_t of prices, assuming that the suppliers operate according to the cobweb model. Find the explicit solution given that $p_0 = 4$, and describe in words how the sequence p_t behaves. Write down a formula for q_t, the quantity on the Market in years *t*.

Q3) Attempt <u>any two</u> of the following: **[10]**

a) Suppose that you have just inherited an asset whose current Market Value is Rs. 2000. Assume that the market value will increase steadily at a rate of Rs. 300 per annum and that the interest on a 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) Show that in case of small efficient firm under perfect competition a firm's inverse supply function is equal to its marginal cost function. Also show that at the start up point, marginal cost is equal to average variable cost.

c) Suppose that Alpern and Co. is an efficient small firm which cannot produce more than 6 units of its product each week. If their cost function is $C(q) = 100 + 20q - 6q^2 + q^3$.

Determine:

i) their fixed cost

ii) their profit function

iii) their start up point and

iv) their breakeven point.

Q4) Attempt <u>any one</u> of the following: **[10]**

a) i) Suppose that an investor invests her money in three different assets and that three possible states can occur. Show that if the returns matrix is

$$R = \begin{pmatrix} 0.95 & 0.9 & 1.0 \\ 1.1 & 1.1 & 1.1 \\ 1.2 & 1.15 & 1.25 \end{pmatrix}$$

then there is no vector of state prices. Show also that Y = (1000 –5000 4000) and Z = (0 –5000 5000) are arbitrage portfolios.

ii) Consider a market in which the supply and demand sets are

$S = \{(q, p) \mid 2p - 3q = 12\}$, $D = \{(q, p) \mid 2p + q = 20\}$.

Write down the recurrence equations which determine the sequence p_t of prices, assuming that the suppliers operate according to the cobweb model. Find the explicit solution given that $p_0 = 10$, and describe in words how the sequence p_t behaves. Write down a formula for q_t, the quantity on the market in year t.

b) Consider an economy with three industries: coal, electricity, railways. To produce Rs. 1 of coal requires Rs. 0.25 worth of electricity and Rs. 0.25 rail cost and transportation. To produce Rs. 1 of electricity requires Rs.0.65 worth of coal for fuel, Rs. 0.05 of electricity for the auxiliary equipment, and Rs. 0.05 for transport. To provide Rs. 1 worth of transport, the railway requires Rs. 0.55 coal for fuel and Rs. 0.10 electricity. Each week the external demand for coal is Rs. 50000 and the external demand for electricity is Rs. 25000. There is no external demand for the railway. What should be the weekly production schedule for each industry?

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Total No. of Questions : 4]

SEAT No. :

P830

[Total No. of Pages : 2

[4817]-3012
T.Y. B.Sc.
MATHEMATICS
MT-337: Elective F: Number Theory
(New) (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.***

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

a) If n and a are prime to 7 then prove that $n^6 - a^6$ is divisible by 7.

b) Find the last digit in the ordinary decimal representation of 2^{50}.

c) Give one example of each:

i) Complete residue system modulo 5.

ii) Reduced residue system modulo 6.

d) Find the value of $\left(\frac{3}{17}\right)$.

e) Solve the congruence $x^2 \equiv 5 \pmod{29}$

f) If x is real number and m is a positive integer then prove that $\left[\frac{[x]}{m}\right] = \left[\frac{x}{m}\right]$

g) Apply Wilson's theorem to show that $18! + 1 \equiv 0 \pmod{23}$.

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

a) Use Euclidean algorithm to obtain g.c.d. 'd' of 14283 and 6409. Also find integers x and y such that $d = 14283\,x + 6409\,y$

b) Prove that for any integers a and b with $a > 0$, there exist unique integers q,r such that b = aq + r; $0 \le r < a$.

c) Find all the integers that gives the remainder 1,2,3 when divided by 3, 4, 5 respectively.

P.T.O.

Q3) Attempt <u>any two</u> of the following: **[10]**

a) Let p be a prime. Then prove that the largest exponent e such that $p^e \mid n!$ is $e = \sum_{i=1}^{\infty} \left[\frac{n}{p^i} \right]$.

b) Find d (180), $\sigma(180)$, and $\mu(180)$.

c) Find a positive integer n such that $\frac{n}{2}$ is a square, $\frac{n}{3}$ is a cube, and $\frac{n}{5}$ is a fifth power.

Q4) Attempt <u>any one</u> of the following: **[10]**

a) i) If (x,y,z) is a primitive Pythagorean triple, then show that atleast one of x,y and z is divisible by 5.

i) For any odd prime p, let $(a,p) = 1$. Consider the integers a, $2a$, $3a$,------ $\frac{(p-1)}{2}a$ and their least positive residues modulo p. If n denotes the number of these residues that exceed $\frac{p}{2}$ then $(\frac{\alpha}{p}) = (-1)^n$

b) i) A coconut worth Rs. 5, a mango Re.1 and 20 oranges together Rs.1 How Many coconuts, mangos and oranges, totaling 100 can be bought for Rs. 100.

i) Let p be an odd prime, prove that if there exists an integer x such that $p \mid x^2 + 2$ then $p \equiv 1$ or 3 (mod 8)

Total No. of Questions :4]

SEAT No. :

P831

[Total No. of Pages :2

[4817]-3013
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 tables & calculator is allowed.***

Q1) Attempt all of the following (one mark each) : **[10]**

a) State ether -drag hypothesis.

b) If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, then determine $\vec{\nabla} . \vec{r}$.

c) State degree & order of differential equation $\frac{d^2y}{dx^2} + \sqrt{\left(\frac{dy}{dx}\right)} + y = 0$.

d) State whether following equation is linear or non-linear, homogeneous or non-homogeneous: $(y')^2 + xy^2 = 0$.

e) State generating function for Hermite's polynomials.

f) What do you mean by parity operation?

g) State importance of special functions in physics.

h) Write expression for ∇^2 in orthogonal co-ordinate system.

i) Draw neat diagram to show volume element in spherical polar co-ordinate system.

j) If $J_{n+1}(x) = \frac{n}{x} J_n(x) - J_n'(x)$, then prove that $\frac{d}{dx}\left[x^{-n} J_n(x)\right] = -x^{-n} J_{n+1}(x)$.

P.T.O.

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

a) Considering generating function $g(x,t) = (1-2xt+t^2)^{-1/2} = \sum_{n=0}^{\infty} P_n(x)t^n$ obtain $P_0(x), P_1(x), P_2(x)$ & $P_3(x)$.

b) Given points A($x = 2, y = 3, z = -1$) & B($r = 4, \theta = 25^o, \phi = 120^o$) then find spherical co-ordinates of A & Cartesian co-ordinates of B.

c) A rocket ship leaves the earth at the speed of 300 m/s. How many years must elapse before a clock in the ship & other on ground differ by 1 second.

Q3) Attempt any two of the following (5 marks each): **[10]**

a) Show that the point $x = 1$ is regular singular point of $(1-x^2)y'' - 2xy' + l(l+1)y = 0$.

b) State expressions for $\hat{e}_\theta, \hat{e}_r$ & $\hat{e}_\phi$ & hence prove that spherical polar co-ordinate system is orthogonal.

c) Derive an expression for length contraction on the basis of Lorentz transformation equations.

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

i) Explain the procedure to decide a point $x = \infty$ as ordinary, regular or irregular singular point for given equation & hence show that $x = \infty$ is regular singular point of $y'' - 2xy' + 2\lambda y = 0$.

ii) If $u = 2x + 3$, $v = y - 4$ & $w = z + 2$, then show that u, v & w are orthogonal. Also calculate h_1, h_2 & h_3 & hence find ds^2.

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

i) Separate the variables of differential equation $\frac{\partial^2 \varphi}{\partial x^2} + \frac{\partial^2 \varphi}{\partial y^2} = 0$.

ii) Explain physical significance of Einstein's mass-energy relation.

EEE

Total No. of Questions : 4]

SEAT No. :

P832

[Total No. of Pages : 2

[4817]-3014
T.Y. B.Sc.
PHYSICS
PH - 332 : Solid State Physics
(2013 Pattern) (New Course) (Paper - II) (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 calculators is allowed.***

Q1) Attempt all of the following (one mark each): **[10]**

a) Define Miller indices.

b) State different characterization techniques.

c) What is Fermi energy level?

d) Define magnetization.

e) What is Hall effect?

f) What is superconductor?

g) What is co-ordination number?

h) What are the Miller indices of a plane having the intercepts $(1, \infty, \infty)$ on three X, Y and Z axes

i) Give two assumptions for classical free electron model.

j) In Bragg's diffraction condition if d = 1.5 A°, then what is upper limit of λ for obtaining the first order reflection?

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

a) Show that the volume of unit cell of the reciprocal lattice is inversely proportional to the volume of unit cell of direct lattice.

b) Using Ewald's construction show that Bragg's diffraction condition in reciprocal lattice is exactly equivalent to the condition in direct lattice.

c) State and explain Meissner effect.

P.T.O.

Q3) Attempt any two (five marks each): **[10]**

a) In a unit cell of simple cubic structure, find the angle between the normals to pair of planes whose Miller indices are

i) (100) and (010) and

ii) (121) and (111).

b) A BCC crystal is used to measure the wavelength of some-X-rays. The Bragg angle for the first order reflection from (110) planes is 20.2º. What is the Wavelength? The lattice parameter of the crystal is 3.15 Aº.

c) Evaluate the temperature at which there is one percent probability that a state with energy 0.4 eV above the Fermi energy will be occupied by an electron.

(Given : $K_B = 1.38 \times 10^{-23}$ joules/Aelvin).

Q4) a) Attempt any one (eight marks): **[8]**

i) Distinguish between metals, semiconductors, and insulators on the basis of band theory of solids.

ii) What do you mean by ferrimagnetisms? What are soft and hard ferrites? And state any four applications of ferrites.

b) Attempt any one (two marks): **[2]**

i) Find number of atoms per unit cell for Body centered cubic system.

ii) A monochromatic beam of X-rays having wavelength 1.2 Aº is incident on a crystal. The first order maxima of reflected X-rays are obtained at an angle of 7º. Calculate the glancing angle for second order reflection.

Total No. of Questions : 4]

SEAT No. :

P833

[Total No. of Pages : 2

[4817]-3015
T.Y. B.Sc.
PHYSICS
PH-333: Classical Mechanics
(2013 Pattern) (Semester-III) (Paper-III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Attempt all of the following (one mark each). **[10]**

a) Define the term time of flight of the projectile.

b) What is the effect of magnetic field on the kinetic energy of a charged particle.

c) What is central force? Give examples.

d) What do you mean by geostationary orbit?

e) What is elastic scattering?

f) What is the effect of impact parameter on the scattering angle?

g) What are constraints?

h) Define the term configuration space.

i) State the condition for a transformation to be canonical.

j) Write Jacobi's identity.

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

a) Obtain an expression for instantaneous velocity of the rocket in vertical direction.

b) Derive the differential equation for the orbit in central force motion.

c) Obtain the relation between scattering angles in LAB and CM systems.

P.T.O.

Q3) Attempt <u>any two</u> of the following: **[10]**

a) The projectile is projected at such an angle that the horizontal range is four times the maximum height. Determine the angle of projection.

b) Evaluate following poisson's bracket.

i) $[J_x, P_x]$ ii) $[J_x, P_y]$

c) The eccentricity of the earth orbit is 0.0167. Calculate the ratio of maximum to minimum speed of earth in its elliptical orbit.

Q4) a) Attempt <u>any one</u> of the following: **[8]**

i) What is inelastic scattering? Obtain the Q-value equation in inelastic scattering process.

ii) State and explain D'Alembert's principle. Obtain Lagrange's equation of motion from D'Alembert's principle.

b) Attempt <u>any one</u> of the following: **[2]**

i) What do you mean by degrees of freedom? State the degrees of freedom for a system of N particles.

ii) Prove that the Poisson's bracket of any two dynamical variables is anti commutative.

Total No. of Questions : 5]

SEAT No. :

P834

[Total No. of Pages : 2

[4817]-3016
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 is the meaning of space quantization?

b) What is multiplicity? Calculate the value of S for triplet.

c) State Hund's rule for electronic configuration of atom.

d) Determine all possible values of L for two D electrons (l_1=2, l_2=2) using ll coupling.

e) What is stark effect?

f) State Moseley's Law.

g) What do you mean by fine structure of x-ray lines?

h) Define fluorescence.

i) Give the selection rule for transition between vibrational energy levels.

j) Give application of Raman effect in Nuclear physics.

Q2) Attempt any Two of the following.

a) What are x-rays? Explain the origin of characteristic x-ray spectra. **[5]**

b) Obtain an expression for rotational energy level of rigid diatomic molecule. **[5]**

c) What is Raman effect? Discuss the experimental setup of Raman spectrometer with neat diagram. **[5]**

P.T.O.

Q3) Attempt any Two of the following.

a) The separation of zeeman components of 600 nm spectral line are 0.015 nm, when the magnetic field is 1.20 Tesla. Calculate the ratio e/m for the electron. **[5]**

[Given: $c=3\times10^{8}$m/s]

b) The bond length of carbon monoxide (co) molecule is 0.113 nm and the masses of 12_c and 16_o atoms are respectively 1.99×10^{-26}kg and 2.66×10^{-26}kg. Calculate the reduced mass, moment of inertia and rotational energy in electron volt in its rotational state J=1. **[5]**

[Given: lev=1.6×10^{-19}J, h=6.63×10^{-34}J.S]

c) Derive all the atomic terms arising from p.d configuration using JJ coupling scheme and draw the vector diagrams. **[5]**

Q4) a) Attempt any one of the following.

i) What are quantum numbers? Explain all four quantum numbers necessary to define the quantum state of an electron. **[8]**

ii) What is spin-orbit interaction energy? Obtain an expression **[8]**

$$\Delta \text{Wls} = \frac{Ze^2}{2m^2c^3}\frac{h^2}{4\pi^2}\cdot\frac{1}{r^3}l^*s^*\cos(l^*, s^*)$$

Where symbols have their usual meaning.

b) Attempt any ONE of the following .

i) State Lande's interval rule. **[2]**

ii) Explain Normal Zeeman effect. **[2]**

Total No. of Questions : 4]

SEAT No. :

P835

[Total No. of Pages : 3

[4817]-3017
T.Y. B.Sc.
PHYSICS
PH - 335 : Computational Physics
(2013 Pattern) (Semester-III) (Paper-V)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator or log table is allowed.***

Q1) Attempt all of the following (one mark each): **[10]**

a) What are keywords?

b) What is algorithm?

c) Define term truncation error.

d) What is library function?

e) Define pixel.

f) Why continue statement is used?

g) What is use of switch statement?

h) Write general format of printf function.

i) What is user defined function?

j) Give uses of gets( ) and puts( ) functions.

P.T.O.

Q2) Attempt Any Two of the following:

a) What is operator? Explain any four operators used in 'C' language. **[5]**

b) Write 'C' program to draw line, circle, ellipse & bar. **[5]**

c) Evaluate $\int_0^2 (x) / \left(\sqrt{2+x^2}\right) dx$ using Trapezoidal rule with four steps. **[5]**

Q3) Attempt Any Two of the following:

a) Explain array with suitable example. **[5]**

b) Find the smallest positive root of $x^3 - 5x + 3 = 0$ using Newton - Raphson method using 4 iterations. **[5]**

c) What is storage class? Explain any two with examples. **[5]**

Q4) A) Attempt Any One of the following:

a) i) What is meant by branching? Compare do while & while statement. **[4]**

ii) Describe Simpson's $\frac{1}{3}^{rd}$ method of computing integral. **[4]**

b) i) Draw a flow chart for conversion of temperature in Fahrenheit into degree C. Given C = (F – 32) / 1.8. **[4]**

ii) Write 'C' program to calculate factorial using recursion. **[4]**

B) Attempt Any One of the following:

a) Give different programming languages. **[2]**

b) Find the output of the following 'C' program. **[2]**

```
# include <stdio.h>
    main ( )
    {   int i, j;
        for (i=1; i<=2; i++)
        {   for (j=1; j<=2; j++)
            {   if (i= =j)
                    continue;
                printf ("\n%d %d", i, j);
            }
    }
}
```

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Total No. of Questions :4]

SEAT No. :

P836

[Total No. of Pages :12

[4817]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (A): Astronomy and Astrophysics
(2013 Pattern) (Paper-VI) (Semester-III) (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 diagrams wherever necessary.***

Q1) Attempt all of the following (1 mark each): **[10]**

a) What is meant by stellar parallex?

b) Why does solar limb appear darker?

c) What is Doppler effect in light?

d) What are promineances?

e) What is a Radio Galaxy?

f) What is the disadvantage of a Newtonian telescope?

g) What is the use of image intensifier tube?

h) What are Binary stars?

i) What is solar wind?

j) Why is Annulas Eclipse a rare event?

P.T.O.

Q2) Attempt Any Two:

a) Explain photospheric phenomenon on the sun. **[5]**

b) Explain the cassegrain reflector telescope. **[5]**

c) What is Hubble's constant? State significance of Hubble's constant in Astronomy. **[5]**

Q3) Attempt Any Two:

a) What is meant by solar maxima and solar minima? **[5]**

b) Describe Butterfly Diagram. **[5]**

c) What are Cephaid variables? **[5]**

Q4) a) Attempt Any One:

i) Write a short note on Quazar Red shift. **[8]**

ii) Explain the formation of Heavier element in stars. **[8]**

b) Attempt Any One:

i) What are sun spots? **[2]**

ii) What is 'Helium Flash'? **[2]**

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Total No. of Questions :4]

P836

[4817]-3018
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 (1 mark each): **[10]**

a) Define the term "Ductility".

b) What is diffusion?

c) What do you understand by Elastic deformation?

d) Give two applications of polymers.

e) What are Linear polymers?

f) What is AX-structure?

g) What is Ferrite?

h) Define phase.

i) State lever rule.

j) What are smart materials?

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

a) State and explain various applications of smart materials.

b) What do you understand by "properties of materials"? Explain thermal properties of materials.

c) Define Deformation. Explain Elastic deformation and plastic deformation.

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

a) Consider a syrup made with 18gm of sugar ($C_6H_{12}O_6$ with M = 180 amu) and 18gm of water (H_2O with M = 18 amu). Based on 50/50 weight ratio, calculate the mass average molecular weight.

b) The compound CsBr has the same structure as CsCl. The centres of the two unlike ions are separated by 0.37 mm. What is the density of CsBr?

c) At atmospheric pressure (arbitrary), a material of unknown composition shows 4 (four) phases in equilibrium at 987 K. What is the minimum number of components in the system?

