Total No. of Questions :4]

SEAT No. :

P1059

[Total No. of Pages :2

[5017] - 3001

T.Y.B.Sc.

MATHEMATICS

MT - 331 : Metric Spaces

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

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

Instructions to the candidates:

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

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

a) Does $d(x, y) = |x^4 - y^4|$ defines a metric on R? Justify.

b) Let (x, d) be standard discrete metric space. Then for $a \in X$, find $S_1(a)$ and $S_1[a]$.

c) Find Q° and $\bar{Q}$ in R_u.

d) Show that (0, 1] is not complete metric space with respect to usual metric.

e) Define separable metric space. Show that R_u is separable metric space.

f) Show that R_u and discrete metric space R_d are not homeomorphic.

g) Show that the set $Q \cap [0, 1]$ is not compact in usual metric space R_u.

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

i) Prove that for any two distinct points x and y in a metric space (X, d), there exist open sets U and V in X such that

$x \in U$, $y \in V$ and $U \cap V = \phi$.

P.T.O.

ii) Prove that arbitrary intersection of closed sets in a metric space (X, d) is closed.

iii) Let (X, d) be a metric space and k > 0 be fixed. For $x, y \in X$, show that $d^x(x, y) = kd(x, y)$ defines a metric on X.

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

i) Prove that every convergent sequence in a metric space is bounded. Is converse true? Justify.

ii) Let (X, d) and (Y, ρ) be metric spaces. Prove that a function $f : X \to Y$ is continuous if and only if $f(\bar{A}) \subseteq \overline{f(A)}$, $\forall A \subseteq X$.

iii) Show that $\mathbb{R}^n$ is complete metric space with respect to usual metric.

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

a) Let $f : (X, d) \to (Y, \rho)$ be a homeomorphism. Prove that $G \subseteq X$ is open if and only if $f(G)$ is open in Y.

b) Let (X, d) be a metric space and $\{A_\alpha / \alpha \in \wedge\}$ be a family of connected sets in X such that $\bigcap_{\alpha \in \wedge} A_\alpha \neq \phi$ then prove that $\bigcup_{\alpha \in \wedge} A_\alpha$ is connected.

c) Prove that every bounded subset of R_u is totally bounded.

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

a) i) Let $f : (X, d) \to (Y, \rho)$ be continuous function and A be compact subset of X. Prove that $f(A)$ is compact in Y.

ii) Let A and B be compact subsets of R_u. Prove that A×B is compact in R^2.

b) Show that compact subset of a metric space is closed and bounded. Is converse true? Justify.

Total No. of Questions : 4]

SEAT No. :

P1060

[Total No. of Pages : 2

[5017]-3002
T.Y. B.Sc.
MATHEMATICS
MT - 332 : Real Analysis-I
(New Course : 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.***

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

a) True or false: For sets A, B and C;

$$(A \cup B) - C = A \cup (B - C)$$. Justify.

b) If $f: A \to B$ is function such that range of f is uncountable set then show that A is uncountable set.

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

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

e) Does the series $\sum_{n=1}^{\infty} \frac{n+1}{10^{10}(n+2)}$ converge or diverge? Justify.

f) Give an example of conditionally convergent series.

g) Give examples of two sequences $s=\{s_n\}_{n=1}^{\infty}$ and $t=\{t_n\}_{n=1}^{\infty}$ such that $s \in l^2$ and $t \notin l^2$.

P.T.O.

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

a) Prove that the set [0, 1] is uncountable.

b) If $\{s_n\}_{n=1}^{\infty}$ is sequence of nonnegative real numbers such that $\lim_{n\to\infty} s_n = \mathrm{L}$, then show that $\mathrm{L} \geq 0$.

c) Let $s_n = \dfrac{1.3.5\cdots(2n-1)}{2.4.6\cdots 2n}, n \in \mathbb{N}$. Show that $\{s_n\}_{n=1}^{\infty}$ is convergent and $\lim_{n\to\infty} s_n \leq \dfrac{1}{2}$.

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

a) If $\{s_n\}_{n=1}^{\infty}$ is convergent sequence of real numbers then prove that

$$\lim_{n\to\infty} \sup s_n = \lim_{n\to\infty} s_n .$$

b) Prove that every Cauchy sequence of real numbers is convergent.

c) Show that the series $1+\dfrac{1}{2!}+\dfrac{1}{4!}+\dfrac{1}{6!}+\cdots$ converges.

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

a) i) Let $\sum_{n=1}^{\infty} a_n$ be series of nonzero real numbers such that $\mathrm{A} = \lim_{n\to\infty}\sup\left|\dfrac{a_{n+1}}{a_n}\right| < 1$. Prove that $\sum_{n=1}^{\infty} a_n$ is convergent series.

ii) Discuss the convergence of series $\sum_{n=0}^{\infty}\dfrac{n^4}{n!}$ and $\sum_{n=1}^{\infty}\dfrac{3}{4+5^n}$.

b) i) If $\{a_n\}_{n=1}^{\infty}$ is nonincreasing sequence of positive real numbers such that $\sum_{n=0}^{\infty} 2^n\, a_{2^n}$ is convergent series then prove that $\sum_{n=1}^{\infty} a_n$ converges.

ii) Show that the series $\sum_{n=1}^{\infty}\dfrac{1}{n^2}$ is convergent and $\sum_{n=4}^{\infty}\dfrac{1}{n\log n}$ diverges.

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Total No. of Questions :4]

SEAT No. :

P1061

[Total No. of Pages :3

[5017]-3003
T.Y.B.Sc.
MATHEMATICS
MT-333: Problem Course
Based on MT -331 and MT - 332
(2013 Pattern - New Course) (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) ***Answers to the two sections should be written in separate answer sheets.***
4) ***Tie answer books of both sections together.***

SECTION -I

Metric Spaces

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

i) For $f, g \in e[0,1]$, $d(f,g) = \int_0^1 |f(x) - g(x)|\,dx$ is the metric. For $f(x) = x^3 + x + 1$ and $g(x) = x^3 - x^2 + \frac{x}{2} + 1$, find $d(f, g)$.

ii) Prove that in a metric space, the complement of any singleton set is open.

iii) Show that any line is nowhere dense in the Euclidean metric space $\mathbb{R}^2$.

iv) Give an example of compact metric space which is not connected and an example of connected metric space which is not complete.

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

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

$f(x) = x$ if x is rational

$= 0$ if x is irrational

Show that f is continuous only at $x = 0$.

ii) Show that standard discrete metric space is complete.

P.T.O.

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

a) For $x, y \in \mathbb{R}$, define

$$d(x,y) = \begin{cases} 0, \text{ if } x = y \\ |x| + |y|, \text{ if } x \neq y \end{cases}$$

show that d is a metric on $\mathbb{R}$.

b) Let d_1, d_2 and d_∞ be metrics for $\mathbb{R}^n$ as follows

$$d_1(\bar{x}, \bar{y}) = \sum_{i=1}^{\infty} |x_i - y_i|$$

$$d_2(\bar{x}, \bar{y}) = \left[\sum_{i=1}^{n} (x_i - y_i)^2 \right]^{1/2}$$

$$d_\infty(\bar{x}, \bar{y}) = \max_{1 \le i \le n} |x_i - y_i|$$

for $\bar{x} = (x_1, x_2, \text{---} x_n)$ and $\bar{y} = (y_1, y_2, \text{---} y_n) \in \mathbb{R}^n$. Show that d_1, d_2 and d_∞ are equivalent metrics.

c) Show that (0, 1) and $(0, \infty)$ are homomorphic metric space with respect to usual metric.

SECTION -II

Real Analysis - I

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

i) Give an example of countable bounded subset A of R whose lub and glb lies in R - A.

ii) Give an example of two divergent sequences (x_n) and (y_n) such that $(x_n y_x)$ is convergent.

iii) Show that $\sum_{n=1}^{\infty} \log\left(\frac{1}{n}\right)$ is divergent series.

iv) Show that $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$ is conditionally convergent series.

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

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

ii) Show that $\left\{\sqrt{n+1}-\sqrt{n}\right\}_{n=1}^{\infty}$ is convergent sequence.

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

a) If $\{S_n\}_{n=1}^{\infty}$ is bounded sequence of real numbers and $\liminf_{n\to\infty} S_n = m$, prove that there is a subsequence of $\{S_n\}_{n=1}^{\infty}$ which converges to *m*.

b) If $\sum_{n=1}^{\infty}|a_n|<\infty$ and if for each $n\in\mathbb{N}$, $\left|\frac{b_{n+1}}{b_n}\right|\leq\left|\frac{a_{n+1}}{a_n}\right|$, prove that $\sum_{n=1}^{\infty}|b_n|<\infty$.

c) Show that if A and B are countable sets then A×B is countable.

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Total No. of Questions : 4]

SEAT No. :

P1062

[Total No. of Pages : 2

[5017]-3004
T.Y. B.Sc.
MATHEMATICS
MT - 334 : Group Theory
(2013 Pattern) (Paper-IV) (Semester-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.***

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

a) Find all generators of $\mathbb{Z}_8$.

b) Are the groups $(\mathbb{R}^+, \cdot)$ and $(\mathbb{R}, +)$ isomorphic?

c) Define the term 'Simple Group' and state an example.

d) Find order of (3, 10, 9) in $\mathbb{Z}_4 \times \mathbb{Z}_{12} \times \mathbb{Z}_{15}$.

e) Find the smallest natural number n such that the permutation group S_n has an element of order 30.

f) Show that the set of all $n \times n$ matrices with determinant one is a normal subgroup of $GL_n(\mathbb{R})$.

g) Justify whether true or false: All groups of order 4 are isomorphic.

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

a) Prove that a subgroup of a cyclic group is cyclic.

b) If H and N are subgroups of G and N is normal in G, then show that $H \cap N$ is normal in H. Is $H \cap N$ normal in G? Justify.

c) Show that $(\mathbb{R}, +) / (\mathbb{Z}, +)$ is isomorphic with the circle group of complex numbers of magnitude 1, under multiplication.

P.T.O.

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

a) Show that every permutation in S_n can be expressed as a product of disjoint cycles.

b) Show that a non-abelian group of order pq, where p and q are primes, has a non-trivial center.

c) If the g.c.d. of m and n is $d > 1$, then show that $\mathbb{Z}_m \times \mathbb{Z}_n$ is not cyclic.

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

a) i) If a finite group G has exactly one subgroup H of a given order, then show that H is a normal subgroup of G.

ii) Give an example of an infinite group such that every element is of finite order.

b) i) If M is maximal normal subgroup of a group G, then prove that G/M is simple.

ii) Prove that a group of order 43 has no proper, non-trivial subgroup.

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Total No. of Questions : 4]

SEAT No. :

P1063

[Total No. of Pages : 2

[5017]-3005
T.Y. B.Sc.
MATHEMATICS
MT - 335 : Ordinary Differential Equations
(2013 Pattern) (Paper-V) (Semester-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.***

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

a) Solve the differential equation

$(2D - 5)(3D + 2)y = 0$

b) Find the particular integral y_p of the differential equation

$(D^2 + 3D - 4)y = 12 \cdot e^{2x}$.

c) Verify that $y_1 = e^x$ is a solution of the differential equation

$$xy'' - (2x+1)y' + (x+1)y = 0 .$$

d) Show that $x = 2e^{2t}$, $y = 3e^{4t}$ and $x = e^{-t}$, $y = -e^{-t}$ are linearly independent solution of the homogeneous system $\frac{dx}{dt} = x + 2y, \frac{dy}{dt} = 3x + 2y$.

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

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

f) Construct the homogeneous differential equation whose solution is $y = x^3$.

g) Find the particular integral of $(D^2 + 1)y = \sin x$.

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

a) With usual notation prove that $\frac{1}{f(D)}e^{ax} = \frac{x^r}{r!\phi(a)}e^{ax}$ where

$f(D) = (D-a)^r \phi(D); \phi(a) \neq 0$.

P.T.O.

b) Obtain the general solution of the differential equation $(D-3)^2 y = e^{3x}$.

c) Solve the differential equation $y'' - 3y' - 4y = 6e^x$ by using the method of undetermined coefficients.

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

a) Explain the method of variation of parameters to solve the second order differential equation $y'' + p(x)y' + q(x)y = R(x)$.

b) Verify that $y_1 = x$ is one solution of $y'' - \frac{x}{x-1}y' + \frac{1}{x-1}y = 0$ and then find y_2. Hence obtain the general solution.

c) Find the general solution of the differential equation $(D^2 + 1)y = \sec x$ by using method of reduction of order.

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

a) i) If $x = x_1(t)$, $y = y_1(t)$ and $x = x_2(t)$, $y = y_2(t)$ are two solutions of the homogeneous system.

$$\frac{dx}{dt} = a_1(t)x + b_1(t)y$$

$$\frac{dy}{dt} = a_2(t)x + b_2(t)y$$

on the interval $[a, b]$ and c_1, c_2 are any two constants, then prove that

$$x = c_1x_1(t) + c_2x_2(t)$$

$$y = c_1y_1(t) + c_2y_2(t)$$

ii) Find the general solution of the system

$$\frac{dx}{dt} = 3x - 4y$$

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

b) Find the power series solution of the differential equation $y'' + 3xy' + 3y = 0$ near the ordinary point $x = 0$.

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Total No. of Questions :4]

SEAT No. :

P1064

[Total No. of Pages :3

[5017] - 3006

T.Y.B.Sc.

MATHEMATICS

MT - 336: Problem Course Based on MT - 334 & MT - 335

(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.***

SECTION - I

(Group Theory)

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

i) Prove that the binary structures $(\mathbb{Q}, +)$ and $(\mathbb{R}, +)$ are not isomorphic.

ii) Show that if G is a finite group of even order, then there is an element $a \in G, a \neq e,$ where e is an identity of G, such that $a^2 = e$.

iii) Write down all subgroups of $\mathbb{Z}_{12}$. Also draw its subgroup diagram.

iv) If $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 8 & 2 & 6 & 3 & 7 & 4 & 5 & 1 \end{pmatrix}$, then express σ as a product of disjoint cycles. Also, find order of σ .

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

i) Show that if H is a subgroup of index 2 in a finite group G, then every left coset of H is also a right coset of H.

ii) Let G = $\left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} \middle| a, b, c, d \in \mathbb{Z} \right\}$ under addition.

Let H = $\left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} \middle| a, b, c, d \in \mathbb{Z} \text{ and } a + b + c + d = 0 \right\}$.

Prove that H is a subgroup of G.

P.T.O.

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

a) Let G_1 and G_2 be groups. Define $\phi : G_1 \times G_2 \to G_2$ by $\phi(x, y) = y$. Show that ϕ is a homomorphism. Also, find the kernel of ϕ and the group isomorphic to the kernel of ϕ .

b) Let G be the set of all 2 × 2 real matrices $\begin{bmatrix} a & b \\ 0 & d \end{bmatrix}$ where $ad \neq 0$ under matrix multiplication. Let N = $\left\{ \begin{bmatrix} 1 & b \\ 0 & 1 \end{bmatrix} \middle| b \in \mathbb{R} \right\}$. Prove that

i) N is a normal subgroup of G

ii) G/N is abelian.

c) If H and K are subgroups of a group G, then prove that HK is also a subgroup of G if and only if HK = KH.

SECTION - II

(Ordinary Differential Equations)

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

i) Solve $(D^2 - 2D + 5)\, y = 0$.

ii) Find the eigen values and corresponding eigen vectors of the matrix

$$\begin{pmatrix} 4 & -1 \\ -4 & 4 \end{pmatrix}$$

iii) Obtain the particular integral of the differential equation $(D^2 - 1)\, y = e^{2x}$

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

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

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

i) Find the general solution of

$(D^2 + 4)\, y = \cos 2x$.

ii) Obtain the power series solution of the differential equation $y'' + y = 0$ near to $x = 0$.

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

a) Solve the linear system $X' = AX$

where $A = \begin{pmatrix} 2 & 1 \\ -4 & 2 \end{pmatrix}$

b) Solve the differential equation $(D^2 + 1)\, y = \sec x \cdot \tan x$ by using the method of variation of parameters.

c) Find the general solution of the differential equation $(D^2 + D)\, y = \sin x$, using the method of undetermined coefficients.

Total No. of Questions : 4]

SEAT No :

P1065

[Total No. of Pages : 4

[5017]-3007
T.Y.B.Sc.
MATHEMATICS
MT - 337(A) : Operations Research
(2013 Pattern) (Semester - III) (Paper - VII)

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

Instructions to the candidates:

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

Q1) Attempt any five of the following: **[5 × 2 = 10]**

a) Show that the following linear programming problem (LPP) has infeasible solution.

Minimize $Z=x_1 + 4x_2$

Subject to $x_1 + x_2 \leq 4$

$x_2 \geq 5,\ x_1,\ x_2 \geq 0.$

b) What is role of artificial variable in LPP.

c) Write any two limitations of LPP.

d) Find the feasible region of the following LPP.

Minimize $Z = x_1 + 4x_2$

Subject to

$x_1 \leq 5,\ x_2 \leq 7,$

$x_1,\ x_2 \geq 0.$

e) Find any two basic solutions of the following LPP.

Minimize $Z = x_1 + x_2$

Subject to $x_1 + 2x_2 \leq 6$

$x_1 + x_2 \geq 2$

$x_1,\ x_2 \geq 0.$

P.T.O.

f) Write the dual of the following LPP.