Q4) a) Attempt Any One of the following: **[8]**

i) State and prove Gibb's phase rule.

ii) Discuss electrical behaviour of ceramic with reference to dielectric properties.

b) Attempt Any One of the following: **[2]**

i) Give two examples of natural polymers.

ii) Define the term critical shear stress.

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Total No. of Questions :4]

P836

[4817]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (C): Motion Picture Physics
(2013 Pattern) (Paper-VI) (Semester-III) (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 diagrams wherever necessary.***

Q1) Attempt all of the following (one mark each): **[10]**

a) Define zoom ratio.

b) State various types of filters.

c) State factors affecting B/W developing process.

d) How optical recording takes place?

e) List various camera formats.

f) State various colour printing methods.

g) State advantages of leaf shutter.

h) What is aperture?

i) List any two laboratory special effects.

Q2) Attempt Any Two of the following:

a) Explain Basic colour theory. **[5]**

b) Explain projector and its essential parts. **[5]**

c) State and explain reasons for using filters in B/W photography. **[5]**

Q3) Attempt Any Two of the following:

a) Explain in brief process of contact printing and projection printing. **[5]**

b) Write a short note on light meter and exposure meter. **[5]**

c) Explain intermittent mechanism of movie camera. **[5]**

Q4) a) Attempt Any One of the following:

i) Compare the features of BOX camera, SLR camera. **[8]**

ii) Explain construction and working of condenser Enlarger. **[8]**

b) Attempt Any One of the following:

i) State various focusing aids. **[2]**

ii) State composition of colour reversal film. **[2]**

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Total No. of Questions :4]

P836

[4817]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (D): Biophysics
(2013 Pattern) (Paper-VI) (Semester-III) (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 diagrams wherever necessary.***
4) ***Use of log tables and calculator is allowed.***

Q1) Attempt all of the following (one mark each): **[10]**

a) Define bond angle.

b) What is Codon?

c) State various chemical components of DNA.

d) Define CMRR.

e) State the working principle of spectrophotometer.

f) What is the use of SEM?

g) Draw PQRST curve of ECG.

h) State any two uses of X rays.

i) What do you mean by biostatistics?

j) What is the full form of NMR?

Q2) Attempt Any Two (Five marks each): **[10]**

a) Explain the functional aspects of cytoplasm.

b) Discuss origin of different compound action potentials of the human body.

c) Explain the construction and working of centrifuge.

Q3) Attempt Any Two (Five marks each): **[10]**

a) Discuss polarizable and non-polarizable electrodes.

b) Explain NMR as the method for structure determination of biomolecules.

c) Explain the terms:

i) Resting potential.

ii) Capacitive Transducers.

Q4) a) Attempt Any One: **[8]**

i) What is a cell? Discuss in detail the function of each constituents of a cell.

ii) State the working principle of ECG machine. Explain its construction and working in details.

b) Attempt Any One: **[2]**

i) Distinguish between Animal cell and plant cell.

ii) State the applications of radioactivity.

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Total No. of Questions :4]

P836

[4817]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (E): Renewable Energy Sources
(2013 Pattern) (Paper-VI) (Semester-III) (Elective-I)

Time : 2 Hours] ***[Max. Marks :40***

Instructions to the candidates:

1) ***All the questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Use of log tables and calculators is allowed.***

Q1) Attempt all of the following (one mark each): **[10]**

a) Define the term: Diffusion Radiation.

b) What is meant by solar constant?

c) State any two applications of flat plate collector.

d) State any two disadvantages of concentrating collectors over flat plate type collectors.

e) State the types of solar cells.

f) State the photo-voltaic principle.

g) Give any two applications of solar photo-voltaic system.

h) What is Biomass?

i) Give any two disadvantages of fixed dome type plant.

j) Considering Sun as a black body, calculate the solar radiation intensity leaving the surface of the Sun.

Given: $\sigma = 5.67 \times 10^{-8}$ W/m^{2}K^4, $T_o = 5762$ K.

Q2) Attempt Any Two (Five marks each): **[10]**

a) Describe: Solar radiation at the Earth's surface.

b) Discuss the limitations of photo-voltaic cell efficiency.

c) Explain in detail: propeller type wind machine.

Q3) Attempt Any Two (Five marks each): **[10]**

a) With a suitable diagram, discuss the structure of Sun.

b) State the factors affecting bio-digestion. Discuss how hydrogen-ion concentration affect the generation of biogas.

c) Calculate the efficiency of solar cell, using the following data:

Given: V_{oc} = 400 mV, I_{sc} = 40 mA, FF = 0.7,

input power of the cell = 6×10^{-2} W.

Q4) a) Attempt Any One: **[8]**

i) Describe the construction and working of solar distillation and solar water heater (Natural circulation).

ii) What is a gasifier? Explain the working of 'Down-draft gasifier'.

b) Attempt Any One: **[2]**

i) State the energy balance equation on the whole collector.

ii) Explain the term 'wind data' in brief.

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Total No. of Questions :4]

P836

[4817]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (F): Applied Optics
(2013 Pattern) (Paper-VI) (Semester-III) (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 diagrams wherever necessary.***

Q1) Attempt all of the following (1 mark each): **[10]**

a) Whta is Fermat's principle?

b) What is matrix?

c) What is interference?

d) What is diffraction?

e) State Malu's law.

f) What are the requirements of hologram?

g) Define the term Numerical aperture.

h) What is bolometer?

i) What are cardinal points?

j) What is the importance of coherence in holography?

Q2) Attempt Any Two:

a) Using Fermat's principle establish the laws of reflection of light. **[5]**

b) Obtain the system matrix for a thin lens. **[5]**

c) Write a short note on Wollstom prism. **[5]**

Q3) Attempt Any Two:

a) Mention various properties of a hologram. **[5]**

b) Explain the types of detectors used in optical radiation. **[5]**

c) Calculate the NA and the acceptance angle of an optical fibre.

Given: μ_1(core) = 1.55, μ_2(cladding) = 1.50. **[5]**

Q4) a) Attempt Any One:

i) What is zone plate? Derive an expression for its focal length. **[8]**

ii) Explain the phenomenon of interference of thin film due to transmitted light and obtain the expression for minima and maxima. **[8]**

b) Attempt Any One:

i) What are the types of losses in optical fibre. **[2]**

ii) Give the construction of zone plate. **[2]**

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Total No. of Questions :4]

SEAT No. :

P837

[Total No. of Pages :3

[4817]-3019
T.Y.B.Sc.
CHEMISTRY
CH-331: Physical Chemistry
(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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator and logarithmic table is allowed.***
5) ***Actual calculations must be shown while solving problem.***

Q1) Answer the following : **[10]**

a) Write relationship between $t_{½}$ and initial concentration of reactants (a) for a third order reaction.

b) Explain the term, temperature coefficient with respect to rate constant.

c) Show graphically, how equivalent conductance varies with $\sqrt{c}$ for weak electrolyte.

d) Define the term: 'Transport Number'.

e) Calculate the reduced mass of ^{14}N ^{16}O molecule.

f) Why CO_2 molecule does not show rotational spectra?

g) Define the term dipole moment. Give its unit.

h) Calculate wave number of the radiation having frequency 1.4×10^{14} sec^{-1}. (Given: C= 3.0×10^{10} cm sec^{-1}.)

i) Define the term, component.

j) Calculate the degree of freedom (F), for the system having P =3 and C=1.

P.T.O.

Q2) a) Attempt ANY TWO of the following: **[6]**

i) Explain the experimental determination of order of reaction by graphical method.

ii) Explain: 'Electrophoretic Effect'.

iii) What are merits and demerits of microwave spectroscopy.

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

i) The frequency difference of sucessive lines in the rotational spectrum of HI molecule is observed to be 13.40 cm^{-1}. Calculate the rotational constant and the bond length in equilibrium.

[Given: At wts - H = 1, I =127, N = 6.023 x 10^{23}, h = 6.626 x 10^{-27} erg.sec, C = 2.987 x 10^{10} cm s^{-1}]

ii) For a certain first order reaction the time required for 50% completion is 30 minutes at 27°C and 10 minutes at 47°C. Calculate the activation energy of the reaction.

[Given: R= 8.314 joules mol^{-1} k^{-1}]

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

a) Describe Hittorf's method to determine the transport number of an ion.

b) Derive the expression of rate constant (k) for third order reaction (with equal initial concentrations).

c) Discuss the phase diagram of sulphur system.

Q4) a) Explain in detail, the molar polarization of polar and non-polar molecules.**[6]**

OR

a) Attempt the following: **[6]**

i) How conductance measurement is useful to determine the dissociation constant of weak electrolyte.

ii) Derive the expression of the phase rule.

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

i) The dipole moment of chlorobenzene is 1.549 D. If the bond distance of C-Cl is 2.8 $\mathring{A}$, estimate the percent ionic character of bond. ($q = 4.8 \times 10^{-10}$ esu.cm)

ii) The resistance of $N/50$ solution of KCl at 25°C is 400 ohms. If the specific conductance of the same solution at 25°C is 2.765×10^{-3} ohm^{-1} cm^{-1} and resistance of 0.01 N solution of acetic acid at same temperature is 815 ohms, calculate equivalent conductance of acetic acid.

EEE

Total No. of Questions : 4]

SEAT No. :

P838

[Total No. of Pages : 2

[4817]-3020
T.Y. B.Sc.
CHEMISTRY
CH - 332 : Inorganic Chemistry
(2013 Pattern) (Paper - II) (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 reserval for neat diagrams.***
4) ***Use of log tables and calculator is allowed.***
5) ***Atomic numbers : H:1, Li : 3, C: 6, N : 7, O : 8, Cr : 24, Fe : 26, Ni : 28, Pt : 78, Co : 27, Ti : 22.***

Q1) Answer the following: **[10]**

a) Write molecular orbital electronic configuration of Li_2 molecule.

b) Give the oxidation state of Fe in $K_4[Fe(CN)_6]$.

c) How many secondary valencies are present in $K_2[PtCl_6]$.

d) Mention the type of isomerism shown by $[Co(NH_3)_5 ONO]Cl_2$ and $[CoCNH_3]_5 NO_2]Cl_2$.

e) Calculate the EAN of $[Fe(CO)_5]$.

f) Define 'Inner orbital complex'.

g) How many unpaired electrons are present in d^6 strong field octahedral complex.

h) Give the bond order of H_2^+ ion.

i) Give the symmetry symbols of d-orbital.

j) Define C.F.S.E.

Q2) a) Answer <u>any two</u> of the following: **[6]**

i) Discuss the formation of N_2 molecule on the basis of MOT.

ii) Explain the formation of $[Ni(CN)_4]^{2-}$ ion on the basis of VBT.

iii) Write IUPAC name of following complexes:

1) $[Pt(NH_3)_4]Cl_2$

2) $[MnCl_4]^{2-}$

P.T.O.

3) $K_3[Al(C_2O_4)_3].\ 3H_2O$.

b) Answer <u>any two</u> of the following: **[4]**

i) Distinguish between AOs and MOs.

ii) Calculate the CFSE of $K_4[CrCl_6]$.

iii) Draw the possible geometries of complexes having C.N. 4.

Q3) Answer <u>any two</u> of the following: **[10]**

a) Discuss the formation of CO_2 molecule on the basis of MOT.

b) Give assumptions of CFT. Discuss CFT with respect of tetrahedral complexes.

c) Discuss the formation of $[FeF_6]^{3-}$ ion without π bonding on the basis of MOT.

Q4) a) 'MOT is superior to VBT', discuss on the basis of paramagnetic nature of O_2 molecule. How bond order and bond energy vary in O_2^+ and O_2^-. **[6]**

OR

a) Answer the following: **[6]**

i) State whether following complexes obey or do not obey EAN rule.

1) $[Pt(NH_3)_4\ Br_2]Cl_2$

2) $[Co(en)_2\ H_2O\ Cl]Cl_2$

3) $[Ti\ (H_2O)_6]^{3+}$

ii) Draw all possible geometrical isomers of $[Ma_2b_2c_2]$.

b) Explain 'multiple bonding'. **[4]**

OR

b) Answer the following: **[4]**

i) Write note on, : 'Nephelauxetic effect'.

ii) Explain first and second coordination sphere according to Werner's theory.

Total No. of Questions : 4]

SEAT No. :

P839

[Total No. of Pages : 2

[4817]-3021
T.Y. B.Sc.
CHEMISTRY
CH-333: Organic Chemistry
(2013 Pattern) (Semester-III) (Paper-III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw the structures & neat diagrams if necessary.***

Q1) Answer the following: **[10]**

a) What is specific acid catalysis?

b) Trans-1,2-(e,e) dimethyl cyclohexane is most stable than its cis isomer why?

c) $\overset{\ominus}{I}$ is a good nucleophile why?

d) List the factors affecting addition of nucleophile to $>C=O$ group.

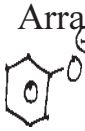
e) What is kinetic isotopic effect?

f) What is π -complex?

g) Nitrobenzene on nitration gives m-dinitrobenzene why?

h) Write the reaction of 1,2-dithiol with cyclobutanone.

i) Arrange the following in decreasing order of basicity.


; $C_2H5O^{\ominus}$, $CH_3COO^{\ominus}$

j) Write the addition reaction of 2-butyne with H_2, pd/$BaCO_3$

Q2) a) Answer '<u>any two</u>' of the following: **[6]**

i) Explain Hydrogen bonding with suitable examples.

ii) Discuss the mechanism of cannizarro reaction with suitable example.

ii) Discuss the mechanism of addition of HBr to propylene. Explain peroxide effect.

P.T.O.

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

i) Why conc H_2SO_4 is essential in nitration reaction?

ii) Define acids & bases according to Lewis theory.

iii) What are the electrophiles & nucleophiles? Give example of each.

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

a) Draw the chair conformations of cis-1,3-dimethyl cyclohexane and comment on their stability & optical activity.

b) What is E_2mechanism? Discuss the evidances of E_2 mechanism.

c) What is S_N1 reaction? Discuss the stereochemistry of $S_N1$reaction.

Q4) a) i) What is meant by Arynes? Give any one example of its orientation. **[3]**

ii) What is ozonolysis? Discuss the mechanism of addition of O_3 molecule to 1-propene. **[3]**

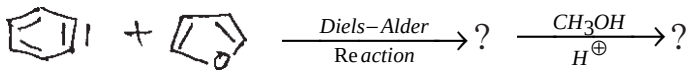
OR

i) Discuss the mechanism involved in sandmeyer's reaction. **[3]**

ii) Trans-2-butene on hydroxylation by O_SO_4 gives dl product why? **[3]**

b) Predict the products with mechanism: **[4]**

i) CH_3-CH_2-OH $\xrightarrow{Socl_2}$? $\xrightarrow{Base}$?

ii)  $\xrightarrow[\text{Reaction}]{Diels-Alder}$? $\xrightarrow[H^{\oplus}]{CH_3OH}$?

OR

b) Write notes on: **[4]**

i) Hofmann elimination

ii) Markovnikoff's rule.

Total No. of Questions : 4]

SEAT No. :

P840

[Total No. of Pages : 2

[4817]-3022
T. Y. B. Sc.
CHEMISTRY
CH-334: Analytical Chemistry
(Paper-IV) (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) ***Use of log table and calculator is allowed.***

Q1) Answer the following: **[10]**

a) State the objective of the washing of the precipitate.

b) Give the Faraday's first law of electrolysis.

c) What are the basic components of TGA

d) Calculate the absorbance of solution having 80% transmittance.

e) State Beer's law.

f) How a effect of migration current is eliminated.

g) What is the diffusion current?

h) Define detection limit in AAS.

i) Give the Boltzman equation.

j) Draw a curve showing deviation from Beer's law.

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

i) What is co-precipitation? Give the precautions to minimise the co-precipitation.

ii) Give a brief account of interferences in AAS.

iii) Explain the qualitative applications of polarography.

P.T.O.

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

i) Draw a neat labelled TG curve.

ii) Calculate the weight of silver deposited when a current of 2.0 A is passed through silver nitrate solution for 20 min.

Given : ECE of silver : 1.110×10^{-3}

iii) Calculate the molar absorptivity for a 0.003m solution having absorbance 0.37 when placed in a cell of pathlength of 2 cm.

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

a) Explain the precipitation from homogeneous solution with suitable examples.

b) What are the spectrophotometric titrations? Describe the various spectrophotometric titration curves.

c) Explain the instrumentation of FES with a suitable diagram.

Q4) a) Explain the principle of DTA. Explain in brief the instrumentation of DTA. **[6]**

OR

i) Write a note on photovoltaic cell. **[3]**

ii) What are the conditions for good precipitation. **[3]**

b) The solubility product of PbI_2 is 1.584×10^{-9} at 30°c . Calculate the solubility of PbI_2 in gram per lit and gram mole per lit.

Given: molecular weight of PbI_2 is 462 **[4]**

OR

Calculate the diffusion current for Ni^{2+} having concentration of 3.00×10^{-3} moles/lit. The diffusion coefficient of Ni^{2+} is 7.3×10^{-6} $cm^{2/sec}$.

Given : t = 3 sec, m = 5.0 mg/sec.

Total No. of Questions : 4]

SEAT No. :

P841

[Total No. of Pages : 2

[4817]-3023
T.Y. B.Sc.
CHEMISTRY
CH - 335 : Industrial Chemistry
(2013 Pattern) (Semester-III) (Paper-V)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer the following: **[10]**

a) Define the term yield.

b) What is pasteurization?

c) What are fungicides?

d) Define the octane number.

e) What is producer gas?

f) Define the term clinker.

g) Explain the term trademark.

h) What is smoking?

i) Give two important uses of nitric acid.

j) Define the term annealing of glass.

P.T.O.

Q2) a) Answer Any Two of the following: **[6]**

i) What are the functions of HR?

ii) In contact process of manufacture of sulphuric acid SO_3 is dissolved in conc H_2SO_4 and not in water. Explain.

iii) Give uses of neem oil.

b) Answer Any Two of the following: **[4]**

i) What are safety precautions taken in chemical process industry.

ii) Explain the factors deciding plant location.

iii) What are physical properties of glass.

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

a) Give different applications of petrochemicals.

b) Explain the process of manufacture of industrial starch from corn with flowsheet.

c) Write short note on:

i) fibre glass.

ii) Safety glass.

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

OR

Discuss manufacture of nitric acid by Ostwald's process with flowsheet.

b) Discuss important properties of good fuel. **[4]**

OR

Write short note on non starch polysaccharides.

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Total No. of Questions :4]

SEAT No. :

P842

[Total No. of Pages :10

[4817]-3024
T.Y. B.Sc.
CHEMISTRY
CH-336 (A): Nuclear 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) ***Draw the diagrams wherever necessary.***
4) ***Use of log tables and calculator is allowed.***

Q1) Answer the following : **[10]**

a) The half life of ^{7}Be is 53.4 days. What is the value of decay constant?

b) Define Isotones with one example.

c) State magic numbers in shell model.

d) Which are the two α active nuclides?

e) Complete the following nuclear reaction

$$^{23}_{11}Na + \cdots\cdots \rightarrow ^{20}_{10}Ne + \alpha .$$

f) State the principle quantum number.

g) State the merits of liquid drop model.

h) Define curie.

i) What are thermonuclear reactions?

j) State one example of conservation of protons in nuclear reaction.

P.T.O.

Q2) a) Attempt Any Two of the following: **[6]**

i) Discuss general characteristics of radioactive decay process.

ii) Explain Bethe's notations. What are the different types of nuclear reactions?

iii) Discuss the classification of nuclides on the basis of their mass number (A) and atomic number (Z).

b) Attempt Any Two of the following: **[4]**

i) Calculate the binding energy of Iron atom $\left({}^{56}_{26}\mathrm{Fe}\right)$

Given: mass of proton = 1.007825 amu

mass of neutron = 1.008665 amu

mass of Iron atom = 55.934932 amu

ii) Define photonuclear reactions. What are the different types of photonuclear reactions?

iii) Discuss the sequence of filling the orbits on Rectangular well potential model.

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

a) Explain different types of decay processes with suitable examples.

b) State and explain semi-empirical mass equation.

c) What is compound nucleus? Discuss important features of compound nucleus theory.

Q4) a) Give salient features of shell model. What are the advantages and disadvantages of the model. **[6]**

OR

Describe liquid drop model in detail giving postulates.

b) Explain Fermi theory of β-decay. **[4]**

OR

Disintegration of 1 gm ^{222}Ac was studied, 0.563 gms of actinium remained after 5 hours, find the half life of ^{222}Ac.

●●●●●

Total No. of Questions :4]

P842

[4817]-3024
T.Y. B.Sc.
CHEMISTRY
CH-336 (B): Polymer 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) ***Draw the neat structures and diagrams wherever necessary.***
4) ***Use of log tables and calculator is allowed.***

Q1) Answer the following : **[10]**

a) Define the term - virgin polymer.

b) Draw the structures of the following polymers.

i) Polystyrene ii) Polyvinyl nitrile

c) Write the IUPAC name of $PhSiEt_3$.

d) Explain the term - Colorants.

e) State whether the statement is true or false - 'Terylene is the example of inorganic polymer'.

f) Write the important linkage in polyamide polymer.

g) Draw the atactic structure of polyvinyl alcohol.

h) Give two important uses of adhesives polymer.

i) Name any two commonly used UV stabilizers in polymer processing.

j) Calculate the molecular weight of polyvinyl chloride whose Dp is 1200.

Q2) a) Attempt Any Two of the following: **[6]**

i) Write a note on rayon and cellulose nitrate.

ii) 'Antistatic material generally used in polymer processing for making die articles'. Explain.

iii) Why aramides and polycarbonates used for making shields and bullet proof materials?

b) How will you distinguish the following (Any Two): **[4]**

i) Linear polymers and cross linked polymers.

ii) Natural polymers and synthetic polymers.

iii) Isotactic polymers and syndiotactic polymers.

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

a) What is meant by chain polymerisation reaction? Give a detailed account of free radical polymerisation with suitable examples.

b) Explain the step polymerisation reaction. Give brief account of ring opening polymerisation reaction.

c) Define the term polymerisation techniques. Discuss in detail note on melt and solution polymerisation.

Q4) a) Attempt Any Two of the follwing: **[6]**

i) Give a brief account of practical significance of molecular weight of polymers.

ii) Write a note on hydrogenation reaction of polymers.

iii) A basket of mangoes contains sets of I, II, III and IV with their numbers and their weights of mangoes is given below,

Set I consist 60 mangoes with its weight 300 gm.

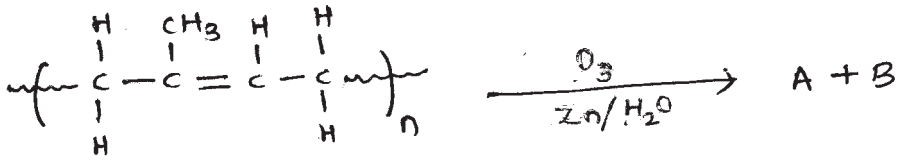
Set II consist 80 mangoes with its weight 250 gm.

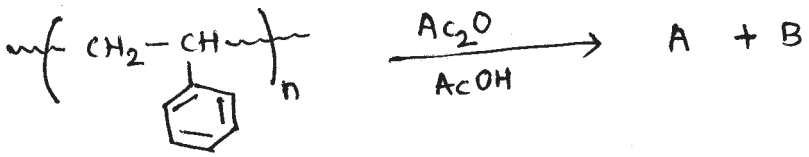
Set III consist 100 mangoes with its weight 200 gm.

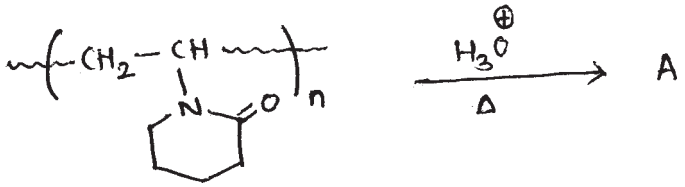
Set IV consist 90 mangoes with its weight 150 gm.

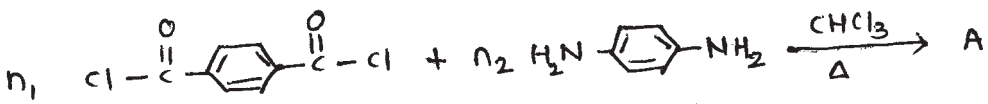
Calculate the number average $\left(\bar{M}_n\right)$ molecular weight of mangoes.

b) Complete the following polymer reactions: **[4]**

i) 

ii) 

iii) 

iv) 

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Total No. of Questions :4]

P842

[4817]-3024
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 two phospholipids.

b) What are allosteric enzymes? Give one example.

c) Give one example of anterior pituitary hormone.

d) Define Glycoproteins.

e) Give two factors that stabilise protein structure.

f) Which organelle in plants help in photosynthesis.

g) Name two Ion exchangers used in chromatography.

h) Define Km.

i) What is the bond seen in polysaccharides?

j) What are Zwitter ions?

Q2) a) Answer Any Two of the following: **[2 × 3 = 6]**

i) What are Amphipathic lipids? How do they behave in water?

ii) Write note on features of Active site of enzymes.

iii) List out biological functions of proteins.

b) Write structures of Any Two: **[2 × 2 = 4]**

i) Serine.

ii) Maltose.

iii) Lecithin.

Q3) Answer Any Two of the following: **[2 × 5 = 10]**

a) Explain the features of enzyme inhibition.

b) Discuss the role of C.AMP as second messenger.

c) Classify amino acids based on 'R' group.

Q4) a) Explain principle, procedure and applications of Gel filtration. **[6]**

OR

Discuss the structural organisation of proteins.

b) Write note on types of bonds in Biomolecules. **[4]**

OR

Tabulate the names of Vitamin B complex and their coenzymes.

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Total No. of Questions :4]

P842

[4817]-3024
T.Y. B.Sc.
CHEMISTRY (Elective-I)
CH-336 (D): Environmental & Green 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) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer the following : **[10]**

a) Define the term 'Source'.

b) What is mean by Residence time.

c) Write name of any minor components of atmosphere.

d) Define the term oxidising smog.

e) Define the term P_E.

f) Define 'Environmental pollution'.

g) Name any two 'Biotic components'.

h) Name any two 'Green catalyst'.

i) What is use of catalytic reagent.

j) Name any two 'Organic contaminants'.

Q2) a) Attempt Any Two: **[6]**

i) Explain chlorofluoro carbons (CFCs).

ii) What is mean by synthetic chemistry?

iii) Explain Greener synthesis of Methyl Methacrylate.

b) Write Any Two of the following: **[4]**

i) Reducing smog.

ii) Waste preventation.

iii) Define P_H.

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

a) What is source & sinks of Hydrocarbon (HC) . Explain some chemical process involving Hydrocarbon (HC).

b) What is mean by risk? How can it be reduced.

c) Explain Practical application of Green chemistry in scientific area.

Q4) a) Explain Bhopal disaster of Biochemical effect of MIC. **[6]**

OR

What is mean by Total organic carbon (T.O.C). How TOC determined by employing UV-promoted oxidation.

b) Write short note (Any One): **[4]**

i) Alternative techniques in Green Chemistry.

ii) Europhication (Agal Nutrients).

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Total No. of Questions :4]

P842

[4817]-3024
T.Y. B.Sc.
CHEMISTRY (Elective-I)
CH-336 (E): Agriculture Chemistry
(2013 Pattern) (Paper-VI) (Semester-III) (New Course) (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 the diagrams wherever necessary.***

Q1) Answer the following : **[10]**

a) What are objectives of agricultural chemistry?

b) Define 'Soil temperature'.

c) Define 'porosity of soil'.

d) What is acid soil?

e) What is denitrification?

f) What is sludge?

g) What are fumingants?

h) What are mixed fertilizers?

i) Draw structure of D.D.T. and B.H.C.

j) What is EPM?

Q2) a) Answer Any Two of the following: **[6]**

i) How alkaline soil is formed?

ii) What are organochlorine insecticides? Give their classification.

iii) Give deficiency symptoms of phosphorous in plants.

b) Answer Any Two of the following: **[4]**

i) Write a note on 'Sampling tools' for collection of soil samples.

ii) What is the role of sulphur in the plants?

iii) Write a note on 'copper fungicides'.

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

a) How alkali soils are reclaimed?

b) Compare Biofertilizers and chemical fertilizers.

c) Describe Vermicompost in detail.

Q4) a) Attempt Any Two of the following: **[6]**

i) Discuss minor constituents in irrigation water.

ii) Discuss complex fertilizers.

iii) Write a note on 'anion exchange reactions' in soil.

b) Answer Any Two of the following: **[4]**

i) Discuss in brief methods of applying liquid fertilizers.

ii) Give chemical functions of soil.

iii) Explain the term meq/L and PPM.

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Total No. of Questions :4]

SEAT No. :

P843

[Total No. of Pages :2

[4817]-3025
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 diagram wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Answer the following : **[10]**

a) What are Thallophytes?

b) Give any two general characters of Bryophytes.

c) Write the names of primary and alternate host in Puccinia.

d) Which type of stele is found in Selaginella.

e) What is Operculum?

f) Define Gemma cup.

g) Name the sex organs of Psilotum.

h) Give any two uses of Sargassum.

i) Mention any two classes of Bryophyta as per G.M. Smith (1955).

j) What is ligule?

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

a) Write the economic importance of Algae.

b) Give an illustrated account of cell of Saccharomyces.

c) With the help of neat labelled diagram describe the thallus structure of Batrachospermum.

P.T.O.

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

a) Tikka Disease of Groundnut.

b) Vegetative reproduction in Chara.

c) Vegetative structure of Rhizopus.

Q4) With the help of labelled diagram describe the structure of sporophyte of Polytrichum. **[10]**

OR

Describe the external morphology and internal structure of sporophyte of Marsilea with the suitable diagram.

EEE

Total No. of Questions : 4]

SEAT No. :

P844

[Total No. of Pages : 2

[4817]-3026
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) Write any two differences between prokaryotic and eukaryotic cell.

b) What is endocytosis?

c) Mention any two functions of lysosomes.

d) Distinguish between acrocentric and metacentric chromosomes.

e) Enlist any two functions of nucleus.

f) State chargaff's law.

g) Give characteristics of genetic material.

h) What are split genes?

i) State one gene one enzyme hypothesis.

j) Define translation.

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

a) Comment on Photoreactivation and Dark excision repair system.

b) Write characteristics of forms of DNA.

c) Describe ultrastructure and chemical composition of plasma membrane.

P.T.O.

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

a) Ribosomes.

b) Plant cell wall.

c) Transcription Apparatus.

Q4) What is genetic code? Write in detail characteristics of genetic code. **[10]**

OR

Give Morphology, ultrastructure and chemical composition of Mitochondria. Comment on its functions in plant Metabolism.

Total No. of Questions : 4]

SEAT No. :

P845

[Total No. of Pages : 2

[4817]-3027
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 interaction of genes.

b) State law of Independent Assortment.

c) Define multiple allelism.

d) What are duplicate genes?

e) Define quantitative traits.

f) Give definition of gene mapping.

g) What is evolution?

h) What is natural selection?

i) Define polyploidy.

j) What is sexlinked inheritance?

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

a) Explain complementory gene interaction with example.

b) Give origin and types of inversion.

c) Explain evidences from bio-geographical relations.

P.T.O.

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

a) Petite mutants in yeast.

b) Blood group in Human.

c) Sex influenced traits.

Q4) What is trisomy? Give an account of its types. Add a note on trisomy in Datura. **[10]**

OR

What are autopolyploids? Describe its effects and write a note on its uses.

Total No. of Questions : 4]

SEAT No. :

P846

[Total No. of Pages : 2

[4817]-3028
T. Y. B. Sc.
BOTANY
BO-334: Spermatophyta and Palaeobotany
(Paper-IV) (2013 Pattern) (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) Give any two salient features oF Lycopsida.

b) DeFine FOSSIL

c) Name the type of Fruit in Leguminosae.

d) Enlist any two eras oF geological. Time scale.

e) What is pentoxylon?

f) Write the Floral Formula of Family Apocynaceae.

g) Name type of pollen qrains found in pinus.

h) Give botanical names of any two plants of family Orchidaceae.

i) Mention the type oF inFlorescence oF Family Asteraceae.

j) Write any two economic importance of Family Lamiaceae.

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

a) State any five merits oF Hutchinson system of classiFication.

b) Describe the structure oF seed in Gnetum.

c) Explain the internal morphology oF calamites.

P.T.O.

Q3) Write short notes on any two of the Following, **[10]**

a) Plant identiFication keys.

b) Bennettitalean theory.

c) Impression.

Q4) Describe external and internal morphology of pinius root and needle. **[10]**

OR

Give distinguishing characters, Floral Formula and Floral diagram oF Family magnoliaceae.

Total No. of Questions : 4]

SEAT No. :

P847

[Total No. of Pages : 2

[4817]-3029
T.Y. B.Sc.
BOTANY
BO - 335 : Horticulture and Floriculture
(2013 Pattern) (Semester-III) (Paper-V)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer the following: **[10]**

a) Define Horticulture.

b) Define sexual propagation.

c) Give the plant source of Vitamin C.

d) What is training?

e) Enlist any two physical properties of soil.

f) Define commercial Floriculture.

g) What is landscape gardening?

h) Give any one scope of floriculture.

i) What are dry flowers?

j) Give any two examples of rhizome spices.

P.T.O.

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

a) Give an account of classification of horticultural crops.

b) Describe various techniques of flower drying.

c) Write about scope and importance of horticulture.

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

a) Branches of horticulture.

b) Bahar treatment.

c) Mughal garden.

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

OR

What is floriculture? Write on importance of floriculture. Add a note on various methods of cultivation of Tagetus.

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Total No. of Questions : 4]

SEAT No. :

P848

[Total No. of Pages : 2

[4817]-3030
T.Y. B.Sc.
BOTANY
BO - 336 : Computational Botany
(2013 Pattern) (Semester-III) (Paper-VI)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer the following: **[10]**

a) Define probability.

b) What is mean deviation?

c) Define variance.

d) Give any two properties of binomial distribution.

e) What is frequency?

f) Define qualitative data.

g) What is mode?

h) Define non-linear regression.

i) What is germination percentage?

j) What is graphic representation of data?

P.T.O.

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

a) What is non-random sampling? Give its merits and limitations.

b) Describe mean as a measure of central tendency.

c) Explain how to compute density and abundance from data obtained through quadrats?

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

a) Scope and applications of biostatistics.

b) Bar diagram.

c) Scatter diagram method for correlation.

Q4) What is Chi-Square test? Give formula to compnte chi-square value. Add a note on its significance. **[10]**

OR

What is seed germination? Explain any two plant growth indices.

●●●●●

Total No. of Questions :4]

SEAT No. :

P849

[Total No. of Pages :2

[4817]-3031
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) Attempt the following : **[10]**

a) State the habit of pila.

b) State the name of organ of aerial respiration in pila.

c) Give any two examples of Dipnoi fishes.

d) Define pleurodont dentition

e) Define pronephros kidney.

f) Define hemichordata.

g) State the characteristic feature of skin of calotes

h) Define dextral shell.

i) Define oligopyrene sperm.

j) Give scientific name of garden lizard.

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

a) Sketch and label brain of scoliodon.

b) Describe pallial complex in pila.

c) Describe the structure of heart of calotes.

P.T.O.

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

a) Electric organs in fishes.

b) Locomotion in protozoa.

c) Statocyst.

Q4) Describe reproductive systems in pila. **[10]**

OR

Describe male urinogenital system of calotes.

EEE

Total No. of Questions : 4]

SEAT No. :

P850

[Total No. of Pages : 2

[4817]-3032
T.Y. B.Sc.
ZOOLOGY
ZY - 332 : Mammalian Histology
(2013 Pattern) (New Course) (Paper - II) (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) Attempt the following: **[10]**

a) Define alveolus.

b) Define Kuffer's cell.

c) Define taste bud.

d) What is hair follicle?

e) Define neuron.

f) What are Leydig's cells?

g) Give names of two hormones secreted by thyroid gland.

h) Give names of histological layers in wall of vein.

i) Give any two types of cells in liver.

j) Name the type of epithelium in oesophagus.

Q2) Attempt <u>any two</u> of the following: **[10]**

a) Sketch and label V.S. of tooth.

b) Describe fluid connective tissue.

c) Describe structure of nephron.

P.T.O.

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

a) Columnar epithelium.

b) Histological structure of pitutary gland.

c) Histological structure of pancreas.

Q4) Describe the histological structure of duodenum. **[10]**

OR

Describe the histological structure of ovary.