Maximize $Z = 70x_1 + x_2$

Subject to $x_1 + x_2 \leq 8$

$x_1 - x_2 \leq 0, x_1, x_2 \geq 0.$

g) Find least cost of the following transportation problem (TP) by using least cost method.

	I	II	III	supply
A	1	9	4	5
B	6	2	7	10
C	5	8	3	15
	10	10	10	

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

a) Solve the following LPP by simplex method.

Maximize $Z = -8x_1 + 2x_2$

Subject to $-4x_1 + 2x_2 \leq 1$

$5x_1 - 4x_2 \leq 3$

$x_1, x_2 \geq 0.$

b) Solve the following LPP by Graphical method.

Maximize $Z = 7x_1 + 3x_2$

Subject to $x_1 + 2x_2 \geq 3$

$x_1 + x_2 \leq 4$

$0 \leq x_1 \leq 5/2$

$0 \leq x_2 \leq 3/2, x_1, x_2 \geq 0.$

c) A company manufactures two types of products A and B and sells them at a profit of Rs. 4 on type A and Rs. 5 on type B. Each product is processed on two machines X and Y. Type A requires 2 minutes of processing time on X and 3 minutes on Y. The machine X is available for not more than 5 hours and 30 minutes while Y is available for 8 hours during any working day. Formulate the problem as a LPP.

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

a) A department has five employess with five jobs to be performed. The time (in hours) each men will take to perform each job is given in the effectiveness matrix.

Employees

	1	2	3	4	5
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man hours?

b) Find the optimal assignment schedule for the following assignment problem.

	I	II	III	IV
W	4	6	10	5
X	7	4	-	5
Y	-	6	6	9
Z	9	3	7	2

c) Solve the following TP by vogel approximation method (VAM).

Destinations

		A	B	C	D	Supply
Sources	I	2	3	11	7	6
	II	1	0	6	1	1
	III	5	8	15	9	10
Demand		7	5	3	2	

Q4) Attempt any one of the following: **[1 × 10 = 10]**

a) i) Show that by simplex method following LPP has unbounded solution.

Maximize $Z = 3x_1 + 5x_2$

Subject to $x_1 - 2x_2 \leq 6$

$x_1 \leq 10, x_2 \geq 1,$

$x_1, x_2 \geq 0.$

ii) Solve the following LPP by simplex method.

Maximize $Z = -x_1 + 2x_2 + 3x_3$

Subject to $-2x_1 + x_2 + 3x_3 = 2$

$2x_1 + 3x_2 + 4x_3 = 1,$

$x_1, x_2, x_3 \geq 0.$

b) Find the optimal solution of the following TP.

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

Total No. of Questions :4]

SEAT No. :

P1066

[Total No. of Pages :3

[5017]-3008
T.Y.B.Sc.
MATHEMATICS
MT-337(B): Dynamical Systems
(2013 Pattern) (New Course) (Semester - III)

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

Instructions to the candidates:

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

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

a) Find the eigenvalues of $A=\begin{bmatrix} a & \sqrt{2}+\frac{a}{2} \\ \sqrt{2}-\frac{a}{2} & 0 \end{bmatrix}$, where $a \in \mathbb{R}$.

b) Give an example of a linear system for which $(3e^{2t}+e^{-2t}, e^{2t})$ is a solution.

c) Is the equilibrium point (0, 0) a saddle point for the system $X'=\begin{bmatrix} -2 & 1 \\ -1 & 1 \end{bmatrix} X$? Justify.

d) For which values of k and b is the system $X'=\begin{bmatrix} 0 & 1 \\ -k & -b \end{bmatrix} a$ center? Justify.

e) Let $U=\{(x,y) \in \mathbb{R}^2 / x^2+y^2 \neq 1\}$. State whether the set U is an open subset of $\mathbb{R}^2$. Justify.

P.T.O.

f) Find the eigenvalues and eigenvectors of $\exp(A)$ if $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$.

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

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

a) Let A be a 2×2 matrix for which λ is the only eigenvalue. Show that there exists a 2×2 matrix T such that, $T^{-1}AT = \begin{bmatrix} \lambda & 1 \\ 0 & \lambda \end{bmatrix}$.

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

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

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

a) Let A be a 3×3 matrix for which λ is the only eigenvalue. If ker (A - λI) = 2 then show that there exists a 3×3 matrix T such that,

$$T^{-1}AT = \begin{bmatrix} \lambda & 1 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix}.$$

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

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

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

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

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

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

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

b) Prove that if λ, μ are real eigenvalues of a 2×2 matrix, then any nonzero column of the matrix $A - \lambda I$ is an eigenvector for μ.

c) Find a matrix T that puts $A = \begin{bmatrix} 1 & -1 & 0 & 1 \\ 2 & -1 & 1 & 0 \\ 0 & 0 & -1 & 2 \\ 0 & 0 & -1 & 1 \end{bmatrix}$ in its canonical form.

EEE

Total No. of Questions :4]

SEAT No. :

P1067

[Total No. of Pages :2

[5017]-3009
T.Y.B.Sc.
MATHEMATICS
MT-337(C): C Programming -I
(2013 Pattern) (New Course) (Semester - III) (Paper- VII)

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

Instructions to the candidates:

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

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

a) Which of the following are valid identifiers?

i) note book

ii) Cash $ 7.

b) Write a function definition called funct which accepts an integer argument and returns an integer quantity.

c) What are logical operators used in C?

d) Explain what happens when the following statement is executed.

if (abs (x) < x min)

x = (x > 0)? x min : –x min;

e) Interpret the meaning of the control string of the following scanf function.

scanf ("% 12 *l*d % 15 *l*f ", & a, & x);

f) Define a one-dimensional, 12 - element integer array called C. Assign the values 1, 4, 7, 10, ..., 34 to the array elements.

g) What are keywords in C?

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

a) Write a short note on for loop in C.

b) Write a short note on conditional operator. Explain with an example.

c) Write a C program to check whether the given string is a palindrome.

P.T.O.

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

a) Write a short note on passing arrays to a function.

b) Write a short note on scanf( ) function.

c) Write a C program to compute average of *n* numbers.

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

a) i) Write a short note on function recursion.

ii) Write a short note on break and continue statements.

b) i) Write a short note on gets and puts functions.

ii) Describe the output that will be generated by the following C program

```
# include < stdio.h>
int  Z[3] [4] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12};
main ( )
{
      int a, b, c;
      for  (a = 0;  a < 3 ;  ++ a) {
            c = 999;
            for (b = 0; b < 4 ; ++ b)
                  if ( Z [a] [b] < c) c = Z [a] [b];
            printf ("%d", c);
      }
}
```

EEE

Total No. of Questions :4]

SEAT No. :

P1068

[Total No. of Pages :2

[5017]-3010
T.Y.B.Sc.
MATHEMATICS
MT-337(D): Lattice Theory
(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) Attempt any five of the following: **[10]**

a) Draw the diagram of the lattice of all subgroups of S_3.

b) If C_1 and C_2 are chains with 2 and 3 elements respectively then show that $C_1 \times C_2$ is not a chain.

c) Show that in a Boolean ring, $ab = ba$. for any two elements a and b.

d) Show that union of two ideals in a lattice need not be an ideal.

e) Draw the circuit diagram for a Boolean function.

$(c \wedge d \wedge e) \vee [(f \vee g) \wedge h]$.

f) Show that $\langle \mathbb{N}_o \leq \rangle$ satisfy DCC but not ACC. Where $\mathbb{N}_o \{1,2,3,...\}$ and $\leq$ is usual order on $\mathbb{N}_o$.

g) State the connecting lemma.

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

a) Show that a lattice L is nondistributive iff N_5 or M_3 are not sublattices of L.

b) Write the DNF of the following Boolean function.

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

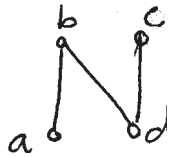
c) Use Knaster Tarski Fixpoint theorem to prove Banach's decomposition theorem.

P.T.O.

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

a) State and prove the connecting lemma.

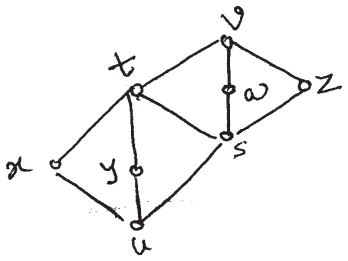
b) Draw the diagram of all down sets of



c) Let $f : L \to K$ be a $\{0, 1\}$ - homomorphism. If L, K are bounded lattices. Show that $f^{-1}(0)$ is an ideal in L.

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

a) i) Check whether the following lattice is modular or not.



ii) Write all dualideals (filter) of the lattice of positive factors of 30 under divisibility.

b) i) Show that in a lattice, for all $a,b,c,\in L$

$(a \wedge b) \vee (b \wedge c) \vee (c \wedge a) \leq (a \vee b) \wedge (b \vee c) \wedge (c \vee a)$.

ii) Draw product of lattices 3 and $2^2 \oplus 1$ and shade the elements which form sublattice isomorphic to $1 \oplus (2 \times 3) \oplus 1$.

EEE

Total No. of Questions :4]

SEAT No. :

P1069

[Total No. of Pages :3

[5017]-3011
T.Y.B.Sc.
MATHEMATICS
MT-337(E): Financial Mathematics
(2013 Pattern) (New Course) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable calculator is allowed.***

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

a) If S consist of the pair (q, p) such that $2q - 3p = 12$. Determine the supply function $q^S(p)$ and inverse supply function $p^S(q)$.

b) Define the term: equilibrium set.

c) An amount of $ 10,000 is invested and attracts interest at rate equivalent to 10% per annum. Find the total amount after one year if the interest is compounded monthly.

d) Without solving any equations, determine whether the cobweb model predicts stable or unstable equilibrium for the market with $q^S(p) = 0.05p - 4$, $q^D(p) = 20 - 0.15p$.

e) Define terms:

i) Perfect competition.

ii) Monopoly.

f) Suppose we are given an input-output model with two industries, for which the matrix of coefficients is $A = \begin{pmatrix} 0.3 & 0.1 \\ 0.2 & 0.4 \end{pmatrix}$. Write down the equation which determines the production schedule x in terms of the external demand d and solve it.

g) Write the IS - LM equations.

P.T.O.

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

a) Suppose that the supply and demand functions for a good are $q^S(p) = bp - a$, $q^D(p) = c - dp$, where a, b, c, d are positive constants.

Show that the equilibrium price is $P^* = \frac{c+a}{b+d}$. If an excise tax of T per unit is imposed $(T \neq 0)$, find the resulting market price P^T.

b) Derive the formula for the present value of an annuity generating I each year guaranteed for the next N years at a constant annual interest rate r.

c) The supply and demand functions for a good are $q^S(p) = 15p - 41$, $q^D(p) = 40 - 12p$.

Suppose the suppliers operate according to the cobweb model and that the initial price is 2.5. Write down explicit formula for p_t and q_t, the price and quantity in year t.

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

a) The supply and demand sets for a good are $S = \{(q, p) \mid q = bp - a\}$, $D = \{(q, p) \mid q = c - dp\}$, where a, b, c, d are all positive. Suppose the government wishes to raise as much money as possible by imposing an excise tax on the good. What should be the value of the excise tax?

Show that the resulting government revenue is $\frac{(bc - cd)^2}{4bd(b+d)}$.

b) The demand set for a good is $D = \{(q, p) \mid q(1 + p^2) = 100\}$.

Determine the elasticity of demand $\varepsilon(p)$ as a funciton of p. For what values of p is the demand inelastic?

c) Prove that, at the breakeven point for an efficient small firm, the derivative of average cost is 0.

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

a) i) Suppose you have inherited an antique whose current market value is ₹ 500. Let us assume that the market value will increase steadily at a rate of ₹ 100 per annum, and that interest on a bank deposit will be compounded continuously at the equivalent annual rate of 5%. Write down the expression for the present value of the amount realised by selling the antique after t years, and determine the optimum time to sell (assuming you can find someone to buy it then , at the market value).

ii) Integration incorporated is a monopoly with cost function $C(q) = 100 + 80q - 50q^2 + 0.5q^3$,

and the demand set for its product is

$D = \{(q, p) \mid 2p + q^2 - 20q = 100\}$.

Sketch the graph of the profit function for q > 0. Find the level of production which maximises the firm's profit, if the upper limit on its output is 50.

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

ii) Suppose you have won a competition and that you are given the choice between $ 180000 now or $ 10000 at the start of each year, for the rest of your life. Assume that the bank has a constant interest rate of 6% and that you currently have no debts. Which option should you choose if you think you will live

1) until 65,

2) until 100,

3) forever?

EEE

Total No. of Questions : 4]

SEAT No. :

P1070

[Total No. of Pages : 2

[5017]-3012
T.Y.B.Sc.
MATHEMATICS
MT 337: Number Theory
(2013 Pattern) (Semester - III) (Elective F) (New Course)

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

Instructions to the candidates:

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

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

a) Find the remainder when 11^{903} is divided by 31.

b) Let p be odd prime, prove that $2(p-3)! \equiv -1 (\text{mod } p)$.

c) Find the highest power of 5 dividing 2000!.

d) If $(a,b) = 1$, then show that $(a^2,b^2) = 1$

e) Find two Pythagorean triples whose terms form an arithmetic progression.

f) Find $\mu(72)$ and $\omega(72)$

g) Find the last digit in the ordinary decimal representation of 3^{101}

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

a) Find all integers x such that $x \equiv 2 \pmod 5$, $x \equiv 4 \pmod 7$, and $x \equiv 3 \pmod 9$.

b) Let a, b and $m>0$ be given integers, $g=(a,m)$. Show that the congruence $ax \equiv b \pmod m$ has solution if and only if g/b.
Also show that if this condition is met, then the solutions form an arithmetic progression with common difference $\frac{m}{g}$, giving 'g' solutions $\pmod m$.

P.T.O.

c) Use Euclidean algorithm to obtain g.c.d. 'd' of 3997 and 2947. Also find integers x and y such that $d = 3997\,x + 2947\,y$.

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

a) Find the number of distinct positive integral divisors and their sum for the integer 56700.

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

c) Find all integer solutions to $70x+28y=518$. Determine how many solutions have both variables positive.

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

a) i) Let m be positive integer such that 2^m+1 is a prime number, prove that m is a power of 2.

ii) For every positive integer n. Prove that the sum of all positive integral divisors of n is $\sigma(n) = \prod_{p^\alpha \| n} \left(\frac{p^{\alpha+1}-1}{p-1}\right)$

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

ii) Show that the congruence $x^2 \equiv -46 \pmod{17}$ admits no solution.

Total No. of Questions :4]

SEAT No. :

P1071

[Total No. of Pages :2

[5017] - 3013

T.Y.B.Sc.

PHYSICS

PH - 331 : Mathematical Methods in Physics - II

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of calculator & Log - table is allowed.***

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

a) Define metric coefficients.

b) State transformation equations between cartetian & spherical polor co - ordinate systems.

c) Show that $\nabla . \bar{r} = 3$.

d) What is length contraction?

e) State relativistic mass - energy relation.

f) State Lorentz transformation equations.

g) State degree & order of differential eqution.

$$\frac{d^3y}{dx^3} + \sqrt[3]{\left(\frac{dy}{dx}\right)^2 + y^2} = 0$$

h) Define Linear differential equation.

i) Show that $P_n(1) = 1$.

j) State importance of special functions in physics.

P.T.O.

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

a) Show that $\hat{e}_\rho \,.\, \hat{e}_\phi = 0$ & $\hat{e}_\phi \,.\, \hat{e}_z = 0$.

b) What is increase in relativistic mass of particle of rest mass 1 gm when it is moving with velocity 0.8C? Also find its kinetic energy.

c) Prove that

$$n\,\mathrm{P}_n(x) = x\,\mathrm{P}_n'(x) - \mathrm{P}_{n-1}'(x).$$

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

a) Show that $x = \infty$ is an essential singularity of $x^2 y'' + xy + \left(x^2 - n^2\right) y = 0$.

b) Separate the variables in spherical polar co-ordinate system for $\nabla^2\psi + K^2\psi = 0.$

c) Show that $\mathrm{H}_{n+1}(x) = 2x\,\mathrm{H}_n(x) - 2n\,\mathrm{H}_{n-1}(x).$

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

i) Obtain power series solution of $y'' - 2xy' + 2\lambda y = 0$ for $x = 0$.

ii) Describe Michelson - Morley experiment & explain negative results.

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

i) State expression for $\nabla \times \bar{\mathrm{A}}$ in orthogonal curvilinear system.

ii) State postulates of special theory of relativity.

Total No. of Questions : 4]

SEAT No. :

P1072

[Total No. of Pages : 2

[5017]-3014
T.Y.B.Sc.
PHYSICS
PH-332: Solid State Physics
(2013 Pattern) (New course)(Semester-III) (Paper-II)

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

Instructions to the candidates:

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

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

a) Define the term 'Space lattice'.

b) What are domains?

c) What is mean free path?

d) State any two uses of thermal gravimetric analysis technique.

e) Define the term 'Packing fraction'.

f) State Bragg's diffraction condition in direct lattice.

g) State Hall effect.

h) State any two spectroscopic techniques for the analysis of crystal structure.

i) Give formula for Fermi function.

j) Why ordinary optical grating cannot diffract X-rays?

Q2) Attempt any two (Five matks each): **[10]**

a) Show that every reciprocal lattice vector is perpendicular to a direct lattice plane.

b) Write short note on scanning tunnelling electron microscopy.

c) Write short note domain and hysteresis of ferromagnetic materials.

P.T.O.

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

a) Find out the number of atoms per square millimeter on a plane (100) of lead whose interatomic distance is 3.449Å. Lead has FCC structure.

b) In case of certain crystal the maxima of reflected X-rays are obtained at glancing angles 5^{o} 12' , 7^{o} 24' and 9^{o} 1' respectively from three different reflecting planes. Determine the type of cubic crystal.

c) The Fermi energy of copper is 7.1 eV. Assuming that it is the maximum kinetic energy of electrons in copper. Find the number of atoms per unit volume in copper.

(Give: Mass of electron (m) $=9.1\times10^{-31}$kg ,

Planck's constant (h) $=6.62\times10^{-34}$ Joule-sec)

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

i) Obtain an expression for energy levels and density of states in one dimension.

ii) What is diamagnetism ? Obtain classical Langevin's formula for the susceptibility of the diamagnetic material.

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

i) Find the number of atoms per unit cell for BCC crystal structure.

ii) Draw the schematic labelled diagram of UV-Visible spectrophotometer.

❄ ❄ ❄

Total No. of Questions :4]

SEAT No. :

P1073

[Total No. of Pages :2

[5017]-3015
T.Y.B.Sc.
PHYSICS
PH -333:Classical Mechanics
(2013 Pattern) (Paper - III)(Semester - III)

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

Instructions to the candidates:

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

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

a) State the principle of rocket motion.

b) Give the trajectory of a charged particle moving in a constant magnetic field.

c) State any two properties of central forces.

d) Find the reduced mass of system of two particles having equal masses.

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

f) What do you mean by differential cross-section?

g) What are holonomic constraints?

h) State the principle of virtual work.

i) What are elementary Poisson's brackets?

j) Show that [u, u] = 0.

Q2) Attempt any two of the following:

a) Show that the path of a charged particle moving in uniform transverse electric field is a parabola. **[5]**

b) Explain how a two body problem can be reduced into equivalent one body problem. **[5]**

c) Derive the differential equation for the orbit in central force motion. **[5]**

P.T.O.

Q3) Solve any <u>two</u> of the following:

a) Two projectiles are projected with same velocity. If one is projected at an angle of 30^{o} and other at 60^{o} to the horizontal, find the ratio of maximum heights and ranges of the projectiles. **[5]**

b) Evaluate the Poisson's bracket's **[5]**

i) $[J_y, P_x]$

ii) $[J_x, J_y]$

c) A geostationary satellite is orbiting the earth at a height of 11 R_e above the surface of the earth where R_e is radius of earth. Find the time period of another satellite at height of 5 R_e from the surface of earth. **[5]**

Q4) a) Attempt any <u>one</u> of the following:

i) Obtain Hamiltonian from Lagrange's equation. Show that Hamiltonian of a system represent total energy of the system. **[8]**

ii) Discuss the elastic and inelastic scattering processes. Obtain Q value equation in inelastic scattering process. **[8]**

b) Attempt any <u>one</u> of the following:

i) Estimate the degrees of freedom for a simple pendulum. **[2]**

ii) Show that the Poisson's bracket's satisfies the distributive property. **[2]**

EEE

Total No. of Questions : 4]

SEAT No. :

P1074

[Total No. of Pages : 2

[5017]-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 log table and calculator is allowed.***

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

a) Define the term: Multiplicity of state.

b) Give the electronic configuration for sodium atom (z = 11).

c) State Pauli's exclusion principle.

d) Define the reduced mass of diatomic molecule.

e) State second postulate of Bohr's theory for hydrogen atom.

f) Determine the values of Me for $l = 5$.

g) State Duane and Hunt's law in X-rays.

h) Write the atomic states for L = 2 and S = $\frac{1}{2}$.

i) Define the term: Larmour precession.

j) Give the quantum state of an electron.

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

a) What is normal zeeman effect? Derive an expression $\gamma = \gamma_0 + \Delta ml \frac{eH}{H\pi M}$

where symbols have their usual meanings.

P.T.O.

b) Explain the origin of continuous X-rays.

c) Obtain an expression for vibrational energy levels of diatomic molecule:

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

where symbols have their usual meanings.

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

a) Determine the ground state of aluminium atom (z = 13) and represent it using spectral notation.

b) Find the linear velocity of an electron in first and fourth orbit of hydrogen atom.

Given:

$E_0 = 8.85 \times 10^{-12}\ C^2/Nm^2$, $h = 6.64 \times 10^{-34}$ JS

$e = 1.6 \times 10^{-19}$C.

c) A sample of compound is irradiated with mercury source of wavelength 4358 $\mathring{A}$. Raman lines are observed at wavelengths 4620 $\mathring{A}$ and 4420 $\mathring{A}$. Determine the value of Raman shift in wavenumber for each line.

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

i) What is L-S coupling? Obtain the spectral terms for two valence electron atom in p-d configuration. Draw the vector diagram.

ii) What are quantum numbers? Give their physical significance.

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

i) What are stoke and antistoke lines.

ii) State Mosley's law and one application of it.

●●●●●

Total No. of Questions :4]

SEAT No. :

P1075

[Total No. of Pages :2

[5017] - 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 Calculator & log - table is allowed.***

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

a) What is keyword?

b) Give syntax of if statement.

c) State symbols used in flowchart with meaning.

d) Identify valid integer constants from the following: 2, 3.1, 1 e 2, 5, 4 e 2.2.

e) What is user defined function?

f) Explain why break statement is used.

g) State rules for variable name in C.

h) What is flowchart?

i) State advantages of higher level language over assembly level language.

j) Give syntax of rectangle in graphix.

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

a) Evaluate $\int_0^2 \frac{x}{\sqrt{2+x^2}}\,dx$ using Trapezoidal rule.

P.T.O.

b) Explain pointer variable with example.

c) Write C program to print odd numbers between 0 & 50.

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

a) Explain Newton Raphson method to find square root of given equation.

b) Write Note on "storage classes".

c) Write C program to print factorial of given number.

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

a) i) What is operator? Explain any two operators in C programming.

ii) Evaluate $\int_0^6 \frac{1}{(1+x)}\,dx$ by Simpson's $\frac{1}{3}$ rule in 10 subintervals.

b) i) Solve using bisection method

$$x^3 - 1.8x^2 - 10x + 17 = 0.$$

ii) Draw flowchart to find square & cube of numbers from 1 to 15.

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

a) What is looping? Give one example of looping.

b) What is output of the following

```
# include <stdio.h>
main ( )
{
    int i = 8;
    while (i)
    {
        i – –;
        if (i = = 5)
        break;
        printf ("%d", i);
    }
}
```

Total No. of Questions :4]

SEAT No. :

P1076

[Total No. of Pages :12

[5017]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (A): Astronomy and Astrophysics
(2013 Pattern) (Paper-VI) (Elective-I) (Semester-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) ***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) How do we calculate temperature from Wein's law?

b) What are pulsars?

c) What are Binary stars?

d) What is meant by main sequence stars?

e) What is the disadvantage of a Newtonian telescope?

f) What is the difference between a photometer and a spectrometer?

g) What is meant by variable stars?

h) What is Annulas eclipse a rare event?

i) What is cosmic microwave background radiation?

j) What are peculiar galaxies?

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

a) What is the significance of the Hubble's constant?

b) What is meant by solar maxima and solar minima?

c) Explain photospheric phenomenon on the sun.

P.T.O.

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

a) What are the advantages of radio telescopes over optical telescopes?

b) Explain the various types of Eclipses in detail.

c) What is non-optical Astronomy?

Q4) a) Attempt Any One (Eight marks): **[8]**

i) Write a short note on Quazar Red Shift.

ii) Describe the classification of Galaxies according to their shapes.

b) Attempt Any One (Two marks): **[2]**

i) What is Nebula?

ii) What are sun spots?

●●●●●

Total No. of Questions :4]

P1076

[5017]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (B): Elements of Material Science
(2013 Pattern) (Paper-VI) (Elective-I) (Semester-III)

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

Instructions to the candidates:

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

Q1) Attempt all questions (1 mark each): **[10]**

a) State various types of smart materials.

b) Give two importance of phase diagram.

c) State lever rule.

d) What is Ferrite?

e) State various electrical properties of ceramic material.

f) Give two applications of polymers.

g) Define Polymerization.

h) Define the term 'Deformation'.

i) State various types of defects in crystal.

j) State Fick's first law for atomic diffusion.

Q2) Attempt Any Two of the following (5 marks each): **[10]**

a) Explain Impurities in solid with examples.

b) Explain mechanism of plastic deformation by slip.

c) Write a short note on smart memory alloy (SMA).

Q3) Attempt Any Two of the following (5 marks each): **[10[**

a) Find out the critical resolved shear stress for crystal slip on the plane (1, 1, 1) and in the direction (1, 1, 0) with 500 psi stress is applied in the direction (1, –1, 1) plane.

b) The coefficient of diffusivity of Aluminium in copper solution is 4×10^{-5} m^2/sec at 750°C. The activation energy per atom is 3×10^{-19} J/atom. Determine diffusivity related to temperature.

c) Consider syrup made with sugar ($C_6H_{12}O_6$) with 180 amu and water (H_2O) with 18 amu. Based on 50:50 weight ratio, determine mass average molecular weight for syrup.

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

i) Draw and explain in brief the phase diagram of sugar and water.

ii) What is AX-structure? Discuss AX-structure of NaCl type and CsCl type.

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

i) What is cross-linked polymer?

ii) State list of smart materials.

●●●●●

Total No. of Questions :4]

P1076

[5017]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (C): Motion Picture Physics
(2013 Pattern) (Paper-VI) (Elective-I) (Semester-III)

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

Instructions to the candidates:

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

Q1) Attempt all questions (One mark each): **[10]**

a) Draw a diagram of angle of view of telezoom lens.

b) What is use of hypo chemical in developing a B/W nagative?

c) What is lens hood?

d) List the chemicals of D-163.

e) Draw D-log E curve.

f) What is view finder?

g) What is magazine?

h) What is Anmorphic projection?

i) What is master print?

j) List Laboratory special effects.

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

a) Explain in detail the essential important parts of projector.

b) Describe additive method in brief.

c) Write a short note on camera moments.

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

a) Explain lightening techniques in detail.

b) Explain the factors affecting developing the B/W negative.

c) Explain movie camera and its essential parts.

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

i) Explain principle, construction and working of S.L.R. camera.

ii) Explain the formation of image in colour negative.

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

i) Mention the use of fill in back light.

ii) What is slow motion?

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Total No. of Questions :4]

P1076

[5017]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (D): Biophysics
(2013 Pattern) (Paper-VI) (Elective-I) (Semester-III)

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

Instructions to the candidates:

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

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

a) Define surface Tension of a liquid.

b) Define Bond angle.

c) State any two names of amino-acids.

d) Define CMRR.

e) State the working principle of spectrophotometer.

f) Draw PQRST curve of ECG.

g) State any two uses of X-rays.

h) What do you mean by Biostatistics?

i) Define computational biology.

j) What is the full form of NMR?

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

a) Discuss the functional aspects of Mitochondria.

b) Explain the term

i) Resting potential and ii) Capacitive transducer.

c) Describe the construction and working of ECG Machine.

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

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

b) Explain polarizable and Non-polarizable electrodes.

c) What are radiation doses? Explain the term: Nuclear detector.

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 an electron microscope. Explain the working of SEM and TEM.

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

i) What do you mean by genetic code?

ii) State the applications of Radioactivity.

●●●●●

Total No. of Questions :4]

P1076

[5017]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (E): Renewable Energy Sources
(2013 Pattern) (Paper-VI) (Elective-I) (Semester-III)

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

Instructions to the candidates:

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

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

a) What are the conventional sources of energy?

b) State any two limitations of solar energy.

c) State the principle of solar dryer.

d) What is the function of solar collector?

e) What is the range of efficiency of commercial solar cells?

f) State the photo-voltaic principle.

g) Define maximum conversion efficiency.

h) What are the contents of Biomass?

i) Write two factors affecting bio-digestion.

j) Define diffusion radiation.

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

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

b) State the applications of solar photo voltaic system. Discuss water pumping in detail.

c) Describe various types of wind machine rotors.

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

a) State the advantages of floating drum and fixed domed type plant.

b) Calculate the efficiency of solar cell; using the following data.

Given:

V_{OC} = 400 mV, I_{SC} = 30 mA, FF = 0.7

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

c) Assuming Sun as a black body whose temperature is 5762 K, calculate the solar flux. Determine the total radient power emitted from the Sun.

Given:

Radius of Sun's surface: 6.96×10^{8} m

Stefan-Boltzman constant: 5.67×10^{-8} W/m^2 K^4,

Mean Earth-Sun distance: 1.5×10^{11} m.

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

i) State the main types of concentrating collectors and hence discuss parabolic trough collector and Fresnel lens collector.

ii) What is gasifier? Explain the methods for obtaining energy from Biomass.

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

i) State any two advantages and disadvantages of solar water heating system.

ii) What is energy audit?

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Total No. of Questions :4]

P1076

[5017]-3018
T.Y. B.Sc.
PHYSICS
PH-336 (F): Applied Optics
(2013 Pattern) (Paper-VI) (Elective-I) (Semester-III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***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) State Fermat's principle.

b) Define nodal points.

c) What is interference of light?

d) What is a zone plate?

e) What is double refraction?

f) What is positive crystal?

g) What is holography?

h) Explain the maximum angle of acceptance.

i) What is photo voltaic detector?

j) Draw the symbol of p-i-n photodiode.

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

a) Explain the laws of reflection of light using Fermat's principle.

b) Obtain the condition $2\mu t \cos r = m\lambda$ for destructive interference in the reflected system of rays from a thin film.

c) State and explain Malus law.

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

a) Calculate the radii of the first three clear elements of a zone plate, which is designed to bring a parallel beam of liqut of wavelength 6000 $\mathring{A}$ to the first focus at a distance of 2 meters.

b) Determine the Brewsters angle for glass of refractive index 1.5 immersed in water of refractive index 1.33.

c) What are the properties of a hologram?

Q4) a) Attempt Any One (Eight marks): **[8]**

i) Describe the principle, construction and production of interference fringes with Fabry-Perot interferometer.

ii) Explain the attenuation and dispersion mechanism in optical fibers.

b) Attempt Any One (Two marks): **[2]**

i) Write a note on polaroid.

ii) Write the lens equation.

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Total No. of Questions :4]

SEAT No. :

P1077

[Total No. of Pages :3

[5017] - 3019

T.Y.B.Sc.

CHEMISTRY

CH - 331 : Physical Chemistry

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***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 the exponential form of Arrhenius equation.

b) Define the term 'Energy of Activation'.

c) Calculate the specific conductance of a solution whose observed resistance is 210 ohm placed in a cell with cell constant 1.049 cm^{-1}.

d) Define the term 'activity coefficient'.

e) Calculate the rotational constant of No molecule, if the moment of inertia is 1.6395×10^{-39} gcm^2. ($h = 6.624 \times 10^{-27}$erg. sec, $c = 3 \times 10^{10}$ $cm.s^{-1}$).

f) What is Snell's law

g) What is dielectric constant.

h) Calculate frequency for the ultraviolet radiation of wavelength 2000×10^{-8} cm ($c = 3 \times 10^{10}$ cm. s^{-1}).

i) Define the term, phase.

j) Estimate the number of degrees of freedom in the following system.

$$H_2O_{(s)} \rightleftharpoons H_2O_{(l)} \rightleftharpoons H_2O_{(g)}$$

P.T.O.

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

i) Describe half - life method for determination of order of reaction.

ii) Explain in detail : 'Asymmetric effect'.

iii) Explain the Mechanism of Raman effect in the light of quantum theory.

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

i) The dipole moment of certain molecule is 1.73×10^{-18} e.s.u. cm. Calculate the orientation polarisation of the substance at 27°C.

(Boltzman constant, K = 1.38×10^{16} erg. deg^{-1} $molecule^{-1}$ N = 6.023×10^{23} molecules.)

ii) The rate constant for a reaction at 20°C is half of the rate constant at 30°C. Calculate the energy of activation of the reaction.

(R = 1.987 Cal K^{-1}. mol^{-1}).

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

a) State and explain Kohlrausch's low of independent migration of ion. How it is useful in the determination of equivalent conductivity of a weak electrolyte at infinite dilution.

b) Define third order reaction. Give its characteristics in detail.

c) Discuss the phase diagram of water system.

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

OR

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

i) Explain the effect of dilution on specific conductance.

ii) What is phase diagram? Explain the graph of variation of vapour pressure of a liquid with temperature.

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

i) The molecules of $^{1}H^{35}Cl$ shows a strong absorption line of a wavelength 3.465×10^{-4} cm. Assuming origin of the line due to vibration, calculate the force constant for HCl bond.

ii) The equivalent conductance at infinite dilution for NH_4Cl, NaOH and NaCl are 129.8, 217.4 and 108.9 ohm^{-1} cm^2 at 25°C. Calculate the equivalent conductance at infinite dilution of NH_4OH. If the equivalent conductance of 0.001N solution of NH_4OH at 25°C is 9.33, calculate the degree of dissociation of NH_4OH at this concetration.