Total No. of Questions : 4]

SEAT No. :

P851

[Total No. of Pages : 2

[4817]-3033
T.Y. B.Sc.
ZOOLOGY
ZY-333: Biological Chemistry
(2013 Pattern) (Semester-III) (Paper-III) (New Course)

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 covalent bond.

b) Give the name of symmetric amino acids.

c) Name the protein possessing α helical structure.

d) What is isomerism in carbohydrates.

e) Define inversion.

f) State Handerson-Hasselbalch equation

g) What are allosteric enzymes?

h) Give the names of any two monosaccharides.

i) Define colloids.

j) Define bronsted acid.

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

a) Describe clinical significance of carbohydrates.

b) Describe effect of substrate concentration on enzyme activity.

c) Give an account of tertiary structure of protein.

P.T.O.

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

a) Muta rotation

b) Formal titration.

c) Amino acids.

Q4) What are lipids? Describe classification of lipids with example. **[10]**

OR

What are buffers? What is buffering capacity?

Total No. of Questions : 4]

SEAT No. :

P852

[Total No. of Pages : 2

[4817]-3034
T. Y. B. Sc.
ZOOLOGY
ZY-334: Environmental Biology and Toxicology
(Paper-IV) (2013 Pattern) (Semester-III)(New Course)

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) Give the names of any two heavy metals.

b) Define toxicology.

c) What is meant by endangered species?

d) Define food chain.

e) What is ozone layer?

f) What are autotrophs?

g) Write any two methods of forest conservation.

h) Define air pollution.

i) Write any two soil pollutants.

j) Define hydrosphere.

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

a) Describe the causes of wild life depletion.

b) Describe the effects of pesticides on public health.

c) Explain LC 50 of a toxicant.

P.T.O.

Q3) Write notes on <u>any two</u> of the following: **[10]**

a) Acid rain.

b) Bioindicator.

c) Renewable resources.

Q4) What is noise pollution? State adverse effects of noise pollution on human health and add a note on its control measures. **[10]**

OR

What is artificial ecosystem? Explain the structure and function of crop land ecosystem.

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Total No. of Questions : 4]

SEAT No. :

P853

[Total No. of Pages : 2

[4817]-3035
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 vector.

b) Define medical parasitology.

c) What is ectoparasite?

d) What is definitive host?

e) State any one control measure for head louse.

f) What is wandering parasite?

g) Write the name of vector of dengue.

h) Give any two symptoms of small pox.

i) Define commensalism.

j) Write the habitat of Taenia Solium.

P.T.O.

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

a) Describe the control measures of arthropod vector of malaria.

b) Explain physiological specificity in host-parasite relationship.

c) Explain parasitism with suitable example.

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

a) Control measures of Entamoeba histolytica.

b) Parasitological significance of bird flu.

c) Eradication programmes of cholera.

Q4) Describe in detail the life cycle of Ascaris lumbricoides. **[10]**

OR

Give a detail account of life cycle, pathogenicity and control measures of tick.

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Total No. of Questions : 4]

SEAT No. :

P854

[Total No. of Pages : 4

[4817]-3036
T.Y. B.Sc.
ZOOLOGY
ZY - 336(A) : General Pathology
(2013 Pattern) (Semester-III) (Paper-VI) (New Course)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Attempt the following: **[10]**

a) Define autopsy pathology.

b) What is special pathology?

c) Explain the term predisposing courses.

d) Define fatty degenaration.

e) What is strangulation?

f) What is regenaration?

g) What is calor?

h) What is metastatic calcification?

i) Describe jaundice.

j) What is megaloblastic Leukemia?

P.T.O.

Q2) Attempt Any Two of following: **[10]**

a) Explain cloudy degeneration.

b) Explain the process of repair of open wound.

c) Describe gout.

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

a) Factors affecting repair.

b) Acute lymphatic Leukemia.

c) Types of necrosis.

Q4) Describe inflammation as vascular phenomenon. **[10]**

OR

What is thrombosis? Describe in detail thrombos formation and its causes.

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Total No. of Questions : 4]

P854

[4817]-3036
T.Y. B.Sc.
ZOOLOGY
ZY - 336(B) : Cell Biology
(2013 Pattern) (Semester-III) (Paper-VI)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

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

Q1) Attempt the following: **[10]**

a) Define eukaryotic cell.

b) What is pinocytosis?

c) Give any two functions of ER.

d) Mention role of F_1 particles.

e) Define necrosis.

f) State the significance of metaphase.

g) What are the effects of free radicals on a cell?

h) Define oncogene.

i) Give significance of crossing over.

j) Mention functions of centriole.

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

a) Explain Danielli - Davson model of plasma membrane.

b) Describe structure of mitochondrion.

c) Describe ultra structure of nuclear envelope.

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

a) Apoptosis.

b) Structure and function of Golgi complex.

c) Microfilaments.

Q4) Describe prophase-I of meiotic cell division. Add a note on the significance of meiosis. **[10]**

OR

What is cancer? Describe extrinsic causes of cancer.

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Total No. of Questions :4]

SEAT No. :

P855

[Total No. of Pages :2

[4817]-3037
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 in 2/3 lines: **[10]**

a) What is optic axis.

b) Give composition of sphalerite.

c) What are aluminosilicates?

d) Define Refractive Index of mineral.

e) Name any two zeolite minerals.

f) What is pleochroism?

g) Give the composition and temperature of formation of forsterite.

h) What is quash wedge?

i) Give the silicate structure of mica.

j) What is acute bisectrix?

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

a) Structure and properties of felspar.

b) Polymorphism.

c) Hess triangular diagram.

P.T.O.

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

a) Composition, properties and uses of rhodochrocite.

b) Occurrence and uses of magnesite and dolomite.

c) Chemical composition and properties of halides.

Q4) Give silicate structure, chemical and optical properties, paragenesis and atteration products of CHLORITE mineral group or AMPHIBOLE mineral group. **[10]**

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Total No. of Questions : 4]

SEAT No. :

P856

[Total No. of Pages : 2

[4817]-3038
T.Y. B.Sc.
GEOLOGY
GL - 332 : Igneous Petrology
(2013 Pattern) (New Course) (Semester - III) (Paper - II)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer the following in 2-3 lines: **[10]**

a) Define Primary magma.

b) Define rock kindred.

c) Under which tectonic setting is the basaltic Magma generated.

d) State the names of minerals found in the rock andesite.

e) State the conditions for generation of Magma.

f) Give the mineral composition of Basalt.

g) Give the occurrence of Anorthosite rock.

h) Name the Physical Properties of Magma.

i) Name any two derivative Magmas.

j) Define the term Petrographic province.

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

a) Give the significance of rock kindreds.

b) Reaction series and its importance.

c) Describe Porphyritic and Glomeroporphyritic texture.

P.T.O.

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

a) Generation of Magma.

b) Contaminated Granites.

c) Origin and occurrence of Basalts.

Q4) Explain CIPW classification of Igneous rocks. **[10]**

OR

What is meant by crystal fractionation? Describe Fo - Fa binary system.

Total No. of Questions : 4]

SEAT No. :

P857

[Total No. of Pages : 2

[4817]-3039
T.Y. B.Sc.
GEOLOGY
GL-333: Sedimentary Petrology
(2013 Pattern) (Revised) (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) What is episenetic deposit?

b) What is significance of studying primary sedimentary structures?

c) Name two oxides which do not undergo mobility.

d) Define the term provenance.

e) Define selective abrasion.

f) Write an equation for determination of roundness.

g) Who proposed phi scale?

h) Name any two chemical parameters for sedimentary environmental analysis.

i) What do you mean by stylolites?

j) Name two heavy minerals which indicate metamorphic provenance.

Q2) Answer in short (any two): **[10]**

a) Explain the methodology for studying sedimentary rocks it field.

b) Compare the grade-scales of Udden and Wentworth.

c) Describe the physical parameters of depositional sedimentary environment.

P.T.O.

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

a) Define provenance. Describe the provenance with the help of light minerals.

b) Describe the process of selective sorting

c) Describe the significance of bedding and lamination.

Q4) Define texture. Enumerate the factors controlling the textures of sedimentary rocks. Distinguish between clastic and non-clastic textures. **[10]**

OR

Describe Dot's classification of sandstones.

Total No. of Questions : 4]

SEAT No. :

P858

[Total No. of Pages : 2

[4817]-3040
T. Y. B. Sc.
GEOLOGY
GL-334: Structural Geology
(Paper-IV) (2013 Pattern) (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 in 2/3 lines. **[10]**

a) Types of forces.

b) Slip folding.

c) Stress and strain.

d) Slaty cleavage

e) Roddings.

f) Thrust faults.

g) Slickensides

h) Ricke's principle

i) Axis of fold

j) Confining pressure.

Q2) Write notes on (any two) **[10]**

a) Elastic and plastic deformation of rocks.

b) flutey's classification of folds.

c) Concept of mechanics of rupturing.

P.T.O.

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

a) Application of strutuctural Geology

b) What are foliation. Describe the types of foliations

c) Primary and secondary lineations.

Q4) Describe the concept and mechanism of folding based on internal processes operative with in the rock **[10]**

OR

Explain the concept of mechanics of faulting. Describe faulting along tension and shear fractures. Add a note on strike-slip and gravity faults.

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Total No. of Questions :4]

SEAT No. :

P859

[Total No. of Pages :2

[4817]-3041
T.Y.B.Sc.
GEOLOGY
GL-335: Precambrian Stratigraphy of India
(2013 Pattern) (Paper - V) (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 in 2/3 lines: **[10]**

a) Define craton.

b) As per the recent geological time-scale, give the classification of proterozoic Eon into Eras.

c) Name at least one Precambrian granite found on Bastar craton and Bundelkhand craton.

d) Name any two proterozoic basins from Dharwar craton.

e) What are khondalites?

f) Name the subdivisions of Kaladgi supergroup.

g) Give economic importance of Singhbhum - Odisha craton.

h) Which geological time is represented by Purana Era of Sir T.H. Holland?

i) Name the stratigraphic units of Western Lesser Himalaya.

j) Explain the term OMTG.

P.T.O.

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

a) Sittampundi complex.

b) Precambrians of Western Tethyan Himalayas.

c) Cratons of India and associated proterozoic basins.

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

a) Tectonic Elements of Oceans.

b) Dongargarh Supergroup.

c) Litho stratigraphic succession of Cuddapah Supergroup.

Q4) Write on - **[10]**

a) Aravathi Supergroup

b) Singhbhum group

OR

Give the geographic distribution, classification with stratigraphic succession, lithology and economic importance of Chhattisgarh Supergroup.

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Total No. of Questions : 4]

SEAT No. :

P860

[Total No. of Pages : 2

[4817]-3042
T.Y. B.Sc.
GEOLOGY
GL - 336 : Applied Geology-I
(Geomorphology, Remote Sensing & Field Geology)
(2013 Pattern) (Semester-III) (Paper-VI)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Define / Answer / explain the following in 2-3 lines **[10]**

a) An outcrop.

b) Field correlation.

c) Active remote sensing system.

d) Wave theory

e) Non-selective scattering

f) Oblique aerial photograph.

g) What is data-base in GIS?

h) Hyperspectral scanners.

i) Factors controlling scale of an aerial photograph.

j) Bad land topography

P.T.O.

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

a) Discrepancies occuring in aerial photographs.

b) Cuesta and Hogback

c) Relief displacement in aerial photos

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

a) Give salient features of Cartosat-2B.

b) Discuss the photocharacters of Lava flows.

c) Explain the vector-model used in GIS?

Q4) Describe the spectral reflectance of natural resources. **[10]**

OR

Explain the importance of rock contacts. How will you Discriminate between igneous contacts, unconformities and faults?

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Total No. of Questions :4]

SEAT No. :

P861

[Total No. of Pages :3

[4817]-3043
T.Y.B.Sc.
STATISTICS (Principal)
ST-331: Distribution Theory - 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) ***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 the correct alternative in each of the following **[1each]**

a) If X ~ C (2, 4), then semi inter -quartile range of X is

i) 6 ii) –2

iii) 4 iv) 8

b) Third quartile of L(μ, λ) distribution is

i) $\mu - \frac{1}{\lambda}\log_e(2)$ ii) $\mu + \frac{1}{\lambda}\log_e(\lambda)$

iii) $\mu - \lambda \log_e(2)$ iv) $\mu - \lambda \log_e(\lambda)$

c) If X ~ LN (0, μ,σ^2) then the distribution of $\log_e$ X is

i) N(μ, σ^2) ii) N(μ, 0)

iii) N(0, σ^2) iv) N(1, σ^2)

d) Distribution function of $X_{(n)}$ is

i) $[F(x)]^n$ ii) $1 - [1 - F(x)]^n$

iii) $n \cdot f(x)\,[1-F(x)]^{n-1}$ iv) $n \cdot f(x)\,[F(x)]^{n-1}$

P.T.O.

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

a) Laplace distribution is symmetric distribution.

b) If $X \sim W(\alpha = 5, \beta = 3)$ then $Z = X^2$ is W (25, 3).

C) Define the following:

a) Beta distribution of second kind. **[1]**

b) Order statistics. **[1]**

D) Attempt each of the following **[2]**

a) If $X \sim \beta_2(m, n)$, then state the distribution of $Y = \frac{1}{X}$

b) If $(X, Y) \sim BN(3, 1, 4^2, 5^2, 0.6)$ then find $E(X/Y = -4)$

Q2) Attempt <u>any two</u> of the following: **[5 each]**

a) $X \sim \beta_2(m, n)$ then find the harmonic mean of X.

b) If $X \sim W(\alpha, \beta)$ then derive the expression for distribution function of X. Hence find the value of 1st quartile of W(2,4).

c) Derive the distribution of $X_{(n)} = \max(X_1, X_2, ---, X_n)$. Hence find the distribution of $X_{(n)}$, if $X_1, X_2, ---, X_n$ are i.i.d $\exp(\alpha)$.

Q3) Attempt <u>any two</u> of the following: **[5 each]**

a) If $X \sim C(0, 1)$ find the distribution of $\frac{1}{X}$.

b) Obtain mean and variance of $L(\mu, \lambda)$ distribution.

c) If $(X, Y) \sim BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then show that X and Y are independent iff $\rho = 0$.

Q4) Attempt <u>any one</u> of the following:

a) i) If $X \sim LN(0, 0, 3^2)$, then find $P[X^2 > 1]$. **[3]**

ii) If $(X, Y) \sim BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find the moment generating function of (X, Y). **[7]**

b) i) If $X_1 \sim G(8, 2)$, $X_2 \sim G(10,5)$ and X_1, X_2 are independent variates, then identify distributions of **[5]**

1) $\dfrac{4X_1}{4X_1 + 5X_2}$

2) $\dfrac{4X_1}{5X_2}$

3) $\dfrac{5X_2}{4X_1 + 5X_2}$

ii) If X_i, i = 1, 2, ---, n are i.i.d. $LN(0, \mu, \sigma^2)$, then find the distribution of $\prod_{i=1}^{n} X_i$ **[5]**

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Total No. of Questions : 4]

SEAT No. :

P862

[Total No. of Pages : 3

[4817]-3044
T.Y. B.Sc.
STATISTICS (Principal)
ST - 332 : Theory of Estimation
(2013 Pattern) (Theory) (Paper - II) (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) In each of the following cases, choose the correct alternative: **[1 each]**

i) Which of the following is a Fisher information function I(θ)?

A) $E\left(\frac{\partial f(x,\theta)}{\partial \theta}\right)$ B) $E\left(\frac{\partial \log f(x,\theta)}{\partial \theta}\right)$

C) $E\left(-\frac{\partial^2 f(x,\theta)}{\partial \theta^2}\right)$ D) $E\left(-\frac{\partial^2 \log f(x,\theta)}{\partial \theta^2}\right)$

ii) If $X_1, X_2, ---, X_n$ is a random sample from U(0, θ) then, the estimator of θ by the method of moments is _____.

A) $\bar{X}$ B) $2\bar{X}$

C) $\bar{X}/2$ D) $\frac{n+1}{1}X_{(n)}$

iii) Given that T is a consistent estimator of θ, then $\Phi(T)$ is also a consistent estimator of $\Phi(\theta)$ if $\Phi(.)$ is a _____ function.

A) one-to-one B) linear

C) continuous D) any

P.T.O.

iv) If $(X_{(1)}, X_{(n)})$ is a confidence interval for population median then, the confidence coefficient is _____ .

A) $1-\frac{1}{2^n}$ B) $1-\frac{1}{2^{n-1}}$

C) $\frac{1}{2^n}$ D) $1-\frac{1}{2^{n+1}}$

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

i) If T is an unbiased estimator is λ then, e^{-T} is also an unbiased estimator of $e^{-\lambda}$.

ii) The maximum likelihood estimator is a function of sufficient statistics.

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

i) Consistent estimator,

ii) Pivotal quantity.

d) Attempt each of the following: **[1 each]**

i) Explain the term 'sufficient estimator' with an illustration.

ii) State the Pitman-Koopman form of probability distributions which admit sufficient statistic.

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

a) Suppose X_1, X_2 is a random sample of size 2 from a probability distribution with the probability density function.

$$f(x,\theta) = \frac{1}{\theta}e^{-x/\theta} \quad \text{,if } x \geq 0, \theta > 0$$
$$= 0 \qquad \text{otherwise}$$

Show that $T = \frac{4\sqrt{X_1 \cdot X_2}}{\pi}$ is an unbiased estimator of θ.

b) If $X_1, X_2, ----, X_n$ is a random sample from Poisson distribution with parameter λ, then find the sufficient estimator of λ.

c) If $X_1, X_2, ----, X_n$ is a random sample from $N(\mu,\sigma^2)$, μ known then, state the pivotal quantity for interval estimation of σ^2 and hence construct the $(1-\alpha)$ 100% confidence interval for σ^2.

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

a) If X is a $N(\mu,\sigma^2)$ random variable, then find the Fisher information function $I(\mu)$.

b) If $X_1, X_2, ----, X_n$ is a random sample from $N(\mu,\sigma^2)$ then show that the sample mean $\bar{X}$ is a minimum variance bound unbiased estimator (MVBUE) of μ.

c) If $X_1, X_2, ----, X_n$ is a random sample from Laplace probability distribution with the following probability density function

$$f(x,\mu) = \frac{1}{2}e^{-|x-\mu|} \quad ,\text{if } -\infty \le x, \mu \le \infty$$
$$= 0 \quad , \quad \text{otherwise}$$

then find the maximum likelihood estimator (MLE) of μ.

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

a) i) Define the term likelihood function and give one illustration.

ii) State and prove the Cramer-Rao inequality. Also derive the condition when equality holds.