Total No. of Questions : 4]

SEAT No :

P1078

[Total No. of Pages : 2

[5017]-3020
T.Y.B.Sc.
CHEMISTRY
CH - 332 : Inorganic Chemistry
(2013 Pattern) (Semester III) (Paper - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat and labelled diagrams.***
4) ***Use of log table and calculator is allowed.***
5) ***Atomic numbers : Pt-78, Cr-24, Cu-29,Fe-26, Ag-47, Al-13, pb-82, Ni-28.***

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

a) Give M.O. electron configuration of He^{+}_{2} ion.

b) What is oxidation state of cobalt in $[Co(NH_3)_6]\ Cl_3$?

c) The complex $K_2[pt\ cl_4]$ is electrolyte or non-electrolyte.

d) What type of structural isomerism is shown by $[Pt(NH_3)_2\ Br_2]$ and $[Pt\ (NH_3)_4]\ [Pt\ Br_4]$?

e) Determine the EAN of the metal ion in complex $[CrCH_2o)_6]^{3+}$ ion?

f) What type of hybridisation is shown by the complexion $[CuCl_5]^{3-}$ ion?

g) Define : C. F. S. E.

h) Give the bond order in CO_2 molecule.

i) Give the types of charge transfer spectra.

j) Draw crystal field splitting diagram for tetrahedral complex.

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

i) Write a note on L.C.A.O. Principle.

ii) Explain the formation of $[FeF_6]^{3-}$ complex ion on the basis of V.B.T.

iii) Write I.U.P.A.C. names of following complexes.

1) $[Ag(NH_3)_2]\ Cl$

2) $K_3\ [Al\ (C_2O_4)_3]$

3) $[Pb\ (H_2O)_4]\ Cl_2$

P.T.O.

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

i) Sketch the σ MO_s from two p-orbital on two atoms.

ii) What is the experimental evidence for C.F.S.E.?

iii) Explain the hydrate isomerism with suitable example.

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

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

b) Discuss the formation of $[Ni(NH_3)_6]^{2+}$ complex ion without π bonding on the basis of MOT.

c) For $[Cr(H_2o)_6]^{2+}$ and $[Cr(CN)_6]^{2-}$ Δ_o values are 17830 Cm^{-1} and 26280 Cm^{-1} respectively. The pairing energy is 23520 Cm^{-1}. Calculate.

i) No. of unpaired electrons and

ii) Magnetic properties.

Q4) a) M.O. theory is superior to V.B. theory Justify the statement with reference to paramagnetic nature of oxygen molecule comment how does bond order vary in O_2^-, O_2^{2-} and O_2^+ ions. **[6]**

OR

Answer the following:

i) State wether the following complexes obeys EAN rule or not? **[6]**

1) $[Cu(en)_2]\ SO_4$

2) $[Pt\ Cl_2\ (NH_3)_2]$

3) $(NH_4)_2\ [Fe\ Br_5.\ H_2o]$

ii) Define geometrical isomerism? Draw the geometrical isomers of $[Co\ (en)_2\ Cl_2]^+$ ion.

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

i) Calculate C.F.S.E. of d^4 ion in strong and weak octahedral ligand field.

ii) Give any four assumptions of VBT.

OR

What are the postulates of Werner's coordination theory? **[4]**

✡ ✡ ✡

Total No. of Questions :4]

SEAT No. :

P1079

[Total No. of Pages :3

[5017]-3021
T.Y.B.Sc.
CHEMISTRY
CH -333:Organic Chemistry
(2013 Pattern) (Paper - III)(Semester - III)

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

Instructions to the candidates:

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

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

a) What is specific base catalysis.

b) Trans -1, 4 - dimethyl cyclohexane is optically in active?

c) Which is a good nucleophile amongst $\overset{\ominus}{O}H + \overset{\ominus}{N}H_2$.

d) Write the Cannizaro's reaction of benzaldehyde with formaldehyde.

e) State Saytzeff rule.

f) What is σ complex?

g) N, N- dimethyl aniline undergoes diazonium coupling reaction at P-position. Why?

h) Write the reaction of 2 - methyl propene with HBr in presence of H_2O_2.

i) $I^{\ominus}$ is a good leaving group. Why?

j) Write the reaction of acetone with ethylthiol.

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

i) Explain steric effect with suitable example.

ii) Discuss the mechanism of Reformatsky reaction.

iii) Discuss mechanism of hydroboration - Oxidation of alkene with example.

P.T.O.

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

i) 2 - chlorobutanoic acid is stronger than 3-chlorobutanoic acid. Explain.

ii) Explain IPSO substitution.

iii) Explain EICB mechanism with suitable example.

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

a) Draw chair conformations of Cis-1, 2-dimethyl cyclohexane. Comment on their stability and optical activity.

b) What is E1 mechanism? Discuss the evidences for E1 mechanism.

c) What is SN^2 reaction? Explain SN^2 reaction with the following points -

i) Kinetics

ii) Transition state formation

iii) Back side attack of nucleophile

Q4) a) i) What do you mean by activating and deactivating groups? Explain with suitable examples. **[3]**

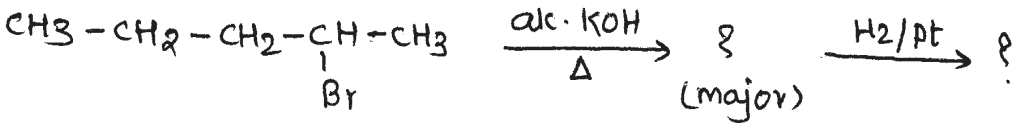
ii) What is ozonolysis? Explain the products obtained by Ozonolysis of 2-methyl - 2 - pentene. **[3]**

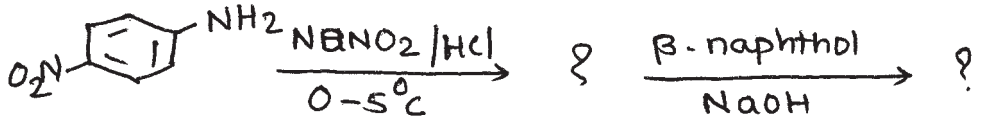
OR

i) What is sulphonation? Discuss mechanism for sulphonation of Benzene. **[3]**

ii) Give the mechanism of addition - elimination of benzaldehyde with phenyl hydrazine. **[3]**

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

i) 

ii) 

OR

b) Write notes on:

i) Cis hydroxylation.

ii) Benzyne intermediate.

EEE

Total No. of Questions : 4]

SEAT No. :

P1080

[Total No. of Pages : 2

[5017]-3022
T.Y. B.Sc.
CHEMISTRY
CH - 334 : Analytical Chemistry
(2013 Pattern) (Paper-IV) (Semester-III)

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

Instructions to the candidates:

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

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

a) What is the effect of common ion on solubility of a sparingly soluble salt.

b) Define Faraday's first law of electrolysis.

c) What do you mean by a absorption filter?

d) Calculate the transmittance of $CuSO_4$ solution when it shows a absorbance of 0.8.

e) What is a indicator electrode in polarography?

f) How a polarographic maxima is supressed in polarography?

g) What is the function of flame in AAS?

h) Draw a typical TG curve.

i) State the different types of interference in FES.

j) State Lambert's - Beer's Law.

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

i) What is co-precipitation? Explain in brief the co-precipitation due to occlusion.

ii) Give a series of events in FES.

iii) Explain the qualitative application of polarography.

P.T.O.

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

i) Give any two point of difference between TGA and DTA.

ii) Calculate the weight of silver deposited when a current of 2.5 Amp is passed through silver nitrate solution for 23 min.

Given: ECE of silver is 1.11×10^{-3}.

iii) Calculate the molar absorptivity of 1.5×10^{-5} M solution having 0.29 absorbance, when placed in a cell of 1.5 cm path length.

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

a) What is solubility and solubility product. Discuss the relation between ionic product and solubility product for precipitation to take place.

b) Enlist the component of spectrophotometer. Explain the photovoltaic cell detector used in spectrophotometer.

c) Draw a neat labelled polarogram. Explain the factors affecting the polarographic wave.

Q4) a) Explain the principle & instrumentation of TGA. **[6]**

OR

i) Write a note on phototube. **[3]**

ii) Explain the advantages of AAS. **[3]**

b) Calculate the diffusion current flowing through a cell containing Ni^{2+} ion having concentration 3.25 millimoles per lit, if the drop rate is 4.5 see and rate of falling mercury is 6 mg/sec. The diffusion coefficient of Ni^{2+} is 6.67×10^{-6} cm^2 per sec. **[4]**

OR

It a solubility of silver chromate is 1.82×10^{-2} g/lit. Calculate its solubility product. Molecular weight of silver chromate is 332.

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Total No. of Questions : 4]

SEAT No. :

P1081

[Total No. of Pages : 2

[5017]-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 diagram and flowsheet wherever necessary.***

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

a) Explain the term yield.

b) Give two uses of ammonia.

c) What is sweetner?

d) Define the term ignition temperature.

e) What is portland cement?

f) Explain the term R&D.

g) Name the catalyst used in manufacturing of ammonia by Haber-Bosch process.

h) What is jellying?

i) What is Devitrification?

j) What is fungicide?

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

i) Distinguish between batch and continious process.

ii) What is oleum? How sulphuric acid is manufacture from oleum?

iii) Give uses of neem oil.

P.T.O.

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

i) Explain the terms a) copy right b) trademark

ii) Write short note on rein forced concrete.

iii) Explain factors deciding plant location.

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

a) What is cracking? Discuss different steps involved in free radical cracking reaction.

b) Explain different traditional techniques used for food preservation.

c) Write note on (i) Boro-silicate. (ii) Optical glass.

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

OR

a) Explain physico-chemical principle involved in manufacturing of nitric acid.

b) Explain different fractions obtained in crude oil distillation. **[4]**

OR

b) Write short note on non-starch polysaccharides.

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Total No. of Questions :4]

SEAT No. :

P1082

[Total No. of Pages :11

[5017] - 3024

T.Y.B.Sc.

CHEMISTRY

CH - 336 (A) : Nuclear Chemistry (913A3)

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

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

Instructions to the candidates:

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

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

a) What is mass defect? Give its relation with binding energy?

b) Define isotones with one example.

c) State the limitations of liquid drop model.

d) State two applications of semi - empirical mass equation.

e) What is magnetic quantum number.

f) Define decay constant. What is its unit?

g) Complete the following nuclear reaction

$$^{24}_{12}Mg + {}^{2}_{1}H \rightarrow .....+ {}^{4}_{2}He$$

h) Define thermonuclear reaction.

i) State two general characteristics of radioactive decay process.

j) What is reaction cross section. What is its unit?

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

i) Write short notes on theory of α - decay.

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

iii) Explain classification of nuclides on the basis of number of protons (Z) & number of neutrons (N).

P.T.O.

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

i) Calculate the binding energy of $^{209}_{83}Bi$.

Given mass of proton = 1.007825 amu

mass of neutron = 1.008665 amu

mass of $^{209}_{83}Bi$ = 208.980 amu

ii) Write short notes on α - energy spectrum.

iii) Discuss the sequence of filling the orbit in nuclear model.

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

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

b) State and explain semi - empirical mass equation.

c) What is Bethe's notations. State different types of nuclear reactions.

Q4) a) Explain Fermi theory of β (beta) decay. **[6]**

OR

Describe the liquid drop model in detail giving postulates.

b) Find the time required to complete 75% of the reaction, if the rate constant of first order reaction is 2.4×10^{-3} sec^{-1}. **[4]**

OR

Explain periodicity in nuclear properties.

Total No. of Questions :4]

P1082

[5017] - 3024

T.Y.B.Sc.

CHEMISTRY

CH - 336 (B) : Polymer Chemistry

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

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

Instructions to the candidates:

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

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

a) Define the term - Plastics.

b) Calculate the molecular weight of polyacrylonitrile whose Dp is 1550.

c) 'Starch is an example of inorganic polymer'. State whether the statement is true or false.

d) Draw the correct structures of

i) Polyacrolein

ii) Polyvinylfluoride

e) Give two important applications of polyethylene.

f) Name any two commonly used colourants in polymer processing.

g) Write the correct structure of diphenyl - methyl - silanol.

h) Explain the term: Fillers.

i) Polymer cellophane was invented by.....

j) What is meant by degree of polymerisation?

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

i) Write a short note on: Rayon polymer.

ii) 'Fire retardants are often added to the polymer before making polymer articles'. Explain.

iii) 'Nylon Fibre is the blessing for fisherman'. Explain.

b) How will you distinguish the following (<u>any two</u>): **[4]**

i) Natural and synthetic polymers.

ii) Linear and branched polymers.

iii) Cationic and anionic polymerisation.

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

a) What is meant by addition polymerisation? Discuss the full account of co-ordination polymerisation - Zieglar Natto catalyst.

b) Define the term step polymerisation. Explain in detail polycondensation reaction.

c) Explain the term polymerisation technique. Give a detailed note on emulsion polymerisation technique.

Q4) a) Attempt any <u>two</u> of the following: **[6]**

i) 'Moleular weight of polymers always expressed in average'. Explain.

ii) Write a short note on: Reactions of aromatic pendant group of polymers.

iii) A container of apples contains set of A, B, C and D with their individual numbers and weight of apples is given below:

Set A contains 30 apples with its weight 200 gm

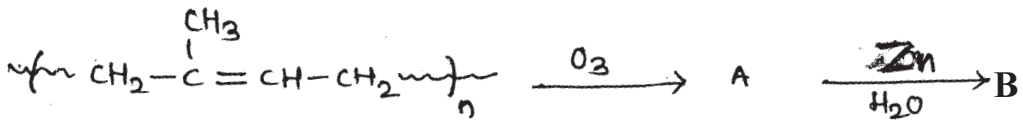
Set B contains 20 apples with its weight 250 gm

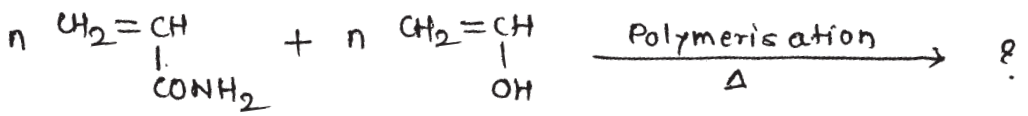
Set C contains 40 apples with its weight 150 gm

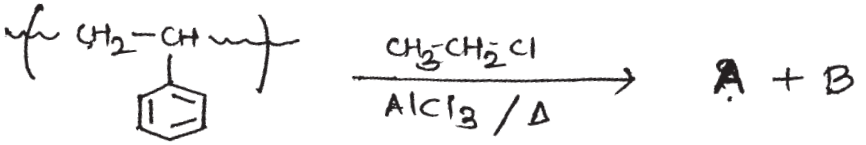
Set D contains 50 apples with its weight 100 gm

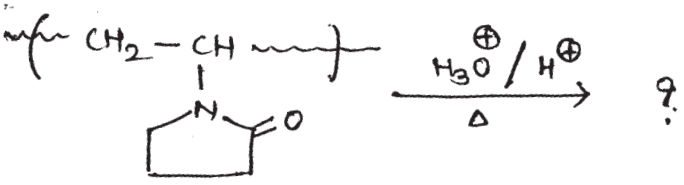
Then calculate the number average $\left(\overline{M_n}\right)$ molecular weight of apples.

b) Complete the following polymeric reactions. **[4]**

i) 

ii) 

iii) 

iv) 

Total No. of Questions :4]

P1082

[5017] - 3024

T.Y.B.Sc.

CHEMISTRY

CH - 336 (C) : Introduction to Biochemistry & Molecular Biology

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

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

Instructions to the candidates:

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

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

a) Give the names of two baisc aminoacids.

b) What happens when monosaccharides react with H_2SO_4.

c) Give two examples of reducing sugars.

d) What is the main function of lysosomes?

e) List out the biomolecules that are involved in composition of membranes.

f) Write the structure of a saturated fatty acid.

g) Name two pancreatic hormones.

h) Deficiency of which vitamin causes Rickets?

i) Define Isoelectric pH.

j) Which chromatography technique is used to separate proteins based on size?

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

i) Write note on factors that stabilise tertiary structure of proteins.

ii) What are storage and structural polysaccharides? Give significance.

iii) Draw the structure of Mitochondria and give its functions.

b) Give the structures of the following (any two): **[4]**

i) Tripalmitin.

ii) Isomaltose.

iii) Dipeptide.

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

a) Explain the distinguishing features of Prokaryotic and Eukaryotic cell.

b) Comment on the types of water soluble vitamins and their role.

c) Discuss the role of C.AMP as second messenger of hormones.

Q4) a) Classify amino acids on the basis of R group. **[6]**

OR

Discuss various types of enzyme inhibition.

b) Write note on types of lipoproteins and their significance. **[4]**

OR

Give the principle, procedure and uses of Thin layer chromatography.

Total No. of Questions :4]

P1082

[5017] - 3024

T.Y.B.Sc.

CHEMISTRY

CH - 336 (D) : Environmental and Green Chemistry (913D3)

(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: **[10]**

a) Define source.

b) Define Biochemical Oxygen Demand (B.O.D.)

c) Write any two Minor components in air.

d) Define Aerosol.

e) Define the pE.

f) Define the term Humin.

g) Define Lithosphere.

h) Give the structure of cyclohexanone.

i) Give example of green reagents.

j) Define term supercritical liquid.

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

i) Explain ozone chemistry in Atmosphere.

ii) What is renewable energy? Give sources of renewable energy.

iii) Explain commercial application of TiO_2.

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

i) Explain pathway of pollutant.

ii) Explain Denitrification.

iii) What is meant by chlorofluorocarbons.

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

a) Explain sources and sinks of NO_X? Give any one effect of NO_X pollution.

b) What is meant by oil pollution. Explain causes and consequence of oil spills.

c) What is Environmental Chemistry? Explain.

Q4) a) Give any four principles of Green Chemistry. **[6]**

OR

Explain ozone layer? Give the mechanism of ozone Depletion.

b) Write short note on any one: **[4]**

i) Explain volatile organic liquids and chlorinated solvent helps green technology.

ii) Green synthesis of Methyl Methacrylate.

Total No. of Questions :4]

P1082

[5017] - 3024

T.Y.B.Sc.

CHEMISTRY

CH - 336 (E) : Agriculture Chemistry (Elective - I)

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

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

Instructions to the candidates:

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

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

a) What is degraded soil?

b) What are stomach insecticides?

c) What is alkaline soil?

d) Define 'surface soil'.

e) What are repellants?

f) Give the importance of soil chemistry.

g) What is complete fertilizer?

h) What do you mean by Residual sodium carbonate?

i) Define 'micronutrients'.

j) Define 'green manuring'.

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

i) Explain about saline alkali soil.

ii) Give classification of herbicides.

iii) What is the role of calcium in the plants?

b) Attempt any two: **[4]**

i) Explain the need of soil liming.

ii) Explain the role of nitrogen and deficiency symptoms of the nitrogen in the plants.

iii) Explain the role of biofertilizers.

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

a) Discuss Horizons of soil.

b) Describe vermicomposting in detail.

c) Discuss manures in detail.

Q4) a) Attempt any two: **[6]**

i) How total dissolved solids are estimated?

ii) Give advantages of mixed fertilizers.

iii) Give physical functions of soil.

b) Attempt any two: **[4]**

i) Buffer action of soil, explain.

ii) pH of the soil, discuss.

iii) Inorganic (Mineral) component of soil.

Total No. of Questions : 4]

SEAT No. :

P1083

[Total No. of Pages : 2

[5017]-3025
T.Y.B.Sc.
BOTANY
BO-331:Cryptogamic Botany
(Algae Fungi Bryophytes and Pteridophytes)
(2013 Pattern) (Semester - III) (Paper - I)

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

Instructions to the candidates:

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

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

a) What is Ligule?

b) What are higher cryptogams.

c) Give any two economic importance of fungi.

d) Enlist the types of Rhizoids in Bryophytes.

e) Give any two general characters of pteridophytes.

f) What is Gemma cup.

g) Which type of stele is found in Selaginella , stem.

h) Give any two uses of Algae.

i) Give functions of air bladder in Sargassum.

j) Give the name of host plant of Tikka disease caused by cercospora.

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

a) Describe the sex organs in Chara.

b) Describe the internal structure of sporophyte of polytrichum.

c) Explain vegetative reproduction in Nostoc.

P.T.O.

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

a) L.S. of strobilus in Selaginella.

b) Internal thallus structure of Marchantia.

c) Thallus structure of Rhizopus.

Q4) Describe Telial and Pycnidial stages in the life cycle of Puccinia graminis var tritici. **[10]**

OR

Describe external morphology and Anatomy of sporophyte of Psilotum.

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Total No. of Questions : 4]

SEAT No. :

P1084

[Total No. of Pages : 2

[5017]-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 indicates full marks.***

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

a) In what way typical plant cell is differ from animal cell.

b) What is unit membrane?

c) Enlist forms of plastids.

d) What is karyotype?

e) Distinguish between nucleoside and nucleotide.

f) Enlist two units for measurement of cell.

g) What is central dogma of molecular biology.

h) Enlist the methods of DNA-repair.

i) What are split genes?

j) What is polytene chromosome?

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

a) Functions of ER.

b) Give the chemical composition of eukaryotic chromosome.

c) Describe DNA damage in brief.

P.T.O.

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

a) Mitochondrial DNA.

b) One gene-one enzyme hypothesis.

c) Transcription apparatus.

Q4) Give ultrastructure, Chemical composition, and functions of golgi apparatus. **[10]**

OR

Define genetic code. Explain the properties of genetic code.

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Total No. of Questions :4]

SEAT No. :

P1085

[Total No. of Pages :2

[5017]-3027
T.Y.B.Sc.
BOTANY
BO -333:Genetics and Evolution
(2013 Pattern) (New Course) (Paper - III)(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) Anwer the following: **[10]**

a) Enlist different branches of genetics.

b) What is phenotype?

c) State law of independent assortment.

d) Define multiple alleles.

e) What are sex influenced genes.

f) Define trisomy.

g) Give any two examples of quantitative traits.

h) What is duplication?

i) State Hardy Weinberg law of gene frequencies.

j) Define epistasis.

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

a) Explain evidences of evolution from genetics.

b) Differentiate between qualitative and quantitative traits.

c) Describe crossing over & its types.

P.T.O.

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

a) Duplicate genes.

b) Chromosome inorphology.

c) Y-linked genes.

Q4) What is allopolyploidy? Describe synthesize of allopolyploidy. **[10]**

OR

What is evolution? Explain modern synthetic theory of evolution. **[10]**

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Total No. of Questions : 4]

SEAT No. :

P1086

[Total No. of Pages : 2

[5017]-3028
T.Y. B.Sc.
BOTANY
BO - 334 : Spermatophyta and Palaeobotany
(2013 Pattern) (New Course) (Paper-IV) (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 economic importance of Gymnosperms.

b) What is manoxylic wood?

c) Give an example of natural system of classification.

d) Mention type of fruit in family - Apocynaceae.

e) Write floral formula of family - Nyctaginaceaes.

f) Give type of inflorescence of family - Asteraceae.

g) What is plant authentication?

h) What is palaeobotany?

i) Give type of pollen grains of Pinus.

j) Write leaf genus of Pentoxylae.

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

a) State the merits of Hutchinson system.

b) Describe flower of Orchidaceae.

c) Write external characters of Rhynia.

P.T.O.

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

a) Bennettitalean theory.

b) Compression.

c) Internal structure Lyginopteris Oldhamia.

Q4) Describe external and internal characters of male and female cone of Gnetum. **[10]**

OR

Give distinguishing characters floral formula and floral diagram of family Magnoliaceae and Cannaceae.

●●●●●

Total No. of Questions : 4]

SEAT No. :

P 1087

[Total No. of Pages :2

[5017] - 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) Attempt the following : **[10]**

a) Define arboriculture.

b) Give the plant source of phosphorus.

c) Mention any two names of growth regulators.

d) What is the ringing?

e) Write any two methods of harvesting mango.

f) Enlist any two horticultural zones of India.

g) Name of any two famous gardens of India.

h) Give any two names of tree spices.

i) Write any two objectives of pruning.

j) Write any two names of cultivar species of Orchid.

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

a) Describe any two artificial methods of vegetative propagation.

b) Describe special practices of Bahar treatment.

c) Describe pre-cooling and pulsing of cut flowers.

P.T.O.

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

a) Mughal garden.

b) Dyeing and painting of cut flower.

c) Nutritional value of fruits and vegetables.

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

OR

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

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Total No. of Questions : 4]

SEAT No. :

P1088

[Total No. of Pages : 2

[5017]-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 labelled diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) Define statistical error.

b) What is promptness index (PI)?

c) Give any two properties of coefficient of correlation.

d) What is sample?

e) Give formula to calculate chi-square test.

f) Define germination stress tolerance index (GSI).

g) What is goodness of fit?

h) Give any two essential features of tabular presentation.

i) Differentiate overlapping and non-over-lapping frequency table.

j) Define mean deviation.

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

a) What is range ? Give its merits and limitations.

b) Describe the use of random number table for achieving randomness.

c) Explain coefficient of determination (r^2).

P.T.O.

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

a) Leaf Area Index(LAI)

b) Line diagram.

c) Normal distribution of probability.

Q4) Define central tendency. Give an account of any two central tendency with their merits and limitations. **[10]**

OR

Describe how to compute frequency, Density and abundance from data obtained through quadrates.

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Total No. of Questions : 4]

SEAT No. :

P1089

[Total No. of Pages : 2

[5017]-3031
T.Y.B.Sc.
ZOOLOGY
ZY-331: Animal Systematics and Diversity (Paper - V)
(2013 Pattern) (New Course) (Semester - III) (Paper - I)

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

Instructions to the candidates:

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

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

a) Write the scientific name of garden lizard.

b) What is torsion?

c) State the function of mantle.

d) State two names of any accessory respiratory organs in fishes.

e) Define diphyodont dentition.

f) Define holozoic nutrition.

g) State the function of Jocobson organ of calotes.

h) Define columella in Pila.

i) State the function of oesophageal pouches.

j) State the function of pulmonary sac in Pila.

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

a) Sketch and label pallial complex in Pila.

b) Describe heart in calotes.

c) Describe dorsal view of brain of frog.

P.T.O.

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

a) Describe dental formula in mammals.

b) Corals.

c) Describe buccal mass in Pila.

Q4) Describe any two sense organs in Pila. **[10]**

OR

Describe digestive system of calotes.

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Total No. of Questions :4]

SEAT No. :

P1090

[Total No. of Pages :2

[5017] - 3032

T.Y.B.Sc.

ZOOLOGY

ZY - 332 : Mammalian Histology

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

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

Instructions to candidates:

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

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

a) Define Villi.

b) Define endocrine glands.

c) What is Graafian follicle?

d) What are goblet cells?

e) Define enamel.

f) Name the types of cells found in Islets of Langerhans.

g) What is taste bud?

h) Define nephron.

i) What are aveoli?

j) What is macula densa?

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

a) Sketch and Label V.S. of skin.

b) Describe T.S. of trachea.

c) Describe fluid connective tissue.

P.T.O.

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

a) Stratified epithelium.

b) Histological structure of liver.

c) Histological structure of testis.

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

OR

Describe the histological structure of kidney.

Total No. of Questions :4]

SEAT No. :

P1091

[Total No. of Pages :2

[5017]-3033
T.Y.B.Sc.
ZOOLOGY
ZY -333:Biological Chemistry
(2013 Pattern) (Paper - III) (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 examples of simple lipids.

b) What is enzyme?

c) Define non essential amino acids.

d) What are anomers?

e) Define diasaccharides.

f) State the use of Sorenson's scale.

g) What is Km?

h) Define non regulatory enzymes.

i) State any two examples of Disaccharides.

j) State biological significance of lipids.

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

a) Explain stereoisomerism in carbohydrates.

b) Explain the concept of buffer with suitable example.

c) Write an account of clinical significance of enzymes.

P.T.O.

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

a) Hetero polysacchrides.

b) Myocardial infarction.

c) Derive Henderson Hasselbalch equation.

Q4) What are enzymes? Describe any two factors influencing an enzyme catalysed reaction. **[10]**

OR

What are amino acids? Give an account of classification of amino acid, based on structure with suitable example.

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Total No. of Questions : 4]

SEAT No. :

P1092

[Total No. of Pages : 2

[5017]-3034
T.Y. B.Sc.
ZOOLOGY
ZY - 334 : Environmental Biology and Toxicology
(2013 Pattern) (Paper-IV) (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) Enlist gaseous pollutants.

b) Define toxicology.

c) Define sewage.

d) What is LDSO?

e) Define threatened species.

f) State any two food additives.

g) What are abiotic components of ecosystem?

h) Enlist noise pollutants.

i) Define food web.

j) What are consumers?

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

a) Explain wildlife conservation in India.

b) Describe non renewable resources.

c) Explain any two factors influencing toxicity.

P.T.O.

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

a) Forest conservation.

b) Role of bioindicators in environmental monitoring.

c) Biotic components.

Q4) What is artificial ecosystem? Explain the structure and function of crop land ecosystem. **[10]**

OR

What is air pollution? Explain the sources and effects of air pollution.

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Total No. of Questions : 4]

SEAT No. :

P1093

[Total No. of Pages : 2

[5017]-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 permanent parasite.

c) State any one control measure for tick.

d) Write the name of vector of Dengue.

e) Give any two symptoms of typhoid.

f) Write the habitat of Ascaris lumbricoides.

g) Define parasite.

h) What is intermediate host?

i) What is periodic parasite.

j) Define helminthology.

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

a) Describe control measures of malaria.

b) Explain parasitism with suitable examples.

c) Explain physiological specificity in host-parasite relationship.

P.T.O.

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

a) Eradication programmes of small pox.

b) Control measures of arthropod vector of Dengue.

c) Parasitological significance of 'Bird flue'.

Q4) Describe in detail the life cycle of Taenia solium. **[10]**

OR

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

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Total No. of Questions : 4]

SEAT No. :

P 1094

[Total No. of Pages :2

[5017] - 3036
T.Y B. Sc.
ZOOLOGY
ZY - 336 (a) : General Pathology
(2013 Pattern) (Semester -III) (Paper - VI)

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

Instructions to the candidates :

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

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

a) Define haemorrhage.
b) Define thrombosis.
c) Define aetiology.
d) What is leukemia?
e) What is mucoid degeneration?
f) What is dry gangrene?
g) Enlist 2 fungal skin diseases.
h) Define jaundice.
i) What is autopsy pathology?
j) Define dystrophic calcification.

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

a) Describe the process of healing.
b) Describe importance of CSF examination.
c) Describe chronic and acute inflammation.

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

a) Causes and effects of hyperemia.
b) Types of lumphocytic leukemia.
c) Tuberculosis.

Q4) What is Ischaemia? Explain causes and effects of ischaemia. **[10]**

OR

What is neoplasia? Explain benign and malignant tumour.

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P.T.O.

Total No. of Questions : 4]

P 1094

[5017] - 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 prokaryotic cell.
b) What is phagocytosis?
c) Give names of any two models of plasma membrane.
d) What are intermediate filaments?
e) What is autophagy?
f) Define oncogene.
g) Give names of two types of lysosomes.
h) Write two functions of Endoplasmic Reticulum.
i) State the function of microfilaments.
j) Define necrosis.

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

a) Describe ultra structure of nuclear membrane.
b) What are membrane receptors?
c) Enlist Functions of Golgi complex.

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

a) Passive transport.
b) Ultrastructure of mitochondrion.
c) Cellular ageing.

Q4) Describe prophase-I of meiotic cell division. Add a note on: Significance of meiotic cell division. **[10]**

OR

What is cancer cell? Describe intrinsic causes of cancer.

☆ ☆ ☆ ☆

Total No. of Questions : 4]

SEAT No. :

P1095

[Total No. of Pages : 2

[5017]-3037
T.Y.B.Sc.
GEOLOGY
GL-331: Mineralogy
(2013 Pattern) (Semester - III) (Paper - I)

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

Instructions to the candidates:

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

Q1) Answer the following questions in 2/3 lines. **[10]**

a) What are uniaxial minerals?

b) What is optic axial angle?

c) What is birefringence?

d) What is dichroism?

e) What is mica plate?

f) Give the structure of felspar.

g) Give the composition of phlogopite.

h) What is mesolite?

i) What are refractory minerals?

j) Name two sulphate minerals?

Q2) Explain the following (any two) **[10]**

a) Becke line method.

b) Composition of galena and properties of pyrite.

c) Pseudomorphism.

P.T.O

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

a) Composition and alteration of pyroxenes.

b) Structure and optical properties of chlorite mineral group.

c) Properties and uses of fluorite.

Q4) Give silicate structure, chemical composition, physical and optical properties, paragenesis and alteration products of Amphibole or garnet mineral group. **[10]**

Total No. of Questions : 4]

SEAT No. :

P1096

[Total No. of Pages : 2

[5017]-3038
T.Y.B.Sc.
GEOLOGY
GL-332 : Igneous Petrology
(2013 Pattern) (Semester-III)(Paper-II)

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

Instructions to candidates:

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

Q1) Answer the following questions. **[10]**

a) Define zone melting.

b) Structures of Basalt.

c) Define petrographic province.

d) Origin of Anorthosite.

e) Define thermal diffusion.

f) Define Gas streaming.

g) Define Xenolith.

h) Give one example of basic and ultrabasic association of petrographic association.

i) Define flow differentiation.

j) Mineral composition of pegmatite.

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

a) Significance of Ropy and flow structure.

b) Origin and occurrence of Granite.

c) Define Magma. Describe its type.

P.T.O.

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

a) Generation of magma in different tectonic settings.

b) Significance of rock kindred.

c) Binary magma with incongurent melting point.

Q4) What is meant by crystal fractionation ? Describe F_o - F_a binary stem? **[10]**

OR

a) Bowen's Discontinuous reaction series. **[5]**

b) Complexity in classification of igneous rocks? **[5]**

❄ ❄ ❄

Total No. of Questions :4]

SEAT No. :

P1097

[Total No. of Pages :2

[5017] - 3039

T.Y.B.Sc.

GEOLOGY

GL - 333 : Sedimentary Petrology

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

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

Instructions to the candidates:

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

Q1) Answer the following in 2/3 lines. **[10]**

a) What are placer deposits?

b) Name any two processes of physical weathering.

c) Name any two heavy minerals.

d) What is progressive dilution?

e) Name any two organic sedimentary structures.

f) Draw neat labelled diagram showing cross bedding.

g) What are quartz arenites?

h) Name any two types of ripple marks.

i) Name any two sedimentary facies.

j) What is sphericity of grains?

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

a) Provenance based on heavy minerals.

b) Syngenetic and epigenetic ores.

c) Tectonic controls on sedimentation.

P.T.O.

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

a) Sedimentology and its branches.

b) Stylolites, concretions and nodules.

c) Sedimentary facies and types.

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

OR

Describe the classification of sedimentary depositional environments.

Total No. of Questions : 4]

SEAT No. :

P1098

[Total No. of Pages : 2

[5017]-3040
T.Y. B.Sc.
GEOLOGY
GL - 334 : Structural Geology
(2013 Pattern) (Paper-IV) (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) What is a couple?

b) What is strain?

c) What are similar folds?

d) What is reclined fold?

e) Define elastic deformation.

f) Explain fracture cleavages.

g) Explain relation between shear fractures and sigma 1.

h) What is reverse fault?

i) Explain release fractures.

j) What is vertical fold?