[2 + 8]

b) i) State and prove the Chebychev's inequaltiy.

ii) If $X_1, X_2, ----, X_n$ is a random sample from Bernoulli (p) distribution, verify that the sample mean $\bar{X}$ is a consistent estimator of p.

[5 + 5]

Total No. of Questions : 4]

SEAT No. :

P863

[Total No. of Pages : 3

[4817]-3045
T.Y. B.Sc.
STATISTICS (Principal)
ST-333: Sampling Methods
(2013 Pattern) (Semester-III) (Paper-III) (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 following: **[1 each]**

i) In simple random sampling without replacement for attributes variance of sample proportion is

A) $\frac{N-n}{Nn}.\frac{PQ}{N-1}$ B) $\frac{N-n}{Nn}.\frac{PQ}{n}$

C) $\frac{N-n}{Nn}.\frac{PQ}{n-1}$ D) $\frac{N-n}{Nn}.\frac{NPQ}{N-1}$

ii) In stratified random sampling with proportional allocation, the size of a sample from i^{th} stratum is

A) $n\ S_i$ B) $n\ W_i$

C) $n\ W_i\ S_i$ D) $n.\frac{W_iS_i}{\sum W_iS_i}$

iii) The ratio estimator of the population mean $\bar{Y}_N$ is

A) $R_N\bar{X}_N$ B) $R_N\bar{y}_n$

C) $R_n\bar{X}_N$ D) $R_n\bar{x}_n$

iv) In case of systematic sampling, the estimator of population total Y is given by

A) $\frac{(N-1)}{N}\bar{Y}_{sys}$ B) $\bar{Y}_{sys}$

C) $\bar{Y}^2_{sys}$ D) $N\bar{Y}_{sys}$

P.T.O.

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

i) In Simple Random Sampling With Replacement (SRSWR), the total number of possible samples of size that can be drawn from a population of size N is $\binom{N}{n}$.

ii) A list of all elements selected in the sample is called sampling frame.

c) i) State a real life situation in which it is appropriate to use the ratio method of estimation of population mean. **[1]**

ii) With an illustration, explain the term 'sampling unit'. **[1]**

d) i) Explain the term 'Non-sampling errors'. **[1]**

ii) State any two demerits of Simple Random Sampling (SRS). **[1]**

Q2) Attmept <u>any two</u> of the following: **[5 each]**

a) What is an unbiased estimator of population mean in the Simple Random Sampling Without Replacement (SRSWOR)? Derive the expression for variance of your estimator.

b) A simple random sample without replacement is drawn from population of 8502 workers. It is observed that out of 170 workers in the sample, 19 had defective eye-sight. Estimate the proportion of workers having defective eye-sight in the population. Estimate the standard error of this estimator.

c) Describe the method of determining the sample size in case of Simple Random Sampling Without Replacement (SRSWOR) so as to meet the desired margin of error and confidence coefficient when the characteristic under consideration is continuous.

Q3) Attempt <u>any two</u> of the following: **[5 each]**

a) State an unbiased estimator of population mean under stratified random sampling. Obtain an expression for its variance under proportional allocation.

b) Explain the method of systematic sampling. Show that the systematic sampling is more precise than simple random sampling if variance within systematic samples is larger than population variance as a whole.

c) Explain the regression method of estimation of population mean. Mention two practical situations where it can be used.

Q4) Attempt <u>any one</u> of the following:

a) i) In case of stratified random sampling, the cost function is of the form $c=c_o+\sum_{i=1}^{k} c_i n_i$. Determine the size of the sample to be drawn from the i^{th} stratum when the variance of the unbiased estimator of the population mean is to be minimised for fixed cost c. **[5]**

ii) State the ratio estimator of population mean. State the expression for its variance and compare it with regression estimator of population mean. **[5]**

b) i) State the requirements of a good questionnaire. **[4]**

ii) For a population with linear trend $y_i=a+bi$ for i=1,2----N, obtain the expression for variance of the estimator of population mean when **[6]**

1) Simple random sampling without replacement is used.

2) Systematic sampling is used.

Total No. of Questions : 4]

SEAT No. :

P864

[Total No. of Pages : 3

[4817]-3046
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]**

i) In RBD with 5 treatments applied on 20 experimental units, the error degrees of freedom will be -

A) 12 B) 14

C) 15 D) 19

ii) The principle of local control is not used in -

A) RBD B) LSD

C) CRD D) ANOCOVA in RBD

iii) In 2^2 factorial experiment, the expression for interaction effect AB is -

A) $\frac{1}{2}(a-1)(b+1)$

B) $\frac{1}{2}(a-1)(b-1)$

C) $\frac{1}{2}(a+1)(b-1)$

D) $\frac{1}{2}(a+1)(b+1)$

P.T.O.

iv) The main purpose of carrying out confounding in factorial experiments is to:

A) Reduce the number of blocks

B) Reduce the number of treatments

C) Increase the experimental error

D) Reduce the block size

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

i) The random error component in the model of a design of experiments is assumed to follow a normal distribution.

ii) For LSD, number of rows and columns will be same.

c) Define each of the following terms: **[1 each]**

i) Experimental unit.

ii) Treatment.

d) i) Define a linear treatment contrast. **[1]**

ii) Give the layout of one replicate in 2^3-factorial experiment where interaction effect ABC is confounded. **[1]**

Q2) Attempt Any Two of the following (5 each):

a) Describe any two basic principles of design of experiments.

b) State the model for RBD with assumptions. Obtain least squares estimators of parameters involved in this model.

c) Obtain the expression for the expectation of mean sum of squares due to error for CRD.

Q3) Attempt Any Two of the following (5 each):

a) What is ANOCOVA? Give a real life situation where it is used. Also state estimators of parameters in CRD with ANOCOVA.

b) Explain the concept of efficiency of a design. Also obtain the efficiency of LSD over corresponding CRD with the following information:

Row. S. S = 142.58, Column. S. S = 168.34

Treatment. S. S = 111.48, Error. S. S = 103.86

Total. S. S (degree of freedom) = 15

c) Explain Kruskal Wallis H test.

Q4) Attempt Any One of the following:

a) i) Explain Yate's procedure to obtain factorial effect totals in 2^3 factorial experiment. **[4]**

ii) What is meant by confounding in factorial experiments. Explain the difference between total and partial confounding. Give the ANOVA table for a 2^3 factorial experiment where interaction effect ABC is confounded in 4 replicates. **[6]**

b) i) Give analysis for testing the significance of regression coefficient and test for equality of treatment effects for ANOCOVA in RBD. **[6]**

ii) Explain the procedure for testing for equality of two specified treatment effects in LSD. **[4]**

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Total No. of Questions :4]

SEAT No. :

P865

[Total No. of Pages :3

[4817]-3047
T.Y.B.Sc.
STATISTICS (Principal)
ST-335: C Programming (Turbo C)
(2013 Pattern) (Theory) (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) ***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: **[1each]**

a) If X is an integer variable, X = 5| 2 will return a value

i) 2.5 ii) 3

iii) 2 iv) 0

b) int *x* = 10;

print f ("%d", *x*++);

output is:

i) 10 ii) 11

iii) 12 iv) 0

c) In a group of nested loops, which loop is executed the maximum number of times?

i) the outermost loop

ii) the innermost loop

iii) all loop are executed the same number of times

iv) it can not be determined

P.T.O.

d) A pointer can store

i) constant value

ii) value of another variable

iii) address of another variable

iv) real value

B) In each of the following cases, state whether the given statement is true or false: **[1each]**

a) Address of a floating point variable is not always an integer number.

b) A function can return only single value.

C) a) Explain how the string function strcmp( ) works. **[1]**

b) How do you declare a symbolic constant using # define in C language? **[1]**

c) Explain use of operator (? :) giving one example. **[1]**

d) When you pass an array as an argument to a function, what actually gets passed? **[1]**

Q2) Attempt any <u>two</u> of the following:

a) i) Draw a flow chart to obtain factorial of an integer number. **[2]**

ii) Write a C program to read in two variables with positive integer values and find Geometric mean. **[3]**

b) Explain each of the following giving syntax and one suitable example.

i) Switch

ii) for **[3+2]**

c) Write a C program to arrange x_1, x_2, ---,x_n in ascending order of magnitude. **[5]**

Q3) Attempt any two of the following:

a) Write a C program to check whether given integer m is divisible by integer n or not. **[5]**

b) Write a C program to find roots of a quadratic equation. **[5]**

c) Write a c program to combine given two strings using string function. **[5]**

Q4) Attempt any <u>one</u> of the following:

a) i) Explain the concept of pointer and its relation to one dimensional array. **[4]**

ii) Write a C program for given a 2 x 2 contingency table for chi-square test, find the value of test statistic and check whether two attributes are independent. **[6]**

b) i) Write the syntex of Scanf( ) for reading integer, float, character and string variables. **[2]**

ii) Explain use of size of( ) operator giving one example. **[1]**

iii) Explain the concepts calling a function by reference and by value giving one example each. **[4]**

iv) Write a C program to find factorial of an integer number using recursive function. **[3]**

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Total No. of Questions :4]

SEAT No. :

P866

[Total No. of Pages :3

[4817]-3048
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: **[1each]**

a) Sum of residuals weighted by the corresponding fitted value is always _____.

i) Zero ii) Positive

iii) Negative iv) None of these

b) Standard error of slope (β_1) in linear regression model is given by _____.

i) $\sqrt{\frac{MS_{Res}}{S_{yy}}}$ ii) $\sqrt{\frac{MS_{Res}}{S_{xy}}}$

iii) $\sqrt{\frac{MS_{Res}}{S_{xx}}}$ iv) $\sqrt{\frac{MS_{Res}}{\bar{x}^2}}$

c) If σ^2 is proportional to E(Y) then the suitable variance stabilizing transformation is _____.

i) Arcsin ii) Reciprocal square root

iii) Reciprocal iv) Square root

d) In a multiple regression analysis involving six independent variables, the total variation in y is 900 and SSR = 600. Then SSE is _____.

i) 300 ii) 1.50

iii) 0.67 iv) 0.50

P.T.O.

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

a) $H=X(X'X)^{-1}Y'X$ is called as Hat matrix.

b) In logistic regression $\frac{\pi}{1-\pi}$ is called as logit transformation.

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

a) Principle of Parsimony

b) Outlier

D) Answer the following in one sentence: **[1each]**

a) State second order regression model involving two variables.

b) State the usefulness of normal probability plot.

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

a) State the formulae for standardized residual and studentized residual for linear regression model. Also state the difference between them.

b) Discuss in brief AIC and BIC.

c) Discuss in brief coefficient of multiple determination as a criterion for evaluating subset regression model in variable selection method.

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

a) Write a note mentioning the interpretation of first three plots produced by lm command in R software.

b) In multiple regression model state $100(1-\alpha)$ percent confidence interval for regression coefficient β_j. Also explain the notations used in it.

c) In logistic regression discuss in brief model deviance.

Q4) Attempt any ONE of the following:

a) i) Explain the procedure to fit the regression model

$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \in$. **[5]**

ii) Given the five data points on (y, x_1, x_2) as follows **[5]**

y	10	17	9	16	26
x_1	2	3	7	8	6
x_2	1	2	3	4	4

and $(X'X)^{-1} = \begin{bmatrix} 1.36 & -0.04 & -0.35 \\ -0.04 & 0.20 & -0.37 \\ -0.35 & -0.37 & 0.80 \end{bmatrix}$ with usual notation.

Fit the regression model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \in$.

b) i) Write a short note on method of weighted least squares for fitting linear regression models. **[5]**

ii) Explain the concept of multiple logistic regression. **[5]**

EEE

Total No. of Questions :4]

SEAT No. :

P867

[Total No. of Pages :2

[4817]-3049
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) What is determinism?

b) Name two contemporary approaches to the study of Human Geography.

c) What are the major divisions of human races?

d) Which continent is known as the cradle of Human beings and why?

e) Name one theory of migration.

f) Define birth rate.

g) Give two reasons why river valleys have high densities of population.

h) Differentiate between in-migration and out-migration.

i) Which two countries contribute to most of the world's population?

j) Name the major cultural realms of the world.

k) What do you understand by cranial index?

l) What are the advantages of using HDI as an indicator of human development?

m) Give one example of cultural diffusion.

P.T.O.

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

a) Scope of Human Geography.

b) Consequences of migration.

c) Diffusion wave.

d) Environmental refugees.

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

a) Throw light on the population policy of China.

b) Describe Griffith Taylor's 'Migration zone Theory of Racial Evolution'.

c) Discuss the reasons of high HDI in Scandinaira.

d) Discuss the reasons of inter-state migration in India.

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

a) Describe the evolution of man with tune.

b) Describe the various cultural realms of the world in today's era.

EEE

Total No. of Questions : 4]

SEAT No. :

P868

[Total No. of Pages : 2

[4817]-3050
T.Y. B.Sc.
GEOGRAPHY
Gg - 332 : Geography of travel and Tourism (Part-I)
(2013 Pattern) (Semester-III) (Paper - III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

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

a) Define Tourism.

b) what do you mean by absolute location of the Tourist place.

c) Define recreation.

d) what do you mean by rural Tourism?

e) Name any two coastal beaches located in Maharashtra.

f) State any two planned cities in India.

g) In which states are Ujjain and Puri located.

h) Name any two historical factors that attracts Tourists.

i) State any two types of Tourist Activities.

j) What is the impact of Tourism on national parks?

k) Define Motel.

l) what do you mean by 'inn'?

m) State any two hot springs in India.

P.T.O.

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

a) Elements of Tourism.

b) Natural features that attract Tourism.

c) Effects of Tourism on historical places.

d) Characteristics of Tourist.

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

a) Explain the role of Geography in Tourism

b) Describe the effect of Tourism on relief features.

c) Discuss the relationship between Language and Tourism .

d) Explain Tourism as a basic need of Man .

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

a) Define tourist. Explain Socio-economic characteristics of Tourist

b) Describe various locational factors that affect Tourism.

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Total No. of Questions : 4]

SEAT No. :

P869

[Total No. of Pages : 2

[4817]-3051
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 <u>two or three</u> sentences (any ten): **[10]**

a) Define GIS.

b) What is meant by aerial photography?

c) Who coined the term GIS?

d) Name any two components of GIS?

e) Define query.

f) Mention any two data sources in GIS.

g) Define DBMS (Data base management system).

h) What is non-spatial data?

i) What is vector data?

j) Write any two characteristics of raster data.

k) What do you understand by data model?

l) What is multiple query?

m) Mention any four application areas of GIS.

P.T.O.

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

a) Aerial photographs as data source in GIS.

b) Manipulation as a GIS task.

c) Characteristics of vector data model.

d) Distinguish between spatial and non spatial data.

Q3) Answer the following question in 100 words (any two). **[10]**

a) Explain the scope and importance of GIS.

b) What is query qnalysis?

c) Explain vector data analysis.

d) Discuss the role of GIS in water resource management.

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

a) Explain how remote sensing and GIS are helpful in urban and regional planning.

b) Give the detailed account of data models.

Total No. of Questions : 4]

SEAT No. :

P870

[Total No. of Pages : 2

[4817]-3052
T.Y. B.Sc.
GEOGRAPHY
Gg - 334 : Geography of India (Part-I)
(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 sketches and diagrams 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 'Barren island' famous for?

b) State any two climatological impacts of the Himalayas on the Indian climate.

c) How many states does the Godavari river basin cover?

d) Name any two areas from the country which receive very heavy rainfall.

e) State the regions of the Peninsular India which are under the lateritic soil.

f) What is 'Retreating of Monsoon'?

g) State any two factors that are responsible for soil erosion in forested areas of India.

h) Mention any two popular measures used in soil conservation.

i) What is 'Bhangar'?

j) What is 'Black cotton soil'?

k) Mention any two tree types found in the Tropical thorn forest.

l) Name any two states in India with the highest area under forest.

m) State any two measures commonly practiced in India for forest conservation.

P.T.O.

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

a) Historical background of India.

b) Coastal lowlands of India.

c) West-flowing rivers of India.

d) Post-Monsoon weather.

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

a) Discuss the strategic importance of the Indian Ocean.

b) Describe the drainage system of the Indus river basin.

c) State measures of soil conservation in India.

d) Comment on the deciduous forest in India.

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

a) Describe the Physiography of the Northern Mountains and the North Indian Plains. State the importance of these regions.

b) Explain the characteristic features of the Indian climate.

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Total No. of Questions : 4]

SEAT No. :

P871

[Total No. of Pages : 2

[4817]-3053
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) ***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) Define Pedology.

b) State the components of soil.

c) State the Jenny's equation of soil formation.

d) Mention various types of weathering.

e) What do you understand by the process of chelation?

f) Mention any two primary minerals found in the tropics.

g) Mention the methods to determine soil texture.

h) Draw neat sketch of soil profile and lable the horizons.

i) What is 'Gleization' process?

j) State any two clay minerals.

k) What do you understand by the process of laterization?

l) What is Redox potential ?

m) What is wilting point and field capacity?

P.T.O.

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

a) Process of leaching.

b) Soil temperature.

c) Water holding capacity of soil.

d) Types of soil colloids.

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

a) How do you distinguish between zonal and azonal soils.

b) Discuss the significance of porosity in the soil.

c) Describe various types of soil structure.

d) Discuss the process of podzolisation.

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

a) Give an account of 'classification of soils'.

b) Discuss the history of development of soil science.

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Total No. of Questions : 4]

SEAT No. :

P872

[Total No. of Pages : 2

[4817]-3054
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 to three sentences. (Any Ten) **[10]**

a) Define Electromagnetic radiation (EMR).

b) What is thermal remote sensing?

c) Define scattering.

d) What is meant by wave frequency?

e) Define wavelength.

f) What do you understand by vertical aerial photography?

g) What are fiducial marks?

h) What is a pseudoscopic image?

i) What is a forward overlap?

j) Give the spectral range for visible spectrum.

k) What is meant by FCC?.

l) Which projection is used for aerial photographs.

m) What information is given on annotation strip of an aerial photograph?

P.T.O.

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

a) Velocity and wavelength of electromagnetic waves.

b) IR scanners.

c) Stereograms.

d) Multispectral photographs.

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

a) Describe in brief oblique and terrestrial photography

b) Explain the use and functioning of mirror stereoscope.

c) Explain the visible and thermal spectral regions of the electromagnetic spectrum.

d) Give a brief account of recent developments in remote sensing.

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

a) What is remote sensing? Give an account of various applications of remote sensing.

b) Discuss in detail the visual interpretation key of an aerial photograph.