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

a) Effect of anisotropy and inhomogenity on behaviour of rocks.

b) Explain mechanics of plastic deformation.

c) Shear folding.

P.T.O.

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

a) Concept of stress ellipsoid.

b) Mechanics of normal faulting.

c) Schistosity and slaty cleavages.

Q4) What are dip isogons? Explain Ramsay's classification of folds. **[10]**

OR

What are secondary lineations? Explain with examples.

●●●●●

Total No. of Questions : 4]

SEAT No. :

P1099

[Total No. of Pages : 2

[5017]-3041
T.Y.B.Sc.
GEOLOGY
GL-335:Precambrian Stratigraphy of India
(2013 Pattern) (Semester-III) (Paper-V)

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

Instructions to the candidates:

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

Q1) Answer the following in 2/3 lines. **[10]**

a) What are Kodurites?

b) Give geographical location of chalk hills.

c) On which craton Erinpura Granite is exposed?

d) Closepet Granite.

e) Give subdivisions of kaladgi Supergroup.

f) As per recent Geological time scale, give the classification of Archean Eon into Era.

g) Name any two precambrian mobile belts of India.

h) Give lithostratigraphic subdivision of Delhi supergroup.

i) Where are Dalma volcanics found?

j) Give lithology of Sargur Group.

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

a) Lithostratigraphic classification of vindhyan supergroup.

b) Salkhala Group.

c) Tectonic elements of continents.

P.T.O.

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

a) Iron Ore Group.

b) Current classification of precambrian formations.

c) Precambrians of western lesser Himalaya.

Q4) Give detailed general stratigraphy of Dongargarh supergroup in a tabular form. **[10]**

OR

Give geographic distribution, classification with stratigraphic succession, lithology and economic importance of cuddapah supergroup.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1100

[Total No. of Pages : 2

[5017]-3042
T.Y.B.Sc.
GEOLOGY
GL-336:Applied Geology - I
(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) Answer the following in 2/3 lines: **[10]**

a) What is Tor topography?

b) What is grey body?

c) What is active remote sensing system?

d) What is air-base?

e) State Stefan-Botzman's law.

f) Give spectral band width of thermal IR.

g) What is overlap?

h) What is active sensor?

i) What is area feature?

j) Define geological field work.

Q2) Answer in short (any TWO) **[10]**

a) Explain in breif the role of fectonic forces in landform development.

b) Explain application of remote sensing in soil survey.

c) Give significance of Radial drainage pattern.

P.T.O.

Q3) Answer in short (any TWO) **[10]**

a) Give the factors to be considered during planning of aerial photography.

b) Give the classification of aerial photographs on the basis of lens systems.

c) Briefly explain IRS-Resources at satellite.

Q4) What do you mean by Global positioning system? Explain the working of Global positioning system. **[10]**

OR

Give a brief history of Remote sensing satellites.

✓ ✓ ✓

Total No. of Questions :4]

SEAT No. :

P1101

[Total No. of Pages :3

[5017] - 3043

T.Y.B.Sc.

STATISTICS (Principal)

ST - 331 : Distribution Theory

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Scientific Calculator and Statistical Tables is allowed.***
4) ***Symbols and Abbreviations have their usual meaning.***

Q1) Attempt each of the following:

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

i) If $X \sim \beta_1$ (10, 10) then the value of median is

a) $\frac{15}{10}$ b) $\frac{10}{15}$

c) $\frac{9}{10}$ d) $\frac{1}{2}$

ii) If $X \sim \beta_2$ (2, 3) then harmonic mean of probability distribution of $\frac{1}{X}$ is

a) $\frac{3}{5}$ b) 3

c) $\frac{2}{5}$ d) 1

P.T.O.

iii) If $X \sim W(\alpha, \beta)$ then $Y = \left(\frac{X}{\alpha}\right)^{\beta}$ follows

a) $Exp(1)$ b) $L(0, 1)$

d) $C(0, 1)$ d) $N(0, 1)$

iv) If $X \sim C(\mu, \lambda)$ then mean of X is

a) μ b) does not exist

c) λ d) $\frac{\mu}{\lambda}$

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

i) If $X \sim C(\mu, \lambda)$, the Bowley's coefficient of Skewnes is zero.

ii) If X and Y be two independent standard exponential variates than $X - Y \sim C(0,1)$.

C) Define the following:

i) Lognormal Distribution. **[1]**

ii) Laplace Distribution. **[1]**

D) Attempt the following:

i) State the probability density function of first order statistic. **[1]**

ii) State the relation between distribution functions of beta distribution of first kind and binomial distribution. **[1]**

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

a) If $X \sim \beta_1(m, n)$ then prove that $1 - X \sim \beta_1(n, m)$.

b) If $(X, Y) \sim BN(1, 1, 2^2, 2^2, \rho > 0)$ and $P[X > 4 / Y = 3] = 0.023$ then find the value of ρ.

c) Find the probability distribution of n^{th} order statistic.

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

a) If $X \sim \cup\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, find the probability distribution of Y = tan$X$.

b) If $X \sim L(\mu, \lambda)$, find the distribution function of X and hence find first quartile.

c) If $X \sim G(\alpha, \lambda_1), Y \sim G(\alpha, \lambda_2)$ and X, Y are independent variates, find the probability distribution of $\frac{X}{X+Y}$.

Q4) Attempt any one of the following:

a) i) If $(X, Y) \sim BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find the marginal probability distribution of X. **[3]**

ii) If $X \sim W(\alpha, \beta)$, find the distribution function of X and hence find the quartile deviation. **[7]**

b) i) Derive rth moment about X = a for LN (a, μ, σ^2). Hence find its mean and variance. **[7]**

ii) If $X \sim L(0,1)$, find P [|X|<1]. **[3]**

Total No. of Questions : 4]

SEAT No. :

P1102

[Total No. of Pages : 3

[5017]-3044
T.Y. B.Sc.
STATISTICS (Principal)
ST - 332 : Theory of Estimation
(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) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

Q1) Attempt Each of the following:

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

a) Suppose T_1 and T_2 are unbiased estimators of population parameter θ. If T_1 and T_2 are independent then which one of the following is an unbiased estimator of $\theta(1-\theta)$?

i) $T_1\ T_2$ ii) $T_1 - T_1\ T_2$

iii) $T_1 + T_2$ iv) $\frac{T_1 + T_2}{2}$

b) Which one of the following is unique estimator?

i) Unbiased ii) Biased

iii) UMVUE iv) Sufficient

c) Suppose $X_1\ X_2$ is a random sample from $p(\lambda)$. If $T_1 = \frac{X_1 + X_2}{2}$ and $T_2 = \frac{X_1 + 3X_2}{4}$ then relative efficiency of T_1 with respect to T_2 is,

i) 5/4 ii) 4/5

iii) 1/2 iv) 1

P.T.O.

d) If T is consistent estimator of θ then $\phi(T)$ is consistent estimator for $\phi(\theta)$ provided ϕ is,

i) Linear function

ii) Linear and continuous function

iii) Continuous function

iv) Continuous but not linear

B) In each of the following cases, state whether the given statement is True or False: **[1 each]**

a) There exist infinitely many unbiased estimators of parameter λ for poisson distribution.

b) The estimators obtained by the method of moments are more efficient than maximum likelihood estimators.

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

i) Best Linear Unbiased Estimator.

ii) Consistent estimator.

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

i) Comment on the following statement if T is unbiased estimator of θ then T^2 is an unbiased estimator of θ^2.

ii) State Pitman-Koopman form of probability density function of random variable X.

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

a) Show that r^{th} sample raw moment is an unbiased estimator of r^{th} population raw moment.

b) Let $X_1, X_2, \ldots X_n$ be a random sample of size n from $u(-\theta, \theta)$. Find m.l.e. of θ.

c) Suppose $X_1, X_2, \ldots X_n$ is a random sample of size n from the distribution with probability density function,

$$f(x,\theta) = \begin{cases} \theta x^{\theta-1}, 0 < x < 1 \\ \quad 0 > 0 \\ 0 \quad , \text{otherwise} \end{cases}$$

Obtain the moment estimator of θ.

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

a) Prove that sample mean is a consistent estimator of population mean when population variance is finite.

b) Let $X_1, X_2, \ldots X_n$ be a random sample from $N(0, \sigma^2)$. Obtain $100(1 - \alpha)\%$ confidence interval for σ^2.

c) Find Fisher's information function $I(\alpha)$ for $G(\alpha, \lambda)$ when λ is known.

Q4) Attempt Any One of the following:

a) i) Show that sample mean is MVBUE of parameter μ in case of $N(\mu, \sigma^2)$ where σ^2 is known. **[6]**

ii) Let $X_{(1)}, X_{(2)}, \ldots X_{(10)}$ be the order statistics corresponding to random sample of size 10 from the continuous distribution. Compute the confidence coefficient for the interval $(X_{(2)}, X_{(5)})$ for the population median of the given sample. **[4]**

b) i) State and prove Cramer-Rao inequality. **[7]**

ii) Prove that if T is sufficient estimator of θ, then $\phi(T)$ is also sufficient estimator of θ, provided ϕ is one to one and onto function. **[3]**

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Total No. of Questions :4]

SEAT No. :

P1103

[Total No. of Pages :3

[5017]-3045
T.Y.B.Sc.
STATISTICS (Principal)
ST-333: Sampling Methods
(2013 Pattern) (Paper - III) (Theory) (Semester - III)

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

Instructions to the candidates:

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

Q1) Attempt each of the following:

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

a) The probability that an item is included in a sample of size n under simple random sampling without replacement (SRSWOR) scheme from a population of size N is _____.

i) $\frac{1}{n}$ ii) $\frac{1}{N}$

iii) $\frac{n}{N}$ iv) $\frac{1}{{}^{N}C_{n}}$

b) In sampling for attributes the population mean square (S^2) is given by _____.

i) $\frac{Npq}{N-1}$ ii) $\frac{NPQ}{N-1}$

iii) $\frac{npq}{n-1}$ iv) $\frac{PQ}{N}$

c) In stratified sampling with Neyman allocation _____.

i) $n_i \propto N_i$ ii) $n_i \propto N_i S_i$

iii) $n_i \propto \frac{N_i S_i}{\sqrt{C_i}}$ iv) $n_i \propto \frac{N_i S_i}{C_i}$

P.T.O.

d) The ratio estimator of the population mean $\bar{Y}_R$ is _____.

i) $R_N \bar{X}_N$ ii) $R_N \bar{y}_n$

iii) $r_n \bar{X}_N$ iv) $r_n \bar{x}_n$

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

a) Ratio estimator of population mean is more precise than that of given by simple random sampling without replacement if $\rho < \frac{1}{2} \cdot \frac{C_x}{C_y}$.

b) Regression estimator and ratio estimator cannot be equally precise at any time.

C) Explain the term sampling unit. **[1]**

D) Distinguish between population census and sampling. **[1]**

E) Explain when stratified random sampling is needed. **[1]**

F) State the unbiased estimator of population mean under stratified random sampling. **[1]**

Q2) Attempt any Two of the following:

a) What is an unbiased estimator of population mean in simple random sampling without replacement? Derive the expression for variance of your estimator. **[5]**

b) Obtain the formula for the sample size under SRSWOR so as to achieve the predetermined precision in the estimation of population proportion of a certain attribute with a given confidence coefficient. **[5]**

c) Explain the regression method of estimation of population mean. Show that the regression estimator of population mean is not unbiased estimator. State its standard error. **[5]**

Q3) Attempt any Two of the following:

a) Describe the procedure of drawing a systematic sample. Obtain the variance of the estimator of population mean under systematic sampling method. **[5]**

b) State the salient features of a good questionnaire. **[5]**

c) In a population of 1000 units the population mean is 1200 and the population variance is 100. What should be the size of a sample to be drawn by SRSWOR so that in 95% of the cases the sample mean may differ from population mean by not more than 2% of the population mean? **[5]**

Q4) Attempt any One of the following:

a) Explain what is stratified random sampling. Suggest an unbiased estimator of population mean under stratified random sampling. Obtain the expression for its variance under

i) Proportional allocation and

ii) Neyman allocation.

Further show that Neyman allocation is more precise than proportional allocation in estimating population mean under stratified sampling. **[10]**

b) i) Write a note on Cronbach's coefficient alpha. **[5]**

ii) Show that the systematic sampling is more precise than SRSWOR if variance within systematic samples is larger than population variance as a whole. **[5]**

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Total No. of Questions : 4]

SEAT No. :

P1104

[Total No. of Pages : 3

[5017]-3046
T.Y. B.Sc.
STATISTICS (Principal)
ST - 334 : Design of Experiments
(2013 Pattern) (Paper-IV) (Semester-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 calculator and statistical table is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

Q1) Attempt Each of the following:

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

a) For RBD with 5 treatments applied on 20 experimental units, the error degrees of freedom is

i) 12 ii) 16

iii) 18 iv) 19

b) For a 2^3 factorial experiment in RBD, all the treatment combinations are

i) Non-linear contrasts

ii) Not contrasts

iii) Non-orthogonal contrasts

iv) Linear orthogonal contrasts

c) In the model of Design of experiment, the random error component is assumed to follow i. i. d. normal variates with mean

i) 1 ii) 2

iii) 0 iv) –1

P.T.O.

d) The ANOCOVA is carried out if the observed variable and concomitant variable are

i) Independent ii) Correlated

iii) Always linearly related iv) Uncorrelated

B) State whether the following statements are True or False: **[1 each]**

a) In CRD, all the 3 principles of design of experiments are not used.

b) In partial confounding, unconfounded effects cannot be tested for their significance.

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

a) Treatment.

b) Experimental unit.

D) a) For a 2^2 factorial experiment with factors A and B show that main effects A and B are orthogonal to each other. **[1]**

b) State the test statistic for testing the equality of treatments t_1 and t_2 using critical difference for RBD with b blocks. **[1]**

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

a) State the mathematical model for CRD with assumptions, also obtain least squares estimators of parameters involved.

b) Show that mean sum of squares due to error is unbiased estimator of error variance σ_e^2 in RBD.

c) Compute the relative efficiency of LSD with 5 treatments, w.r.t. corresponding RBD when

i) Rows are used as blocks.

ii) Columns are used as blocks, based on the data

Row.S.S = 16.3, Column.S.S = 18.8, Error.S.S = 19.1.

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

a) Explain Tuckey's procedure for comparing pairs of treatment means in LSD.

b) Explain about ANOCOVA with one real life situation. Also state the least squares estimators of parameters involved in ANOCOVA in CRD.

c) Describe the principles of replication and local control in Design of experiments.

Q4) Attempt Any One of the following:

a) i) Give analysis for testing the significance of regression coefficient β and test for the equality of treatment effects for ANOCOVA in RBD. **[5]**

ii) Explain Yate's procedure to obtain factorial effect totals in 2^3 factorial experiment. **[5]**

b) i) Explain about total and partial confounding in factorial experiments. Give layout of a replicate in 2^3 factorial experiment where interaction effect ABC is confounded. **[6]**

ii) Write a note on Kruskal Wallis H-test. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P1105

[Total No. of Pages : 3

[5017]-3047
T.Y. B.Sc.
STATISTICS (Principal)
ST - 335 : C-Programming (Turbo C)
(2013 Pattern) (Paper-V) (Semester-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 the following: **[1 each]**

a) If $x = 8 \% 3$, then the value assigned to x is

i) 2 ii) 3

iii) 8 iv) 2.5

b) The following is not a valid C-variable name

i) rate ii) date-of-joining

iii) int iv) name

c) The following assignment statement is wrong.

i) $x = 2.5;$ ii) $y = x * z;$

iii) $k = a \% b;$ iv) $a + b = c;$

d) The function, which returns the length of a string is

i) strcpy( ) ii) strlen( )

iii) strcmp( ) iv) strcat( )

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

a) & & is a relational operator.

b) Among all functions, the compilar executes function main( ) first.

P.T.O.

C) a) Write an expression in C for the following arithmetic expression $\frac{x^3 - y^3}{\sqrt{x^2 + xy}}$. **[1]**

b) Give the syntax rule of 'for' loop. **[1]**

D) a) If $a = 7, b = 8, c = 9$ then give the truth value of following condition $((a * b) < (b * c))$. **[1]**

b) Explain the declaration and initialization of a pointer. **[1]**

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

a) Explain the syntax and one illustration for each of the following:

i) printf( )

ii) scanf( )

iii) getchar( )

b) Draw a flowchart to get and print the real roots of a given quadratic equation $ax^2 + bx + c = 0$ if they exist. The flowchart should message "No real roots exist", if they do not exist.

c) Write a C program to check whether a given integer *m* is divisible by another integer *n* or not.

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

a) Explain the syntax and one illustration for each of the following:

i) if ... else.

ii) switch.

b) Define one-dimensional array. State its properties. Give the syntax and one illustration of declaration and initialization of one-dimensional array.

c) Write a C-program to get and print arithmetic mean and variance of given *n* observations $X_1, X_2, ..., X_n$ on a variable X.

Q4) Attempt Any One of the following:

a) i) Explain each of the following with one illustration each: **[4]**

I) User-defined function.