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Total No. of Questions :4]

SEAT No. :

P873

[Total No. of Pages :2

[4817]-3055
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:

A) Match the following: **[5]**

A		B	
a)	Tuberculosis	i)	Chloramphenicol
b)	Gonorrhea	ii)	Ethambutol
c)	Shigellosis	iii)	Dapsone
d)	Leprosy	iv)	Self limiting
e)	Typhoid	v)	Penicillin
		vi)	Antitoxin

B) State —— True or False: **[2]**

a) Ciliary escalators are present in small intestine.

b) Blood supply to liver is through canaliculi rather then capillaries.

C) Define: **[3]**

a) Source of infection

b) Epiclemiology

c) Chronic carrier

P.T.O.

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

a) Draw and label Kidney.

b) Cultural characters of Vibrio cholerae.

c) Weil Felix test.

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

a) Post streptococcal diseases.

b) E.coli diarrhea.

c) Epidemiology and control of Acinetobacter infections.

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

a) Discuss various measures for prevention and control of infections diseases.

b) Discuss cultural characters, pathogenesis and epidemiology of Bacillus anthracis.

EEE

Total No. of Questions : 4]

SEAT No. :

P874

[Total No. of Pages : 2

[4817]-3056
T.Y. B.Sc.
MICROBIOLOGY
MB - 332 : Genetics and 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.***

Q1) a) Fill in the blanks : **[5]**

i) Two genes do not assort independantly because they are located on the same _____.

ii) The junction between the newly separated template strand and the unreplicated duplex DNA is known as _____.

iii) _____ catalysis the separation of the two strands of duplex DNA.

iv) To stabilise the separated strands _____ proteins rapidly bind to the separated strands.

v) _____ Proteins induce termination of Transcription

b) State whether the following statements are true or false : **[4]**

i) Western blotting is a technic used for separation of proteins.

ii) Topo isomerases create supercoils in DNA.

iii) RNA is translated from 3'–5' direction.

iv) Crossing over occurs during first meiotic division of chromosome.

c) Define:- Replicon. **[1]**

P.T.O.

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

a) Synthesis of aminoacyl tRNA.

b) Termination of DNA replication.

c) Potential uses and hazards of recombinant DNA technology.

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

a) Describe the methodology & uses of agarose gel electrophoresis

b) With a suitable example explain the working of an inducible operon.

c) Draw a neat labelled diagram of tRNA .

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

a) What is Tetrad analysis? With a suitable example explain the use of tetrad analysis in.

   i) Centromere mapping and

   ii) Finding the distance between the genes

b) Describe Initiation, elongation and Termination of RNA synthesis in Prokaryotes.

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Total No. of Questions : 4]

SEAT No. :

P875

[Total No. of Pages : 2

[4817]-3057
T.Y. B.Sc.
MICROBIOLOGY
MB-333: Enzymology-I
(2013 Pattern) (Semester-III) (Paper-III) (New Course)

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: **[10]**

a) Enlist any 2 anion exchangers.

b) Enlist any 2 commonly occuring amino acids in catalytic site.

c) Define: i) Isoelectric pH

ii) Specific activity of an enzyme.

d) The coenzyme form of Thiamin is--------

e) Match the following.

1)	Dihydrolipoyl dehydrogenase	i)	Reversible inhibition
2)	TEMED	ii)	Multienzyme complex
3)	Uncompetitive inhibitor	iii)	Initiator for polymerization of polyacrylamide gel
4)	Trypsinogen	iv)	Salting out
5)	$(NH_4)_2SO_4$	v)	Zymogen
		vi)	Monovalent salt

P.T.O.

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

a) Discuss how effect of temperature can be used for enzyme characterization.

b) Explain the concept of multienzyme complexe with the help of an example.

c) Describe various physical methods of cell fractionation.

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

a) Define the equation for line-weaver and Burke plot.

b) Explain the entrapment method of immobilization technique.

c) Explain occurrence, structure and biochemical role of Riboflavin.

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

a) Explain, principle, working and applications of Molecular Exclusion chromatography.

b) Explain with suitable example the covalent modification of enzyme regulation.

Total No. of Questions : 4]

SEAT No. :

P876

[Total No. of Pages : 2

[4817]-3058
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) Attempt the following:

A) Match the following and rewrite: **[5]**

A column		B column	
a)	Anti tetanus serum	i)	Placental transfer
b)	Memory cells	ii)	Primary lymphoid organ
c)	Thymus	iii)	Passive immunity
d)	IgM	iv)	Super antigen
e)	TSST	v)	Macroglobulin
		vi)	Secondary immune response

B) State True or False: **[2]**

a) Acquired immunity is produced in absence of pathogen.

b) Antigen alone can activate complement system.

C) Enlist, atleast two of each: **[3]**

a) Particulate antigen.

b) Types of graft.

c) Gene segments of variable domain.

P.T.O.

Q2) Describe Any Two: **[10]**

a) First line of defense.

b) Lymphatic system.

c) Adjuvants.

Q3) Attempt Any Two: **[10]**

a) Compare in tabular form - antigen processing pathways.

b) Draw neat, labelled diagram of structure of IgG.

c) Explain: formation of blood cells.

Q4) Attempt Any One: **[10]**

a) Describe inflammation in detail.

b) Describe cells involved, mechanism of cytotoxicity in CMI and give its significance.

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Total No. of Questions :4]

SEAT No. :

P877

[Total No. of Pages :2

[4817]-3059
T.Y.B.Sc.
MICROBIOLOGY
MB-335: Fermentation Technology - I
(2013 Pattern) (Paper -V) (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) Do as directed

A) Fill in the Blanks: **[5]**

a) Mutants with _____ permeability shows improved yield.

b) Cell disruption in fermentation industry is done using _____.

c) Scale up means _____.

d) Heat sensitive ingredients of media are sterilized by _____.

e) Auxotrophs are isolated by _____ technique.

B) Match the following: **[5]**

I		II	
a)	Shelf life	i)	Carcinogen
b)	Bioassay	ii)	Media optimization
c)	Ames test	iii)	Quantification of product
d)	Plackett Burman	iv)	Agar diffusion
e)	Specific gravity	v)	sterility test
		vi)	Expiry date

P.T.O.

Q2) Attempt <u>any two</u> of the following: **[10]**

a) Describe RSM for media optimization.

b) Derive Del factor equation. Give its importance.

c) Comment on mechanical separation and visual identification of fermentation products.

Q3) Attempt <u>any two</u> of the following: **[10]**

a) Describe the method for isolation of analogue resistant mutants.

b) Give outline of levels of fermentation scale up.

c) Describe in brief IPR.

Q4) Attempt <u>any one</u> of the following: **[10]**

a) What is meant by quality assurance of fermentation product? Describe in detail sterility and toxicity testing.

b) Explain the principle and methods of counter-current and concurrent liquid-liquid extraction used in fermentation product recovery with suitable example.

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Total No. of Questions : 4]

SEAT No. :

P878

[Total No. of Pages : 2

[4817]-3060
T. Y. B. Sc.
MICROBIOLOGY
MB - 336: Food and Dairy Microbiology
(Paper - VI) (2013 Pattern) (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) ***Draw neat labelled diagrams wherever necessary.***

Q1) Attempt the following: **[5]**

a) Match the following:

I		II	
i)	Stormy Fermentation	1)	Pseudomonas Synxantha
ii)	Red Milk	2)	Alcaligens Viscolactics
iii)	Yellow Milk	3)	Clostridium perfrengens
iv)	Mastitis	4)	Serratia marscencens
v)	Ropiness	5)	Streptococcus agalactiae
		6)	Brucella abortus

b) Fill in the blank: **[1]**

i) The skimmed milk has _____ % fat.

c) Define: **[2]**

i) Semiperishable Food.

ii) Blanching.

d) Write role of NDRI. **[2]**

P.T.O.

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

a) Explain Brucella ring test.

b) Describe spoilage of Bread, Fruits and Vegetables.

c) Explain physical and chemical properties of food affecting microbial growth.

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

a) Food sanitation.

b) Phosphatase Test.

c) Aflatoxins.

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

a) Define Pasteurization. Explain LTH and HTST methods of pasteurization.

b) Describe food poisoning by Clostridium botulinum.

Total No. of Questions :4]

SEAT No. :

P879

[Total No. of Pages :2

[4817]-3061
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 right side indicate full marks.***
4) ***Use of calculator is allowed.***

Q1) Attempt all of the following:

a) What are the fixed function IC's? **[1]**

b) Write the meaning of non blocking assignment in verilog. **[1]**

c) What do you mean by compatible states. **[1]**

d) State the difference between vector and Array data types in verilog. **[1]**

e) List four advantages of PLD. **[2]**

f) What is state assignment technique? Write its importance. **[2]**

g) State the functions looping statements forever and repeat in verilog. **[2]**

h) Write four important system tasks used in verilog. **[2]**

Q2) Attempt any Two of the following:

a) Explain mealy and moore sequential machine models, with the help of block diagram. **[4]**

b) Describe with examples the number specification: Sized numbers, unsized numbers and negative numbers in verilog. **[4]**

c) Explain and draw the block diagram of PLA. **[4]**

P.T.O.

Q3) Attempt any Two of the following:

a) Explain various steps involved in Equivalence classes state reduction technique with suitable state table. **[4]**

b) Draw the block diagram of CPLD. compare CPLD and FPGA with respect to process technology, gate capacity, cost and number of I/O's. **[4]**

c) List structured procedure statements in verilog and describe them. **[4]**

Q4) Attempt any two of the following:

a) Draw general flowchart of design for logic circuits and explain it in detail. **[6]**

b) i) State and explain conditional statements with examples in verilog. **[3]**

ii) Describe continuous assignment statement in verilog with suitable program. **[3]**

c) What is vending machine? List any four types of vending machine. Draw and explain block-diagram of vending machine. **[6]**

OR

Attempt all of the of following:

a) Output functions of a combinational logic circuit are given as follows: **[4]**

$$y_1 = \overline{x}_1 \cdot x_2 + x_1\overline{x}_3 + \overline{x}_1 x_2 \overline{x}_3$$

$$y_2 = x_1\overline{x}_2 x_3 + \overline{x}_1 x_2 x_3 + x_2\overline{x}_3$$

Implement these functions using PAL. Specify its size.

b) Obtain compatible states and maximal compatibles using merger graph for the following incompletely specified state table. **[4]**

Present State	Next State $x=0$	Next State $x=1$	Output $x=0$	Output $x=1$
a	c	b	0	–
b	c	b	0	1
c	d	*a*	–	1
d	*a*	e	0	–
e	e	*a*	–	0

c) Write the program in verilog for 4 to 1 multiplexer, using gate level modeling. **[4]**

EEE

Total No. of Questions : 4]

SEAT No. :

P880

[Total No. of Pages : 2

[4817]-3062
T.Y. B.Sc.
ELECTRONICS-SCIENCE
EL - 332 : Microcontrollers
(2013 Pattern) (Paper - II) (Semester - III)

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 right indicate full marks.***
4) ***Use of calculator is allowed.***

Q1) Attempt all the following :

a) What is size of internal ROM of Microcontroller 8051? **[1]**

b) What is purpose of program counter in 8051 μc? **[1]**

c) Identify the addressing mode of instruction MOV A,Ro. **[1]**

d) Write down instruction which copies data from CPU to internal RAM of 8051 μc. **[1]**

e) What do you mean by Simulator? **[2]**

f) List any four SFR's used in 8051 μc. **[2]**

g) If A=97H, what is content of register A after SWAP A operation. **[2]**

h) What do you mean by 40 × 2 LCD? **[2]**

Q2) Attempt any two of the following:

a) Explain in brief internal RAM structure of 8051 μc. **[4]**

b) Interface 8 K byte of RAM to 8051 μc. Give its memory map. **[4]**

c) Write down the difference between MOVA, #00H and MOV A, 00H. **[4]**

P.T.O.

Q3) Attempt any <u>two</u> of the following:

a) With suitable example, explain various addressing modes of 8051 μc. **[4]**

b) Explain PSW register of 8051 μc. in brief. **[4]**

c) Draw LCD interface to 8051 μc, and explain it in brief . **[4]**

Q4) Attempt any <u>two</u> of the following:

a) Draw internal block diagram of 8051 μc and write its features. **[6]**

b) Interface 4 × 4 matrix key board to 8051 μc. Explain its action with the help of flow chart. **[6]**

c) explain timer / counter unit of 8051 μc. **[6]**

OR

Attempt <u>all</u> the following:

a) Explain stack & stack operations with suitable example. **[4]**

b) Write AL program to generate time delay of 500 μs using timer o, model. Given XTAL = 12 MHz. **[4]**

c) Write a note on assembler and compiler. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P881

[Total No. of Pages : 2

[4817]-3063
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL-333: Analog Circuit Design and Applications of Linear ICS
(2013 Pattern) (Semester-III) (Paper-III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) What do you mean by interference noise? **[1]**

b) List the applications of peak-detector. **[1]**

c) Write the IC number for adjustable negative voltage regulator. **[1]**

d) Write the expression for cut off frequency of second order low pass active filter. **[1]**

e) Which are the important blocks of phase lock loop. **[2]**

f) Draw the circuit diagram of monostable multivibrator using operational amplifier. **[2]**

g) If RA=2.2 kΩ, RB=3.9 kΩ. Calculate percentage duty cycle of astable multivibrator using timer IC 555. **[2]**

h) Write imporatant features of IC 8038. **[2]**

Q2) Attempt any two of the following:

a) Draw the circuit diagram of practical differentiator using operational amplifier and write design steps for it. **[4]**

b) Write short note on "voltage comparator using IC 311". **[4]**

c) Draw the block diagram and explain working of frequency multiplier using PLL. **[4]**

P.T.O.

Q3) Attempt <u>any two</u> of the following:

a) What do you mean by precision rectifier? Draw the circuit diagram for half wave precision rectifier and explain its working. **[4]**

b) Draw circuit diagram of ON-OFF controller using comparator and explain its working. **[4]**

c) Write short note on "Fixed 3 terminal voltage Regulators". **[4]**

Q4) Attempt any two of the following:

a) Draw and explain practical sample and hold circuit. Define acquisition and aperture time of sample and hold circuit. **[6]**

b) Draw and explain circuit diagram of function generator using IC 566. Write the expression for output frequency. **[6]**

c) Draw and explain circuit diagrams to design low and high voltage regulators using IC 723. **[6]**

OR

Q4) Attempt all of the following:

a) Calculate output frequency of function generator using IC 8038 if c=0.1 μf R=9.1 kΩ. Assume 50% duty cycle. **[4]**

b) Design an adjustable voltage regulator using IC LM 317 for the output Vo=6 to 10 volts. **[4]**

c) For monostable multivibrator using IC 555, determine the time for quasi stable state if R_2=9k, R_1=1k and R=4.7 k C=0.22 μf. **[4]**

Total No. of Questions : 4]

SEAT No. :

P882

[Total No. of Pages : 2

[4817]-3064
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL - 334 : Principles of Semiconductor Devices
(2013 Pattern) (Semester-III) (Paper-IV)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Attempt All of the following:

a) Define lattice. **[1]**

b) What is reverse bias of diode? **[1]**

c) Draw symbol of JFET. **[1]**

d) Define co-ordination number. **[1]**

e) What do you mean by crystalline solids? **[2]**

f) List different regions in BJT characteristics. **[2]**

g) What do you mean by Enhancement mode of MOSFET? **[2]**

h) What is Ebers-Moll equations? **[2]**

Q2) Attempt Any Two of the following:

a) Explain molecular beam epitaxy. **[4]**

b) What is Bohr model? Write Bohrs postulates. **[4]**

c) What is contact potential? Explain in detail. **[4]**

P.T.O.

Q3) Attempt Any Two of the following:

a) Explain working of NPN transistor. **[4]**

b) What is ohmic contact? Explain in detail. **[4]**

c) Explain pinch-off and saturation in case of JFET. **[4]**

Q4) Attempt Any Two of the following:

a) Explain base resistance and emitter crowding in transistor. **[6]**

b) With proper diagram explain simple cubic (sc), body centered cubic (bcc) and face centered cubic (fcc) structures in detail. **[6]**

c) Explain construction and working of MOSFET. **[6]**

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Total No. of Questions :4]

SEAT No. :

P883

[Total No. of Pages :2

[4817]-3065
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL-335: 'C' Programming
(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 is allowed.***

Q1) Answer all of the following:

a) What are the different ways to exit from a loop? **[1]**

b) What is strcat( ) function in 'C'? **[1]**

c) What do you mean by function in 'C' program? **[1]**

d) State various data types in 'C' language. **[1]**

e) How null character helps in string manipulations? **[2]**

f) State the rules for variable name. **[2]**

g) Explain the function getw( ) and putw( ). **[2]**

h) Explain and give the general format of f print f function in 'C'. **[2]**

Q2) Answer any two of the following:

a) Compare 'while and 'do-while' loop. give one example of each. **[4]**

b) Write algorithm to arrange 20 elements in ascending order, using selection sort algorithm. **[4]**

c) How will you initialize one dimensional and two dimensional array? **[4]**

P.T.O.

Q3) Answer any <u>two</u> of the following:

a) Write a program for first 10 fibonacci numbers using one dimensional array.

1, 1, 2, 3, 5, 8 ..... **[4]**

b) What is the difference between print f and f print f in 'C'? Give one example of each. **[4]**

c) Explain function with argument and no return values with one example. **[4]**

Q4) Answer any <u>two</u> of the following:

a) Write a program to count and print the number of negative and positive numbers in a given set of numbers. Use scanf to read the numbers. Reading should be terminated when the value O is entered. **[6]**

b) Write algorithm using quick sort to arrange 10 numbers in ascending order. **[6]**

c) What is an operator? Describe different types of operators used in 'C' language. **[6]**

OR

Answer all of the following:

a) Explain Bitwise operator in 'C' with one example. **[4]**

b) Write an algorithm to accept n number from user and find number m from n numbers, if it is available then display number m is found. **[4]**

c) How to initialize pointer variable? Give example. **[4]**

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Total No. of Questions :4]

SEAT No. :

P884

[Total No. of Pages :4

[4817]-3066
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL-336 (A): Fiber Optic Communication (Optional)
(2013 Pattern) (Paper - VI) (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 different types of data links. **[1]**

b) Why particular spectrum bandwidth of source are used in optical fiber communication? **[1]**

c) State types of optical detectors. **[1]**

d) What is optical fiber amplifiers? **[1]**

e) Classify optical fibers based on index profile. **[2]**

f) Define term quantum efficiency and linearity of LED. **[2]**

g) What is fiber splice? List different splicing techniques. **[2]**

h) 'Repeaters are essential in long haul fiber optic communication system' Comment. **[2]**

Q2) Attempt any two of the following:

a) Explain acceptance angle and obtain expression for numerical aperature NA of optical fiber based on ray theory analysis. **[4]**

b) Describe operating principle of LASER. Explain action of Lasing in p-n junction laser diode what is important feature of spectral output characteristic compared with LED? **[4]**

c) Compare structure, performance parameter of multimode glass-glass, glass-plastic and plastic fibers. Draw schematic diagram. **[4]**

P.T.O.