II) Library function.

ii) Write a C-program to check whether a given string is palindrome or not (palindrome eg. malayalam). **[6]**

b) i) Explain with one illustration 'call by reference' of a user-defined function. **[3]**

ii) Write a C-program to read two given matrices A and B, each of order $m \times n$ and obtain and print their addition A + B. **[7]**

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Total No. of Questions :4]

SEAT No. :

P1106

[Total No. of Pages :4

[5017] - 3048

T.Y.B.Sc.

STATISTICS (Principal)

ST - 336 : Introduction to Regression Analysis

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

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

Instructions to the candidates:

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

Q1) Attempt each of the following:

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

i) For a non-linear regression model $y = \beta_0 e^{\beta_1 x} \varepsilon$, the suitable transformation to linearize the model is,

a) $y' = \ln(y)$

b) $y' = \log(y)$ and $x' = \log(x)$

c) $y' = \ln(y)$ and $x' = \log(x)$

d) $y' = 1/y$ and $x' = 1/x$

ii) A linear regression model with 2 regressors has been fitted to 25 items and the value of R^2 was found to be 0.9. For testing the significance of the regression, the value of test statistic is,

a) 126 b) 97

c) 99 d) 103.5

P.T.O.

iii) Standardized residuals in a linear regression model is,

a) $e / \sqrt{MS_{RES}}$ b) $\sqrt{MS_{\text{RES}}} / e$

d) $e / \sqrt{SS_{RES}}$ d) $e / \sqrt{SS_R}$

iv) In a simple linear regression model, if we multiply each x value by a constant say C, then the value of residual and fitted value of Y,

a) remains unchanged

b) residual changes but not fitted value

c) fitted value changes but not residual

d) both of them change

B) In each of the following cases state whether the given statement is true or false. **[1each]**

i) In logistic regression model deviance has an approximate Chi - square distribution with $n - p$ degrees of freedom as, $n \to \infty$.

ii) In linear regression model the least square estimators of regression coefficients have always minimum variance compared with other estimators of regression coefficients.

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

i) Logit transformation.

ii) Adjusted R^2.

D) i) State why do we plot the residuals against $\hat{Y}_i$ and not against the Y_i for the usual linear model. **[1]**

ii) State any two differences between linear and logistic regression. **[1]**

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

a) For a multiple linear regression model, $\mathrm{Y} = \mathrm{X}\beta + \varepsilon$ with $\varepsilon \sim N_p\left(0, \sigma^2 \mathrm{I}_n\right)$. Obtain the variance of least squares estimator of β.

b) Explain K^{th} -order polynomial model in one variable. Discuss in brief the model building strategy in polynomial regression model.

c) Explain the procedure of estimating the parameters of a logistic regression model.

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

a) Consider a simple linear regression model $y = \beta_0 + \beta_1 x + \varepsilon$ where the intercept β_0 is known. Find the least squares estimator $\hat{\beta}_1$ of β_1. Also, find the variance of $\hat{\beta}_1$.

b) The table below shows the output produced by *glm* command in R.

Call:

glm (formula = $y \sim x$, family = "binomial", data = data)

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.0620	-0.4868	0.3915	0.5476	2.1682

Coefficients:	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	6.070884	2.108996	2.879	0.00399**
x	-0.017705	0.006076	-2.914	0.00357**

Signif. codes: 0'***' 0.001'**' 0.01'*' 0.05 '.' 0.1' ' 1

Null deviance: 34.617 on 24 degrees of freedom

Residual deviance: 20.364 on 23 degrees of freedom

AIC:24.364

Using above information,

i) Write a logistic regression model to the response variable *y.* Use simple linear regression model as the structure for the linear predictor.

ii) Does the model deviance indicate that the logistic regression model is adequate?

iii) Provide an interpretation of the parameter β_1 in the model.

iv) To test $H_0: \beta_1 = 0$.

c) Write a short note on method of weighted least squares for fitting linear regression models with changing variances.

Q4) Attempt any one of the following:

a) i) Consider the least squares residuls $e_i = y_i - \hat{y}_i; i = 1, 2, ..., n$ from a simple linear regression model $y = \beta_0 + \beta_1 x + \varepsilon$. Find the variance of the residuals $var(e_i)$. Is the variance of the residuls a constant? Discuss. **[6]**

ii) Write a short note on backward elimination method. **[4]**

b) i) Discuss in brief residual mean square as a criterion for the evaluation of subset regression model associated with variable selection problem.

ii) Explain the procedure to fit the second order polynomial regression model in one variable.

$$y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon$$ **[5+5]**

Total No. of Questions : 4]

SEAT No. :

P1107

[Total No. of Pages : 2

[5017]-3049
T. Y. B. Sc.
GEOGRAPHY
Gg-331:Fundamentals of Human Geography (Part-1)
(2013 Pattern) (Semester - III) (Paper - I)

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

Instructions to the candidates:

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

b) Name any two characteristics of Homo erectus.

c) Define migration.

d) In which continent is the occidental cultural realm mainly found?

e) Who proposed the term stop and go determinism?

f) What are the three components of population change?

g) Samoyeds and Yakuts are sub races of which primary race?

h) Discuss two push factors responsible for migration.

i) Who were the scientists who developed HDI?

j) Define population density.

k) What led to development of Behavioral approach in Human Geography?

l) Which are the categories of human development?

m) Types of cultural diffusion.

P.T.O.

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

a) Population policies of the United Nations.

b) Spatial Approach to Human geography.

c) International migrations.

d) Branches of Human Geography.

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

a) Explain the distribution of population in Asia according to densities.

b) Discuss the Diffusion model of Hagerstrand.

c) Give a classification of the human races.

d) Explain how HDI is an indicator of the relation between human development and economic growth of a country.

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

a) Explain the Demographic Transition Theory.

b) Examine the growth of world population with respect to developed and developing countries.

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Total No. of Questions : 4]

SEAT No. :

P1108

[Total No. of Pages : 2

[5017]-3050
T.Y.B.Sc.
GEOGRAPHY
Gg-332: Geography of Travel and Tourism (part-1)
(2013 Pattern) (Semester-III) (Paper-III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer The following questions in two to three sentences (Any ten): **[10]**

a) Define tourism.

b) State any two sea-side resorts from Goa.

c) What is dynamic element in tourism?

d) What is relative location?

e) Mention any two natural features from Maharashtra which are tourists' attractions.

f) State any two impacts of topography on tourism.

g) Why are hot- spring popular tourist attractions?

h) Mention any two wildlife sanctuaries from the Western Ghats.

i) State any two cultural factors affecting tourism.

j) Define domestic tourist.

k) Name any two social characteristics of tourists.

l) What is 'Length of stay'?

m) Provide any two examples of travel for education.

P.T.O.

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

a) Geography of summer resorts.

b) Accessibility with respect to travel time.

c) Waterfalls as tourist attraction.

d) Health tourism.

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

a) What is the impact of climate on tourism?

b) Describe tourist movements and flows.

c) Why are historical places tourism attractions?

d) What are the types of 'tourist activity'?

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

a) What is seasonality? Describe the effects of seasonality on tourism.

OR

b) Explain, With suitable examples, How travel and tourism are basic needs of man.

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Total No. of Questions :4]

SEAT No. :

P1109

[Total No. of Pages :2

[5017] - 3051

T.Y.B.Sc.

GEOGRAPHY

Gg - 333 : Fundamentals of Geo - informatics (Part - I)

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

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

a) Define Geoinformatics.

b) What is remote sensing?

c) Who coined the term GIS?

d) What is entity?

e) Mention any two GIS tasks.

f) Define DBMS (Data Base Management System).

g) What is digitization?

h) What is spatial data?

i) What is data conversion?

j) Write any two characteristics of vector data.

k) What is multiple query?

l) What is raster data?

m) Importance of GIS.

P.T.O.

Q2) Write short notes (**any two**). **[10]**

a) Write in brief history of GIS.

b) Surveying as data source in GIS.

c) Manipulation as a GIS task.

d) Spatial information technology.

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

a) Give an account of components of GIS.

b) Explain scope and importance of GIS.

c) Describe raster data analysis.

d) Discuss the role of GIS in soil resource management.

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

a) Explain how remote sensing and GIS are helpful in water resource management.

b) What is Raster data? Write characteristic of raster and vector data models in GIS?

Total No. of Questions : 4]

SEAT No. :

P1110

[Total No. of Pages : 2

[5017]-3052
T.Y. B.Sc.
GEOGRAPHY
Gg - 334 : Geography of India-I
(2013 Pattern) (Paper-VII) (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) List the names of neighboring countries of the India.

b) What is geographical area of the India?

c) Which is southern most location of India?

d) Name the highest peak of India.

e) Write any two characteristics of the Indian peninsular region.

f) Name the place of origin of river Ganga.

g) State the name of rivers originates in the western Ghat.

h) Name any two districts of rain shadow zone in Maharashtra.

i) State any two factors controlling Indian monsoon.

j) What is the present percentage of vegetation cover in India?

k) State any two species found in coniferous forest of India.

l) Write any two regions of India characterized by laterite soils.

m) Name any two human factors responsible for soil degradation in India.

P.T.O.

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

a) India-Nepal relationship.

b) The Krishna river system.

c) Major season of Indian climate.

d) Measures of soil conservation.

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

a) Discuss drainage system of river Ganga and river Brahmaputra.

b) Explain the characteristics and importance of northern plains of India.

c) Elaborate origin and mechanisms of Indian monsoon.

d) Write a note on 'Indian island and geopolitics of Indian Ocean'.

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

a) Mention major physiographic region of India and discuss the characteristics of Indian peninsular plateau.

b) Discuss the distribution of major forest types in India with suitable examples.

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Total No. of Questions : 4]

SEAT No. :

P1111

[Total No. of Pages : 2

[5017]-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 candidates :

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

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

a) Define soil.

b) Define soil colloids.

c) Write any two characteristics of zonal soils.

d) Define primary mineral.

e) What do you understand by the process of Elluviation?

f) Define humus.

g) What is soil structure?

h) What is Redox potential?

i) Define soil density.

j) State importance of soil colour.

k) Define Ion exchange.

l) what are soil aggregates?

m) Name any two types of tropical soils.

P.T.O.

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

a) Effect of field capacity on plant growth.

b) Types of soil colloids.

c) Relationship between soil pH and fertility of soil.

d) What is Hydrogen Ion Concentrations?

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

a) What are sources of organic material?

b) What do you understand by mineral horizon?

c) Discuss the methods of classification of soils.

d) What are the measures to be taken to reduce acidity of soil?

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

a) Define clay minerals and their behavior in the tropical environment

b) Define weathering and discuss various types of weathering.

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Total No. of Questions : 4]

SEAT No. :

P 1112

[Total No. of Pages :2

[5017] - 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 or three sentences (Any TEN) **[10]**

a) Give the definition of remote sensing.

b) What do you understand by oblique aerial photograph?

c) State the relationship between wavelength and wave frequency.

d) What are IR colour photos?

e) Define the term wave reflection.

f) Give the percentage forward overlap of a stereo pair photograph.

g) What do mean by the term tilt in aerial photography.

h) Give any two types of information provided on an annotation strip of an aerial photograph.

i) What is meant by the term run number on an aerial photograph?

j) Give the spectral range of IR region.

k) What is a pseudoscopic image?

l) What is meant by diffused solar radiation?

m) Give any two application areas of remote sensing in geography.

P.T.O.

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

a) Properties of electromagnetic waves.

b) Air base and flying height of an aerial photograph.

c) Visible spectral range.

d) Aerial photo scale.

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

a) Explain the types of scattering.

b) Give the usage of principal point and conjugate principal point on an air photograph.

c) Differentiate between IR colour and Normal colour aerial photograph.

d) Describe the types of aerial photograph.

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

a) What is Electromagnetic radiation? Explain in detail properties of Electromagnetic spectrum.

b) Give an account of application of remote sensing in the field of agriculture and environmental studies.

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Total No. of Questions :4]

SEAT No. :

P1113

[Total No. of Pages :2

[5017]-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]**

I		II	
i)	E. coli	a)	'O' and 'H' Antigens
ii)	Shizella spp.	b)	Nosocomial infections
iii)	Salmonella spp.	c)	Opportunistic pathogen
iv)	Vibro spp.	d)	Dysentery
v)	Pseudomonas spp.	e)	Darting motility

B) State true or false: **[3]**

a) Staphylococcal enterotoxin indue fluid and electrolyte loss from host cell.

b) Inflammation of liver is called Cirrhosis.

c) Meningitis is inflammation of meninges.

C) Fill in the blanks: **[2]**

a) _____ infection is the most common STD.

b) Bacteraemia is presence of _____ in urine.

P.T.O.

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

a) Comment on Anatomy of CNS.

b) Compare & contract 'case control' and 'cohort studies'.

c) Comment on 'principle of clinical trials of drug'.

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

a) Pathogenesis of Pseudomonas.

b) Sources and reservoirs of infection.

c) Pathogens, diseases and symptoms of respiratory front.

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

a) Give the classification of streptococci. Comment on the infections caused by streptococci.

b) Describe pathogenesis and treatment of Tuberculosis.

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Total No. of Questions : 4]

SEAT No :

P1114

[Total No. of Pages : 2

[5017]-3056
T.Y.B.Sc.
MICROBIOLOGY
MB - 332 : Genetics & Molecular Biology - I
(2013 Pattern) (Semester - III) (Paper - II)

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

Instructions to the candidates:

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

Q1) a) Attempt the following: **[5]**

i) Define - Chromosome mapping.

ii) DNA - B is a _____.

iii) State true or false - RNA is transcribed using the coding strand of DNA.

iv) The factor required for the elongation step in bacterial translation is _____.

v) State true or false - Prokaryotic mRNA needs extensive processing before it is translated into proteins.

b) Match the following. **[5]**

A		B	
i)	Gregor Mendel	a)	RNA Analysis
ii)	Dna - G	b)	RNA Polymerase
iii)	Northern blot technique	c)	pea plant
iv)	EF - Tμ - GTP	d)	Primase
v)	σ factor	e)	Elongation factor

P.T.O.

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

a) Explain the principle of Isolation & Purification of Genomic DNA in bacteria.

b) Give the safety guidelines for the set - up of Recombinant DNA laboratory.

c) Eukaryotic Ribosomal structure.

Q3) Draw neat labelled diagrams any two: **[10]**

a) Replication fork.

b) Western blot technique.

c) Structure of a eukaryotic MRNA.

Q4) a) What is mapping? Explain steps in Parasexual cycle in A nidulans. Give the significance of parasexual cycle. Add a note of mapping. **[10]**

OR

b) What is Transcription? Explain regulation at the level of transcription with the help of a suitable example.

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Total No. of Questions :4]

SEAT No. :

P1115

[Total No. of Pages :2

[5017] - 3057

T.Y.B.Sc.

MICROBIOLOGY

MB - 333 : Enzymology

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

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

Instructions to candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagram wherever necessary.***

Q1) a) Attempt following. **[3]**

i) Define - allsteric enzymes.

ii) Give two examples of covalent modifying reagents in mapping amino acids.

iii) List two methods of enzyme immobilisation.

b) State True or False: **[2]**

i) Ligand binding occurrs in affinity chromatography.

ii) Eadie - Hof stee plot is not a straight line graph.

c) Match the following: **[5]**

A		B	
i)	Scintillation counter	a)	Ion-exchange resins
ii)	CMC	b)	SDS - PAGE
iii)	Mercap to ethanol	c)	Ultracentrifugation
iv)	Multienzyme complex	d)	Radioactivity measurement
v)	Molecular weight determination	e)	PDH

P.T.O.

Q2) Attempt any two:

a) Explain in brief spectro fluorometric method for enzyme assay. **[10]**

b) Describe in brief concerted feedback inhibition.

c) Explain role of Thiamine pyrophosphate in metabolism.

Q3) Short notes any two: **[10]**

a) Explain cross - linking method of enzyme immobilization.

b) Describe in brief ultracentrifugation technique.

c) Explain stability of enzyme activity and temp.

Q4) Attempt any one:

a) Explain principle, working and applications of molecular exclusion chromatography. **[10]**

b) Derive Brigg's Haldane modification of Michaelis - Menten equation for initial velocity.

Total No. of Questions : 4]

SEAT No. :

P1116

[Total No. of Pages : 2

[5017]-3058
T.Y. B.Sc.
MICROBIOLOGY
MB - 334 : Immunology-I
(2013 Pattern) (Paper-IV) (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)	A. B. H antibodies	i)	APC
b)	B cells	ii)	O blood group
c)	Mucus membrane	iii)	Bombay blood group
d)	A. B antibodies	iv)	Hematopoiesis
e)	Bone marrow	v)	Innate immunity

B) State True or False: **[2]**

a) Thymus dependent antigens do not require TH lymphocytes participation.

b) IgA immunoglobulins are present in secretions.

C) Fill in the blanks: **[2]**

a) _____ predominates earlier in secondary immune response.

b) MHC II presents the antigenic peptide to _____ cells.

D) Define: Xenograft **[1]**

P.T.O.

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

a) Draw neat labelled diagram of spleen.

b) Give the comparative account of different immunoglobulin types.

c) Describe the coagulation cascade.

Q3) Write short notes (Any Two): **[10]**

a) Macrophages.

b) Significance of CMI.

c) Cell adhesion molecules.

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

a) What are antigens? How antigens differs from immunogens? Describe the factors affecting immunogenecity.

b) Give comparative account of classical alternative and lectin pathways of complement activation.