Q3) Attempt any two of the following:

a) What is attenuation in optical fiber? Explain technique used for measurement of total attenuation in optical fiber. **[4]**

b) Describe, with aid of suitable diagrams, three common techniques used for the mechanical splicing of optical fibers. **[4]**

c) Draw block diagram of optical fiber transmitter. Explain limitations of sources in brief. **[4]**

Q4) Attempt any two of the following:

a) Explain block schematic of optical link in a point-to-point communication based on power budget considerations. Write necessary design equation. **[6]**

b) Discuss Fiber optic voice link in details. **[6]**

c) What is dispersion of optical signal transmitted through optical fiber? Explain intermodal dispersion. **[6]**

OR

Q4) Attempt all the following:

a) A multimode graded index fiber shows total pulse broadening of 0.1 μs over a distance of 20 km. Estimate. **[4]**

i) the maximum profile bandwidth on link.

ii) the pulse dispersion per unit length.

b) A silica optical fiber with a core refractive index 1.48 and a cladding refractive index of 1.46 determine **[4]**

i) critical angle at the core - cladding interface

ii) the NA of fiber and

iii) the acceptance angle in air for the fiber.

c) A multimode fiber with a core refractive index of 1.49, a relative refractive index difference of 1% and operating at o.85 μm. Estimate the critical radius of curvature at which large bending loss occurs. **[4]**

EEE

Total No. of Questions :4]

P884

[4817]-3066
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL-336 (B): Electronic Product Design and Entrepreneurship (Optional)
(2013 Pattern) (Paper - VI) (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) What is system failure? **[1]**

b) Define the term sole proprietorship. **[1]**

c) What is commodity? **[1]**

d) State any two non-government sources of finance. **[1]**

e) Explain the concept on joint stock company. **[2]**

f) Explain quality assurance testing of manufactured product. **[2]**

g) Explain the term pricing. **[2]**

h) Explain marketing mix in short. **[2]**

Q2) Attempt any two of the following:

a) Explain break even point analysis. **[4]**

b) Explain the designing steps carried while designing DAS for manufacturing the product. **[4]**

c) Distinguish between private limited and public limited company. **[4]**

Q3) Attempt any <u>two</u> of the following:

a) Write short notes cash flow and fund flow. **[4]**

b) What is meant by marketing strategy? Explain in detail. **[4]**

c) Calculate MTBF and reliability for 10,000 hours, if the total FR is 2.5×10^{-6} per hour. **[4]**

Q4) Attempt any <u>two</u> of the following:

a) Explain the concept of four wire resistive touch screen technology with neat diagram. **[6]**

b) Explain the process of entrepreneurship development. **[6]**

c) What are decision support systems? Explain in detail. **[6]**

EEE

Total No. of Questions : 4]

SEAT No. :

P1271

[Total No. of Pages : 2

[4817]-3067
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 301 : India's Foreign and Defence Policy
(Semester-III) (2013 Pattern) (Theory) (Paper - I)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

Q1) Answer in 2 to 4 Sentences each: **[16]**

a) Define containment policy.

b) Define Threat Perception.

c) Define national security.

d) Define environmental security.

e) What do you mean by world order?

f) Define perspective planning.

g) What do you mean by human security?

h) Define nuclear doctrine.

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

a) Analyses characteristics of India's defence policy.

b) Discuss characteristics of India's foreign policy.

c) Explain objectives of India's Indian Ocean policy.

P.T.O.

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

a) Determinant factors of India's defence policy.

b) India's role in world politics.

c) Evolution of India's defence policy.

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

a) Analyses India's foreign policy since - 1947.

b) Discuss India's security consideration in nuclear age.

Total No. of Questions : 4]

SEAT No. :

P1272

[Total No. of Pages : 2

[4817]-3068
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 302 : Defence Economics
(Semester-III) (2013 Pattern) (Paper - II)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

Q1) Answer in 2 to 4 Sentences each: **[16]**

a) Define war potential.

b) Define industrial power.

c) What do you mean by war finance?

d) Define defence budgeting.

e) Define national power.

f) Write full form of DPSU.

g) What do you mean by economic mobilization of national defence?

h) Write any two foreign sources of war finance.

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

a) Explain demerits of war.

b) Describe elements of war potential.

c) Explain domestic sources of war finance.

P.T.O.

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

a) Defence planning in India.

b) Defence vs Development.

c) Concept of public good.

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 national economy.

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Total No. of Questions : 4]

SEAT No. :

P1273

[Total No. of Pages : 2

[4817]-3069
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 303 : Research Methodology
(Semester-III) (2013 Pattern) (Paper - III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

Q1) Answer in 2 to 4 Sentences each: **[16]**

a) Define advance research.

b) What is meant by questionnaire method?

c) Define secondary data.

d) Write the importance of scientific methods in research.

e) Write about the relations of research to development.

f) What do you understand by Action Research?

g) What is applied research?

h) What should be the basic qualifications of researcher?

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

a) Write the role of research in important areas.

b) Write about the significance of research.

c) What are the sources of stating a problem?

P.T.O.

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

a) Hypothesis.

b) Research Design.

c) Need of research in disaster management.

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

a) Discuss the style and structure of a research report.

b) Explain about the qualities of interviewer.

Total No. of Questions : 4]

SEAT No. :

P1274

[Total No. of Pages : 2

[4817]-3070
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 304 : Science, Technology and National Security
(Semester-III) (2013 Pattern) (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 Science.

b) Define Information Technology.

c) Define National defence and Security.

d) What is the difference between Subsonic and Supersonic aircrafts?

e) What is Ferrous Metal?

f) Define Stealth Technology.

g) What is meant by Aeronautics?

h) What is meant by First Grade Military Technology?

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

a) Write about the Revolution in Military Affairs.

b) Write the concept of Small arms Technology.

c) How advance science substantiate the national defence and security?

P.T.O.

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

a) Role of Private Sector in Defence Production.

b) India's achievements in Missile Technology.

c) Civil and Military application of Rocket Science.

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

a) Explain about the strides in military technological revolution.

b) Explain about the economic impact of transfer of military technologies.

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Total No. of Questions : 4]

SEAT No. :

P1275

[Total No. of Pages : 2

[4817]-3071
T. Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 305 : Defence Planning and Management in India
(Semester-III) (2013 Pattern) (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) How AWACS manage the surveillance of intercepting aircrafts?

b) What is Vertical Proliferation of Nuclear Weapons?

c) What is meant by grade of technology?

d) Define technology absorption.

e) Introduce LCA and its technology management.

f) What is "Obsolescence Factor"?

g) Write the role of Military Leadership.

h) What is meant by Management of Technological Modifications?

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) Introduce management and its concepts.

b) Explain the status of defence management in India.

c) Write the significance of defence management.

P.T.O.

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

a) Salient Features of Management.

b) Working Principles of defence management.

c) Nature of defence management.

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

a) Explain the application of function of defence management.

b) How defence planning and management can be clubbed together for better output? Explain.

Total No. of Questions : 4]

SEAT No. :

P1276

[Total No. of Pages : 4

[4817]-3072
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 306 A : Military and Media (Optional)
(Semester-III) (2013 Pattern) (Paper - VI)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each: **[16]**

a) What is NEWS?

b) What is meant by Column?

c) What is meant by Bulletin?

d) Define National Security.

e) Write about the importance of Military to Society.

f) What is meant by AFSPA?

g) Write the responsibility of Defence PRO.

h) What is significance of Press - Conference?

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) As a journalist, how will you make sure secrecy in defence reporting?

b) You are interviewing Army Chief, ask ten questions on its preparedness.

c) Write about the current trends in Indian Defence Journalism.

P.T.O.

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

a) Military Science.

b) What christened Dr. APJ Kalam as "Missile Man of India".

c) Fair and Balanced Reporting.

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

a) Explain the problems and prospects in defence journalism.

b) As a journalist, how will you encourage a debate on the subject 'National Defence and Security'?

Total No. of Questions : 4]

P1276

[4817]-3072
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 306 B : Armed Conflicts and Human Rights (Optional)
(Semester-III) (2013 Pattern) (Paper - VI)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each: **[16]**

a) Define Armed Conflict.

b) Define Military Intervention.

c) What is Human Right?

d) Define War.

e) Define POW.

f) Define Combatants.

g) What is War Neurosis?

h) Define Propaganda.

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) What are the uses of military intervention?

b) Explain the Theory of Liberty.

c) Write about the protections of human right.

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

a) Significance of Human right for Armed Forces.

b) Wounded and Sick Soldiers.

c) International Humanitarian Laws.

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

a) Justify, why protection of human right is indispensable during war?

b) Explain about the defenseless victims.

Total No. of Questions : 4]

SEAT No. :

P1277

[Total No. of Pages : 4

[4817]-3073
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS-307(A):Disaster Management
(Paper - VII) (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.***

Q1) Answer in 2 to 4 sentences each. **[16]**

a) Define disaster

b) Define environmental disaster

c) State the meaning of professional training.

d) State any two limitations of disaster Management.

e) Write any two roles of social scientist in disaster.

f) Define Global warming.

g) State the meaning of public awareness in disaster.

h) Define sustainable development.

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) Explain role of civilian in disaster management.

b) Discuss Latur earthquake and its economic implications.

c) Describe proccss of settlement during post disaster phase.

P.T.O.

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

a) Bhopal gas tragedy of 1984

b) Weapon of Mass Destruction.

c) Relationship between national security and disaster.

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

a) Evaluate India's disaster management policy with reference to Ambegaon (Malin)–Pune Land slide in 2014.

b) Discuss manmade disaster due to lack of public awareness.

Total No. of Questions : 4]

P1277

[4817]-3073
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS:-307(B); Global security-I
(Paper - VII) (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.***

Q1) Answer in 2 to 4 sentences each. **[16]**

a) Define Global warming

b) Define Human rights.

c) Define war studies.

d) Define Common security.

e) Define world peace.

f) Define International law.

g) Define military strategy.

h) State the meaning of world affairs.

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) Describe causes of global warming.

b) Explain cross border terrorism as a global problem.

c) Discuss present status of Arab-Israel conflict.

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

a) Kashmir Dispute.

b) Oil-as a source of conflict.

c) Global security Issues.

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

a) Write a note on the security challenges in the new Millennium.

b) Evaluate India's nuclear policy.

Total No. of Questions : 4]

SEAT No. :

P1278

[Total No. of Pages : 4

[4817]-3074
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 308 (A) : Indian Military Strategy [1857 - 1947]
(Semester - III) (2013 Pattern) (Paper - VIII)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) State the meaning of Military History.

b) Define "Total War".

c) What do you mean by Strategy?

d) Who win the firstly Victoria cross during world war - I?

e) Why the study of Military History is necessary for us?

f) State the meaning of Blitzkrieg.

g) What do you know about Indian Expeditionary Force?

h) State the meaning of "Battle Cry".

Q2) Answer in 8 or 10 sentences (Any Two): **[8]**

a) Write few lines on "Indian National Army" under the leadership of Netaji Subhash Chandra Bose.

b) Explain any one source of Indian Military History.

c) Explain the concept of "strategy".

P.T.O.

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

a) Concept of Blitzkrieg Tactics.

b) Concept of Military History.

c) Havaldar Major Cheluram.

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

a) Evaluate the changing nature of war from limited to total with examples.

b) Explain the role of Indian Army during World War - II.

Total No. of Questions : 4]

P1278

[4817]-3074
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 308 (B) : Indian Military Strategy [1630 - 1680]
(Semester - III) (2013 Pattern) (Paper - VIII)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) Who was the teacher of Shivaji?

b) Who was Vankoji?

c) State the weapons of Maratha.

d) State any two names of Shivaji's commrade.

e) What do you know about Dilerkhan?

f) Who was Afzulkhan.

g) What was the aim of Shivaji for battle of Jawali.

h) Between whom the treaty of Purandar it was signed?

Q2) Answer in 8 or 10 sentences (Any Two): **[8]**

a) Write in brief "Intelligence Department of Shivaji".

b) Explain in short the political powers in Maharashtra before the birth of Shivaji.

c) Discuss about Dadoji Konddev as a maker of Shivaji.

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

a) Murarbaji as a "Gallent Soldier".

b) Chandrarao More of Jawali.

c) Significance of Treaty of Purandar.

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

a) Explain with examples shivaji as a Master of Discipline.

b) What were the gains of Shivaji from Karnataka Campaign.

Total No. of Questions : 4]

SEAT No. :

P1279

[Total No. of Pages : 4

[4817]-3075
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 309(A) : Regional Security System
(2013 Pattern) (Semester-III) (Paper-IX)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) Define "Regional Security System".

b) Write the longform of NATO.

c) What do you understand by GATT?

d) Who is the founder member of SAARC?

e) State the basic aim of OPEC.

f) Who was the basic enemy of WARSAW?

g) State the formation year of SAARC.

h) What do you understand by SAFTA?

P.T.O.

Q2) Answer in 8 or 10 sentences (Any Two): **[8]**

a) Explain in short the political linkages of OPEC.

b) Write in brief objectives of W.T.O.

c) Write a few lines on SAARC.

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

a) NATO.

b) Nature of SAARC.

c) NAFTA.

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

a) Critically analyse the overall picture of SAARC.

b) Highlight on "merits & demerits" of W.T.O.

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Total No. of Questions : 4]

P1279

[4817]-3075
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 309(B) : Strategic Environment of Indian Ocean
(2013 Pattern) (Semester-III) (Paper-IX)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) Define "Maritime Security".

b) Which country is the largest one at the rim of Indian Ocean?

c) State the location of Andaman & Nicobar Islands.

d) What do you know about B.I.O.T.?

e) State the meaning of littoral countries.

f) By whom the military base is established at Diego-Garcia?

g) What do you understand by Power Rivalary.

h) State the meaning of sea piracy.

Q2) Answer in 8 or 10 sentences (Any Two): **[8]**

a) Why Indian Ocean being called Indian Ocean?

b) Explain the concept of "Zone of peace".

c) Write in short threat of maritime shopping.

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

a) View of Pakistan on Indian Ocean.

b) Naval strategy of India.

c) Relationship between India & Indian Ocean.

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

a) Explain the strategic consideration for America from Diego-Garcia Islands.

b) Write in detail Chinese Indian Ocean Policy.

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Total No. of Questions : 4]

SEAT No. :

P1280

[Total No. of Pages : 2

[4817]-3082
T.Y. B.Sc. (Vocational Course)
INDUSTRIAL CHEMISTRY
Analytical Methods of Chemical Analysis
(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.***
4) ***Use of calculator / logarithmic table is allowed.***
5) ***Assume suitable additional data if necessary.***

Q1) Answer precisely the following: **[10]**

a) Write the equation for the migration rate of an ion in an electric field relating the electrophoretic mobility. Give units of terms in it.

b) What is capillary isotachophoresis?

c) Why does pH affect separation of amino acids by electrophoresis?

d) Define parent ion.

e) State the principle of mass spectrometry.

f) What is the energy of thermal neutrons?

g) Define a flame.

h) What is the temperature of LPG - air flame?

i) Why are crystals used for x-ray diffraction?

j) Write the principle of ion-selective electrodes.

Q2) A) Answer Any Two of the following: **[6]**

a) Explain the principle of separation by adsorption in electrophoresis.

b) What are the properties of ion-selective membranes?

c) Give any three applications of x-ray absorption.

P.T.O.

B) Answer briefly Any Two of the following: **[4]**

a) State the need of hollow cathode lamp in AAS.

b) Why is target element in an x-ray tube cooled? Give two commonly used target elements.

c) Calculate the resolution in a mass spectrum if a peak that is centred at 156 amu has a peak width of 0.58 amu at 5% of the peak height.

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

a) Describe the technique of two dimensional gel electrophoresis.

b) Describe the construction and working of HPLC - MS apparatus.

c) A time of flight mass spectrometer has a flight path of 50.0 cm and accelerating potential of 1250 V. What is the time required for ionic fragments with $\frac{m}{z} = 50$ to strike the detector.

Q4) A) Describe with a neat labelled diagram, the gas ionization detector used in an x-ray absorption technique. **[6]**

OR

Explain with a neat labelled diagram, a time of flight mass analyzer in mass spectrometry.

B) Answer Any One of the following: **[4]**

a) Derive Bragg's equation used in an x-ray diffraction technique.

b) Describe the construction and working of an x-ray tube.

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Total No. of Questions : 4]

SEAT No. :

P885

[Total No. of Pages : 2

[4817]-3083
T.Y. B.Sc. (Vocational)
BIOTECHNOLOGY
VOC - Biotech - 335 : Plant and Animal Biotechnology
(Semester - III) (Paper - V) (2013 Pattern)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer each of the following: **[10]**

a) Define callus.

b) What are vaccines.

c) Name two physical gene transfer methods in plants.

d) What are secondary metabolites?

e) What is meant by cell fusion?

f) What are artificial seeds?

g) What is meant by organogenesis?

h) Name few commonly used cell lines.

i) What is role of insulin?

j) Define haploids?

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

a) Explain production of transgenics using stem cells.

b) Explain gene transfer in plants using Agrobacterium.

c) Explain mass production of factor VIII.

P.T.O.

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

a) Embryo rescue.

b) Artificial seed production.

c) Cell fusion.

Q4) What are monoclonal antibodies? Explain production of monoclonal antibodies. **[10]**

OR

What is meant by somaclonal variation? Explain its causes.

Total No. of Questions : 4]

SEAT No. :

P1281

[Total No. of Pages : 2

[4817]-3084

T. Y. B. Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Video Recording and Playback Sytsems

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

Time : 2 Hours] *[Max. Marks : 40*

Instructions:

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

Q1) Answer the following: **[10]**

a) State the bandwidth of video signal for TV.

b) Why are Red, Green and Blue chosen as primary colours in TV?

c) How is the resolution of a CCD sensor expressed?

d) State various sections in a OB van.

e) What is the bandwidth of TV channel in India?

f) What is the need for interlaced scenning?

g) State two pints of comparison between film and video for TV.

h) What is meant by helical scanning?

i) State the applications of magnetic video disc machine.

j) Resolution of a human eye for colours is less than that for black and white details. Comment.

Q2) Answer ANY TWO of the following: **[10]**

a) Explain the working of a colour TV camera with the help of a neat diagram.

b) Compare performance of a CCD sensor with that of a CMOS sensor.

c) Explain the scanning and the synchronization section in a B/W TV receiver.

P.T.O.

Q3) Answer ANY TWO of the following: **[10]**

a) Explain the working principle of a plasma TV panel.

b) Compare the working principle, performance and capacity of a DVD and a blue-raydisc.

c) Write a short note on home theatre system.

Q4) Answer ANY ONE of the following: **[10]**

a) Explain the block diagram of a ACD/VCD player. Comment on eight to fourteen modulation and CLV for disc rotation.

b) i) Explain PAL colour system in detail.

ii) Explain colour camera adjustments.

Total No. of Questions : 4]

SEAT No. :

P886

[Total No. of Pages : 2

[4817]-3085

T.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE

Troubleshooting and Repair of Audio and Video Equipment

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

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer all of the following:

a) How is colour produced in LCD TV? **[1]**

b) Explain the fault 'Remote control does not operate in digital TV'. **[1]**

c) In a PA system explain the fault 'excessive hum'. **[1]**

d) Why does a blue ray disc have higher data storage than DVD? **[1]**

e) One should not touch anode button in a CRT monitor even when it is turned OFF. Comment. **[2]**

f) In a laptop computer CFL is good but still there is no light on the screen. Comment. **[2]**

g) Operation of a blue ray disc player is erratic when cold. Explain. **[2]**

h) Why are LCD TVs relatively inefficient in terms of power use? **[2]**

Q2) Answer any two of the following:

a) Explain any two faults in FM receiver and their remedies. **[4]**

b) Explain following faults in VCD player **[4]**

i) VCD player ignores you

ii) Drawer operation is erratic

c) What is digital TV? Explain digital TV standards. **[4]**

P.T.O.

Q3) Answer any <u>two</u> of the following:

a) Discuss faults in dot matrix printer and their remedies. **[4]**

b) Discuss troubleshooting of laptop computer. **[4]**

c) Discuss requirements of a PA system. How would you **[4]**

i) Place the loudspeakers and

ii) Connect them to the power amplifier.

Q4) Answer the following:

a) Discuss faults in laser printer and their remedies. **[6]**

b) Explain the working principle of LCD panel used in TV. What are its advantages over CRT TV? **[6]**

OR

Answer the following:

a) Explain any two faults in Video Monitor and how to repair them. **[4]**

b) List most common causes of tracking and audio readout problems in a CD player. **[4]**

c) Give block diagram of a typical smartphone. What are its applications? **[4]**

Total No. of Questions : 4]

SEAT No. :

P887

[Total No. of Pages : 3

[4817]-3086
T.Y. B.Sc. (Vocational)
INDUSTRIAL MICROBIOLOGY
VOC-IND-MIC - 335 : Pollution Control Technology
(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) ***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 (c) state whether the statement given is True or False:

a) COD is usually more than or equal to the BOD in the same sample.

b) BOD is a measure of oxygen in the water.

c) MLSS can be used as a parameter to indirectly measure the active biomass in an activated sludge process.

For (d) to (j) choose the best correct option:

d) The measure of active biomass in any biological treatment process is:

i) COD ii) MLSS

iii) VSS iv) MLTSS

e) Excessive solids in the activated sludge process, must be wasted to maintain the

i) BOD : COD ratio

ii) The endogenous decay rate

iii) Influent BOD/MLVSS ratio

iv) MLVSS/Influent BOD ratio

P.T.O.

f) Type I and Type II sedimentation differ in:

i) Type of particles

ii) Type of suspending medium

iii) Concentration of particles

iv) Density of the suspending medium

g) 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

h) The position of bar screens is between the:

i) aeration tank and the sedimentation tank

ii) primary settler and the biological reactor

iii) influent storage tank and the primary settler

iv) secondary clarifier and the sand filter

i) If the BOD of a sample is 200 mg/L, it means that:

i) the sample contains 200 mg/L oxygen

ii) the sample is contaminated with molds

iii) the sample contains organic matter which needs 200 mg of oxygen for oxidation

iv) the sample contains biodegradable organic matter which needs 200 mg of oxygen for oxidation

j) Bulking of activated sludge is due to:

i) Excess microorganisms in the system

ii) Excess oxygen in the sample

iii) Lack of microorganisms in the system

iv) Lack of oxygen in the sample

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

a) Draw a flow diagram of a typical activated sludge process and explain the mass balance of biomass around the aeration tank.

b) Explain the 3-stages of biochemical reactions taking place in an anaerobic digester.

c) Describe a grit chamber and its working.

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

a) Explain in brief why it is critical to maintain a constant F/M ratio in biological treatment of wastewater.

b) With the help of a diagram, describe one method for phosphorus removal from wastewater.

c) Describe the process of chemical flocculation in wastewater treatment.

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

a) Draw a flow chart of a wastewater treatment plant of paper industry wastewater. Explain its working.

b) Describe a malfunction in an activated sludge process and measures to control it.

Total No. of Questions : 4] **SEAT No. :**

P3251 **[Total No. of Pages : 2**

[4817]-3087

T.Y. B.Sc. (Vocational) (Semester - III)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Computer/IT Service Management (Paper - V)

(2013 Pattern)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

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

Q1) Attempt all of the following : **[10 × 1 = 10]**

a) COBIT Stands for

b) What is the function of Request For Proposal?

c) Use of Multiuser License on Single PC is allowed. State True or False.

d) Name an ISO Standard for ISMS.

e) Thumb Reader is Physical Access Control Device.State True or False

f) Who manages Problem Escalation?

g) Use of Freeware License on Single PC is allowed. State True or False.

h) CEO stands for-

i) What does SLA stands for

j) Network Administrator is responsible to maintain Database. State True or False.

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

a) How social engineering helps to extract information from a user?

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) What is the need of different Types of Access Controls?

b) Define the role and Responsibilities of a Network Administrator.

c) "TESTING" is important before IT Product Delivery - Explain.

Q4) Attempt any One of the Following : **[1 × 10 = 10]**

a) Comment on :-

i) Software Licensing Issues

ii) Service Level Agreement.

b) Explain :-

i) Working of Help Desk.

ii) Problem Escalation Procedure

Total No. of Questions : 4] **SEAT No. :**

P3252 **[Total No. of Pages : 2**

[4817]-3087A

T.Y. B.Sc. (Vocational) (Semester - III)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Network Concepts - I (Paper - V)

(2013 Pattern)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:

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

Q1) Attempt all of the following : **[10 × 1 = 10]**

a) Give the default Port no for POP Service.

b) VPN stands for-.

c) What is a NVR?

d) Why do we use a Static IP?

e) Why do we need an Operating System?

f) Give the importance of FTP protocol in internet world.

g) Android is used only as a Network Operating System. State True or False

h) Which Network Topology is used widely today?

i) Which type of Server is used to host a Website?

j) What is a DNS?

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

a) Explain in brief importance of CCTV Network as a security tool.

b) Name any five different Protocols and their applications.

c) What is a Network Attached Storage?

P.T.O.

Q3) Attempt any Two of the Following : **[2 × 5 = 10]**

a) Give different types of cables that are used in Computer Networks?

b) What is an application Server? Explain its need.

c) Differentiate between: Android OS and IOS.

Q4) Attempt any One of the Following : **[1 × 10 = 10]**

a) Explain the various applications of :-

i) UTM Device ii) Thin Client

b) Specify the Applications of :-

i) DHCP Server ii) Mail Server.

Total No. of Questions : 4]

SEAT No. :

P888

[Total No. of Pages : 2

[4817]-3088
T.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
VOC - ST - 311 : Seed Pathology and Entomology
(Paper - V) (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.***

Q1) Answer in one line: **[10 × 1 = 10]**

a) What do you mean by seed borne disease?

b) What are storage Fungi?

c) Define Pathology.

d) What are seed borne bacteria?

e) Give any one example of plant disease caused by insects as a vector.

f) Give any one example of insect pest belonging to order Diptera.

g) What is a Symptom of Red cotton bug on cotton crop?

h) Which insecticide is used to control aphids of cereals.

i) What do you mean by pest?

j) What is seed health testing?

Q2) Answer any two of the following: **[2 × 5 = 10]**

a) Comment on influence of seed borne diseases.

b) Explain the impact of seed borne viruses on the seeds/crop with suitable example.

c) Give the relation of insects and plants.

P.T.O.

Q3) Write short notes on any two of the following: **[2 × 5 = 10]**

a) Characters of Order Coleoptera.

b) Pest problem in seed storage.

c) Seed treatment.

Q4) Explain in detail, any one insect pest of vegetables with respect to it's lifecycle, way of damage, symptoms and control measures. **[10]**

OR

Explain in detail any one seed borne fungi with respect to damage, symptoms and control measures.

Total No. of Questions : 4]

SEAT No. :

P1282

[Total No. of Pages : 2

[4817]-3089
T.Y. B.Sc. (Vocational)
INDUSTRIAL CHEMISTRY
Basic Chemical Industries-I
(2013 Pattern) (Semester-III) (Paper-VI)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer the following questions: **[10]**

a) What is varnish?

b) How oleum converted to H_2SO_4?

c) Draw the structure of RDX.

d) Write two uses of H_2SO_4.

e) What is fermentation?

f) Name two organo-phosphorus pesticides.

g) What is emulsion paint?

h) What are repellants?

i) Write two advantages of organic manure.

j) Name the catalyst involved in Ostwald's process.

Q2) A) Attempt Any Two of the following: **[6]**

a) Write comparison between batch process and continuous process.

b) Explain rodenticides and fungicides with suitable example.

c) What are explosives? Write characteristics briefly.

P.T.O.

B) Attempt Any Two of the following: **[4]**

a) Write good qualities of fertilizers.

b) Write a note on, 'coffee still'.

c) What is sun powder? Give its uses.

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

a) Describe manufacturing of alcohol from molasses.

b) Describe manufacturing of ammonia by Haber-Bosch process with flow-sheet diagram.

c) Describe manufacturing of nitric acid by Ostwald's process with flow-sheet diagram.

Q4) A) What are steps involved in fermentation? Discuss the factors affecting the fermentation yield. **[6]**

OR

Describe synthesis of DDT and gammexane.

B) Attempt Any One of the following: **[4]**

a) What is mustard gas? How it is prepared?

b) Explain commercial manufacturing of nitrocellulose.

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Total No. of Questions : 4]

SEAT No. :

P889

[Total No. of Pages : 2

[4817]-3090
T.Y. B.Sc. (Vocational)
BIOTECHNOLOGY
VOC - BIOTECH - 336 : Microbial Biotechnology and Fermentation
(Paper - VI) (2013 Pattern) (Semester - III)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer each of the following in 1-2 lines: **[10]**

a) Define Barophiles. Give an example.

b) What is bioleaching.

c) Define Microbial biotechnology.

d) Give two examples of growth linked products.

e) Define fermentation.

f) Define Biopesticides. Give one example.

g) Name the organism used for industrial production of protease.

h) Give the role of impellor.

i) What is packed bed fermenter.

j) Mention two steps of downstream processing of fermentation product.

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

a) Enzyne Immobilization.

b) Diauxic growth.

c) Air Lift fermenter.

P.T.O.

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

a) What are Psychrophiles? Discuss the adaptations of these organisms to low temperature environment.

b) Describe the industrial fermentation of vitamin B12.

c) Explain the different types of fermenters.

Q4) Describe in detail the industrial production of Baker's yeast. Add a note on harvest of Baker's yeast. **[10]**

OR

a) Describe the process of MEOR in detail.

b) What are biosensors? Write the general features of biosensor. Mention the types of biosensors.

Total No. of Questions : 4]

SEAT No. :

P1283

[Total No. of Pages : 2

[4817]-3091

T. Y. B. Sc.(Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Television Software

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

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

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

a) Explain the importance of continuity during shooting of a film.

b) Explain the importance of research in making a documentary film.

c) Write short note on-

i) Establishing Scene ii) Continuous Scene.

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

a) Explain the different shot sequences used in the making of a film.

b) What are different aspects you must consider while developing a story for a film?

c) Illustrate the importance of a cinematographer in the production process.

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 documentary on e-waste.

P.T.O.

Q4) Attempt <u>any two</u> of the following: **[10]**

a) Illustrate the importance of music in films.

b) Explain the role of the editor in a film.

c) What is the meaning of concept in films ? Give three concepts for a documentary to be made on a college.

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Total No. of Questions : 4]

SEAT No. :

P890

[Total No. of Pages : 2

[4817]-3092

T.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE (EEM)

VOC - EEM - 211 : Electronic Instrumentation

(Paper - VI) (2013 Pattern) (Semester - III) (New Syllabus) (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) a) Answer the following: **[4 × 1 = 4]**

i) What are primary and secondary transducers?

ii) What is PLC?

iii) Define accuracy.

iv) What is proximity type instrument?

b) Answer the following: **[2 × 2 = 4]**

i) What do you mean by traceability?

ii) State two examples of photo conductive transducer.

c) Answer the following: **[2 × 2 = 4]**

i) On 10V range, a voltmeter has input of 4V. What will be the range of output if its accuracy is $\pm$ 1% of fsd.

ii) What is LVDT? State its application.

Q2) Answer any 2: **[2 × 4 = 8]**

a) Draw basic form of transistor output for PLC for

i) Current sinking and

ii) Current Sourcing

b) Explain digital phase meter.

c) Define "impedance" and give its complex and polar forms.

P.T.O.

Q3) Answer any 2: **[2 × 4 = 8]**

a) Explain any 1 application of PLC.

b) Discuss the concept of DSP.

c) Give a brief account on "spectrum and its analysis".

Q4) Answer any 2: **[2 × 6 = 12]**

a) Give event sequence and ladder diagram for bottle filling plant.

b) Explain servo potentiometric DVM.

c) Discuss applications of DSP in various fields.

OR

Q4) Answer the following: **[3 × 4 = 12]**

a) In R-C branch; R = 150 Ω, C = 0.2 μF at 1 KHz frequency. Evaluate the overall impedance in complex and polar form.

b) Explain hydraulic load cell.

c) Explain the working of photomultiplier tube.

Total No. of Questions : 4]

SEAT No. :

P891

[Total No. of Pages : 2

[4817]-3093
T.Y. B.Sc. (Vocational)
INDUSTRIAL MICROBIOLOGY
VOC - IND - MIC - 336 : Animal and Plant Tissue Culture
(Paper - VI) (2013 Pattern) (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) ***Draw neat-labeled diagrams wherever necessary.***

Q1) a) i) Define / Explain in one line: Contact inhibition **[5]**

ii) Define / Explain in one line: Eagles' Minimum Essential Medium.

iii) Mark True / False: The holding medium for animal cell cultures contains 15-20% serum.

iv) Mark True / False : For adhesion of animal cells to the substratum, the glass or plastic surfaces need to be charged.

v) Mark the correct choice:

Following are the products of the medicinal use derived from animal cell culture, EXCEPT:

1) erythropoietin
2) monoclonal anti-CD_4 antibody
3) measles vaccine
4) amino-glycoside antibiotics

b) i) What is crown gall? **[5]**

ii) Enlist the antibiotics used in PTC medium.

iii) What is Ri plasmid?

iv) What is antisense RNA technology?

v) State True / False: 'Plant cell have longer generation time than Bacteria'.

P.T.O.

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

a) pH indicator in animal cell culture media.

b) Genotypic properties for characterization of animal cell lines.

c) Animal cell lines for screening of anticancer drugs.

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

a) Discuss in detail nutritional requirement of a plant cell. Comment on the suspension culture.

b) Enlist the compounds that are commercialized from Plant Cell Culture and comment on the use of bioreactor for large - scale production.

c) What is anther culture? How is it obtained?

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

a) With the help of flow-sheet, explain the mechanical disaggregation of animal tissue explant. Discuss the advantages and disadvantages of this method.

b) Explain in detail development of Bt varieties of plants with reference to gene, vector and host used.

Total No. of Questions : 4] SEAT No. :

P3543 [Total No. of Pages : 2

[4817]-3094A

T.Y. B.Sc. (Vocational) (Semester - III)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Computer/IT Service Management (Paper - VI)

(2013 Pattern)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Attempt all of the following : **[10 × 1 = 10]**

a) What is a incident?

b) ITT stands for -

c) Use of Freeware software on Multiple PCs is not allowed. State True or False.

d) Specify any one ISO Standard for Information Security.

e) What is a OTP?

f) What is Segregation of Duties in IS?

g) COBIT Stands for

h) What does EUL stands for -

i) Network Administrator is responsible to maintain Database. State True or False.

j) What is Escalation?

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

a) What is an 'IS Audit'?

b) Write a note on RFP?

c) Explain in brief the concept of "Change Management Process".

P.T.O.

Q3) Attempt any Two of the Following : **[2 × 5 = 10]**

a) What is the need of different Types of Access Controls?

b) Explain in brief the concept of "Change Management Process"

c) Where do make use of Social Engineering concept?

Q4) Attempt any One of the Following : **[1 × 10 = 10]**

a) Explain :

i) Significance of a Help Desk

ii) Significance of Freeware softwares.

b) Why do we need to do 'Study of Requirements' before procuring Hardware?

Total No. of Questions : 4]

SEAT No. :

P892

[Total No. of Pages : 2

[4817]-3095
T.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
VOC - ST - 312 : Seed Farm Management, Processing and Storage
(Paper - VI) (2013 Pattern) (Semester - III) (Revised)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

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

Q1) Answer in one line: (any ten) **[10 × 1 = 10]**

a) What is farm business?

b) What is chemical seed treatment?

c) Define Seed Marketing.

d) What is seed conditioning?

e) Define seed cleaning.

f) Enlist any one objective of farm management.

g) Enlist any one method of seed bagging.

h) What is seed processing?

i) Enlist any one storage container.

j) Give the name of any one seed organisation in seed marketing.

Q2) Answer any two of the following: **[2 × 5 = 10]**

a) Describe in detail the layout of seed processing plant.

b) Write an account on general farming for the beginners.

c) What is seed drying? Explain in detail the process of seed drying.

P.T.O.

Q3) Write notes on any two of the following: **[2 × 5 = 10]**

a) Role of seed organizations in seed marketing.

b) Farm management as personal matter.

c) Need of seed treatment.

Q4) What is seed storage? Comment on the storage containers & basic requirements on seed storage. **[10]**

OR

Draw a flow chart including various steps in seed processing and describe in detail management of seed processing plant.