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Total No. of Questions : 4]

SEAT No. :

P1117

[Total No. of Pages :2

[5017] - 3059
T.Y.B.Sc.
MICROBIOLOGY
MB - 335 : Fermentation Technology - I
(2013 pattern) (Semester - III) (Paper - V)

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

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

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

a) Define patent. Give its composition.

b) Match the following :

i)	Labor cost	Membrane filtration
ii)	Sterility test	Solvent selection
iii)	Dielectric constant	Cell distruption
iv)	Solid shear	Recurring expenditure

c) What are the non-recurring expenditures of fermentation industry?

d) State true or false :

i) Laboratory fermenters have a capacity of 25 to 100 gallons.

ii) Auxotrophic mutants are useful for the production of intermediates of unbranched pathway.

e) Fill in the blanks :

i) Carboxy-methyl cellulose is a _____ exchange resin.

ii) RSM stands for _____.

P.T.O.

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

a) Amest test.

b) Continuous sterilization.

c) Plackett and Burman designs.

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

a) Explain the scale-up of sterilization process.

b) Describe biological assay with reference to turbidimetric and growth assay.

c) Describe the method of endotoxin detection for fermentation products.

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

a) Describe the use of analogue resistant mutants and revertants for the production of primary metabolites.

b) Describe centrifugation technique for the recovery of fermentation products.

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Total No. of Questions : 4]

SEAT No. :

P1118

[Total No. of Pages : 2

[5017]-3060
T.Y.B.Sc.
MICROBIOLOGY
MB-336: Food and Dairy Microbiology
(2013 Pattern) (Semester-III) (Paper-VI)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagram wherever necessary.***

Q1) Attempt the following: **[5]**

A) Match the following.

	I		II
a)	Clostridium botulinum.	i)	Enterotoxin
b)	Staphylococcus aureus.	ii)	Neurotoxin
c)	Alkaligenes viscolactis.	iii)	Bread Mold
d)	Rhizopus stolonifer.	iv)	Renin
e)	Recombinant Dairy Enzyme.	v)	Ropiness

B) Fill in the blank: **[1]**

_____antibiotic is used for food preservation.

C) Define **[1]**

Tonned milk.

D) State true or false **[1]**

a) PH of mastitic milk is 7

b) Temperature used in UHT Pasteurization is greater than 100^{o}c **[1]**

E) Write any two organisms involved in spoilage of eggs. **[1]**

P.T.O.

Q2) Attempt any TWO. **[10]**

a) Describe milk borne diseases.

b) Explain food sanitation

c) Describe sources of food-spoilage Microorganisms.

Q3) Comment on any TWO **[10]**

a) Milk Pasteurization by LTH.

b) Brucella Ring test and tests for Mastitis.

c) Food infection by Salmonella Typhimurium.

Q4) Attempt any ONE.

a) Explain the spoilage of meat and poultry products. Describe the food preservation by canning. **[10]**

b) Define milk. Describe the types and composition of milk.

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Total No. of Questions :4]

SEAT No. :

P1119

[Total No. of Pages :2

[5017] - 3061

T.Y.B.Sc.

ELECTRONIC SCIENCE

EL - 331 : Advanced Digital Systems Design

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

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) Write two compiler directives in verilog. **[1]**

b) State two basic classes of FPGA. **[1]**

c) What is Moore sequential machine model? **[1]**

d) What do you mean by ports in verilog. **[1]**

e) Write highest level and lowest leval of abstraction provided by verilog. **[2]**

f) State two advantages of ROM as a PLD. **[2]**

g) Define state equivalence theorem. **[2]**

h) List relational operators used in verilog. **[2]**

Q2) Attempt any two of the following:

a) Explain Implication chart state reduction technique using suitable state table. **[4]**

b) Write the meaning of the following numbers in verilog. **[4]**

i) 9432 ii) 5 'hoFF

ii) 'h 837ff iv) –9d5

c) Write short note on complex programmable Logic Devices. **[4]**

P.T.O.

Q3) Attempt any two of the following:

a) List structured procedure statements in verilog. Describe them with examples. **[4]**

b) Draw the block diagram of Programmable Logic Array and explain its working. **[4]**

c) Write short note on 'ASM' symbols. **[4]**

Q4) Attempt any two of the following:

a) Draw the block diagram of 'Automatic Tablet Filling System'. Describe its working. **[6]**

b) i) Explain in verilog - conditional statements with examples. **[3]**

ii) State 3 ways of specifying delays in continuous assignment statements and explain ony one with example. **[3]**

c) i) State and explain different types of variables used for state machine. **[3]**

ii) What is state assignment technique? Write its importance. **[3]**

OR

Attempt all of the following:

a) Write program in verilog for 2 to 4 decoder using NADA gates by Gate Level Modeling. **[4]**

b) Implement following output functions using PAL. **[4]**

$f_1 = \overline{x}\ \overline{y}\ \overline{z} + y\ \overline{z} + x\ y$

$f_2 = \overline{x}\ y\ \overline{z} + x\ y\ z + \overline{x}\ z$ specify its size.

c) Draw the merger graph for following incompletely specified state table. Find compatible states. **[4]**

Present state	Next state, Output		
	I_1	I_2	I_3
A	E, 0	B, 0	C, –
B	–, –	D, –	B, 0
C	E, –	D, –	C, 0
D	C, 0	–, –	B, 1
E	C, 0	–, –	B, 1

Total No. of Questions : 4]

SEAT No :

P1120

[Total No. of Pages : 2

[5017]-3062
T.Y.B.Sc.
MICROCONTROLLER
EL - 332: Electronic Science
(2013 Pattern) (Semester - III) (Paper - II)

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) Write the inportance of registor B of 8051. **[1]**

b) List different registors of 8051 used as memory pointers. **[1]**

c) What is OV Flag? **[1]**

d) What is an interrupt? **[1]**

e) State the difference between JNZ & DJNZ instructions. **[2]**

f) Write the assembly language instructions to perform the following operations. **[2]**

i) Load Accumulator with 97H.

ii) Find 1st complement of a number in Accumulator.

g) Give the difference between ADD & ADDC instructions. **[2]**

h) List the tools used in program designing. **[2]**

Q2) Attempt any two of the following:

a) Draw the format of PSW registor & explain the function of each bit in it. **[4]**

b) Draw the memory map of internal RAM of 8051. Explain different parts of internal RAM. **[4]**

c) Explain interrupt system of 8051. **[4]**

P.T.O.

Q3) Attempt any two of the following:

a) Write a short note on "JUMP" instructions. **[4]**

b) Explain the terms Editor, Assembler, Compiler & Linker. **[4]**

c) Draw the various symbols used to draw flow charts & explain them. **[4]**

Q4) Attempt any two of the following:

a) Draw the diagram to interface single digit seven segment display to 8051. Write assembly language program to display decimal numbers from 0 to 9. **[6]**

b) Draw the internal block diagram of 8051 & write the features of 8051. **[6]**

c) Draw the interfacing diagram of stepper motor with 8051. Write an assembly language program to rotate the motor in clockwise direction. **[6]**

OR

Attempt all of the following:

a) Write an assembly language program to add BCD no s stored in memory location (31H) & (32H). Store the result in memory location 33H. **[4]**

b) Write an assembly language program to toggle all the bits of port PO with certain delay. **[4]**

c) Draw the interfacing diagram of LCD with 8051. State the advantages of LCD over seven segment display. **[4]**

✡ ✡ ✡

Total No. of Questions :4]

SEAT No. :

P1121

[Total No. of Pages :2

[5017] - 3063

T.Y.B.Sc.

ELECTRONIC SCIENCE

EL - 333 : Analog circuit Design & Applications of Linear ICS

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

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

Instructions:

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

Q1) Answer all of the following.

a) What is guarding? **[1]**

b) Define aperture time of sample & hold circuit. **[1]**

c) List different voltage options available for voltage regulator IC 78xx. **[1]**

d) State applications of PLL. **[1]**

e) Write the values of V_{ref} and out put voltage range for regulator IC Lm 317. **[2]**

f) Draw the circuit diagram of as table multivibrator using IC 555. **[2]**

g) "Capacitor discharges through discharge terminal of IC 555". Comment **[2]**

h) Give examples of linear voltage regulators. **[2]**

Q2) Attempt any two of the following.

a) What are the factors which affects closed loop stability of op-amp? Explain any one. **[4]**

b) Explain the working of transdiode configuration of Logarithmic amplifier. **[4]**

c) Explain the working of IC 555 with it's internal block diagram. **[4]**

P.T.O.

Q3) Attempt any two of the following.

a) What is peak detector? Explain the working of peak detector using op-amp. **[4]**

b) What is comparator? Explain its application as ON-off controller. **[4]**

c) Explain the working of second order low pass filter. **[4]**

Q4) Attempt any two of the following.

a) i) What is supply by passing? **[3]**

ii) What is interference noise in case of op-amp? **[3]**

b) i) What are the limitations of log amplifier with diode as a log element? **[3]**

ii) Explain the working of PLL as frequency multiplier. **[3]**

c) Draw the circuit diagram for low voltage regulator and high voltage regulator by using IC 723. Write expression for output voltages. **[6]**

OR

Q4) Attempt all of the following.

a) Design adjustable voltage regulator for 5v to 12v by using IC Lm 317. **[4]**

b) For monostable mutivibrator using op-amp C=0.1 μf, R=100kΩ, R_1=10kΩ, R_2=15kΩ; Calculate the duration of pulse width. **[4]**

c) In VCO using IC 566, if V_{cc}=15V, V_c=13V, C_1=0.0068 μf, Determine the change in output frequency if R_1 is varied from 4kΩ to 18kΩ. **[4]**

Total No. of Questions : 4]

SEAT No. :

P1122

[Total No. of Pages : 2

[5017]-3064
T.Y. B.Sc.
ELECTRONIC - SCIENCE
EL - 334 : Principles of Semiconductor Devices
(2013 Pattern) (Paper-IV) (Semester-III)

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

Instructions to the candidates:

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

Q1) Attempt All of the following:

a) What is unit cell? **[1]**

b) Explain the term epitaxial growth. **[1]**

c) "FET is voltage controlled device" - Comment. **[1]**

d) State the difference between JFET and MESFET. **[1]**

e) What do you mean by effective mass of an electron? **[2]**

f) When an ohmic contact is formed? **[2]**

g) Define the terms α and β in bipolar junction transistor. **[2]**

h) Explain emitter crowding effect. **[2]**

Q2) Attempt Any Two of the following:

a) With the help of energy band structure diagram explain the difference between intrinsic and extrinsic semiconductor. **[4]**

b) What do you mean by crystal growth? Explain the vapour phase epitaxy. **[4]**

c) Discuss recombination in direct and indirect semiconductors. **[4]**

P.T.O.

Q3) Attempt Any Two of the following:

a) Discuss the process of avalanche breakdown in zener diode. **[4]**

b) Write a note on rectifying contacts. **[4]**

c) With the help of neat labelled diagram explain the switching operation of a transistor. **[4]**

Q4) Attempt Any Two of the following:

a) Draw the band structure of metal, semiconductor and inswator at 0°k and explain the difference between them. **[6]**

b) Discuss how the space change is formed at a PN junction. **[6]**

c) Explain the effect of substrate bias effect in MOSFET. **[6]**

OR

Attempt All of the following:

a) Explain the thermal effect in bipolar junction transistor. **[4]**

b) With suitable diagram explain the output characteristics of MOSFET. **[4]**

c) Explain the electrical equivalent circuit of MOSFET. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P1123

[Total No. of Pages : 3

[5017]-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) ***Use for calculator is allowed.***

Q1) Answer all of the following.

a) What is pointer? **[1]**

b) What is meaning of \n in c program? **[1]**

c) Explain the term 'f print f'. **[1]**

d) What do you mean by keywords in 'C'? **[1]**

e) Give rules for evaluation of expression in 'C'. **[2]**

f) Explain the term 'getc' and 'put c'. **[2]**

g) Explain function strcmp ( ) in 'C'. **[2]**

h) State basic file operation in 'C'. **[2]**

Q2) Answer any TWO of the following.

a) Explain 'switch' statement. How 'break' statement is usefull in C. **[4]**

b) Explain function with no arguments and no return values. **[4]**

c) Explain the files in 'c' to store data. **[4]**

Q3) Answer any TWO of the following.

a) What is a loop? Explain 'while' loop in 'c'. **[4]**

b) Define algorithm and explain properties of algorithm. **[4]**

P.T.O.

c) What will be the output of following program.

```
main ( )
{
int a, b, *P1,*P2, X, Y, Z;
a=12 ; b=4;
P1=&a;
P2=&b;
X= *P1 **P2 -6;
Y= 4*-* P2/*P1 + 10;
Printf(" a=%u \n",P1);
Printf(" b=%u \n",P2);
Printf("\n");
Printf("a=%d, b=%d\n", a,b);
Printf("x=%d, y=%d\n", x,y);
*P2 = *P2 + 3;
*P1 = *P2 - 5
z = *P1 *   * P2 - 6;
Printf("\n a=%d, b=%d",a,b);
printf("z=%d\n",z);
}
```

[4]

Q4) Answer any TWO of the following.

a) Write a program to print first 10even numbers using 'do-while'100P. **[6]**

b) Write algorithm using bubble sort to arrange 10 numbers in descending order. **[6]**

c) What is function? Explain the meaning of call by value and call by reference. **[6]**

OR

Q4) Answer all of the following.

a) List different types of decision making statements and explain if - else statement. **[4]**

b) Write a program to display first 10 fibonaci numbers using one dimentional array. **[4]**

c) Write algorithm to arrange n elements in descending order using insertion sort algorithm. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P1124

[Total No. of Pages : 4

[5017]-3066
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL-336(A) : Fiber Optic Communication(Optional)
(2013 Pattern) (Semester - III)(Paper - VI)

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) Define critical angle. **[1]**

b) What is fiber splice? **[1]**

c) What do you mean by LASER? **[1]**

d) What is acceptance cone? **[1]**

e) State different types of data links. **[2]**

f) Classify optical fibers based on Index profile. **[2]**

g) State the names of blocks used in flber optic communication block diagram. **[2]**

h) "The energy of incident photon must be very large to obtain good responsivity" comment. **[2]**

Q2) Attempt any two of the following:

a) Derive the expression for numerical aperture(NA) of fiber optic cable based on ray theory analysis. **[4]**

b) Write a short note on PIN photo detector. **[4]**

c) Explain the method used for the measurement of diameter of fiber optic cable. **[4]**

P.T.O.

Q3) Attempt any two of the following.

a) State different losses in fiber optic cable and discuss any two in details. **[4]**

b) With the neat diagram explain Snell's law, critical angle and propagation of light in optic fiber cable. **[4]**

c) State selection criteria of fiber optic cable for short haul, long haul and high speed data links. **[4]**

Q4) Attempt any two of the following.

a) Explain in detail the dispersion measurement method of fiber optic cable. **[6]**

b) Explain the basic differnce between the principle of emission of light in LED and LASER diode. **[6]**

c) Write a full note on long haul and short haul communication. **[6]**

OR

Attempt all of the following.

a) A multimode fiber with care RI, n_1=1.90 having relative refractive index difference of 4% and operating at wavelength of 0.80 μ m. Estimate the critical radius of curvarture at which large bending loss occurs. **[4]**

b) When 3×10^{11} photons each with a wavelength of 0.80 μm are incident on a photodiode, on average 1.4×10^{11} electrons are collected at the terminals of the device. Determine the quantum efficiency and the responsivity of the photodiode at 0.80 μ m. **[4]**

c) A multimode graded index fiber shows total pulse broadening of 0.4 μ s over a distance of 100 km. Estimate **[4]**

i) The maximum profile bandwidth on link.

ii) The pulse dispersion per unit length.

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Total No. of Questions : 4]

P1124

[5017]-3066
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 336(B) : Electronic Product Design and Entrepreneurship
(Optional)
(2013 Pattern) (Semester - III)(Paper - VI)

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

Instructions to the candidates:

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

Q1) Attempt all of the following.

a) What is system failure? **[1]**

b) What is small business? **[1]**

c) What is co-operative society? **[1]**

d) Define the term pricing of product. **[1]**

e) Explain the term incentive for small business development. **[2]**

f) Find out the failure rate, if 1000 microcontroller chips are operated for a period of 1000 hours; out of which 10 fails. **[2]**

g) State the objectives of entrepreneurship development. **[2]**

h) Explain the concept of information for starting the business. **[2]**

Q2) Attempt any <u>two</u> of the following.

a) Write a short note on cash flow and fund flow. **[4]**

b) What are the uses of decision support system. **[4]**

c) State the steps for registration of partnership firm. **[4]**

Q3) Attempt any <u>two</u> of the following.

a) Explain the factors to be considered for starting business. **[4]**

b) Explain different incentives for small business development. **[4]**

c) Explain the steps for electronic product design with neat diagram. **[4]**

Q4) Attempt any <u>two</u> of the following.

a) State and explain different elements of marketing mix. **[6]**

b) State and explain different sources of finance. **[6]**

c) Explain the factors affecting reliability of product with neat block diagram. **[6]**

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Total No. of Questions :4]

SEAT No. :

P1125

[Total No. of Pages :2

[5017] - 3067

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 301 : India's Foreign and Defence Policy

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

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 Sentences each: **[16]**

a) Define Foreign policy.

b) Define Threat Perception.

c) Define Ideology.

d) What are the objectives of India's Foreign policy? Write any two

e) Define national security.

f) Define perspective planning.

g) Define world order.

h) State the meaning of scientific defence research.

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

a) Describe principles of India's defence policy.

b) Write a note on India's national interest.

c) Discuss objectives of India's defence policy.

P.T.O.

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

a) India's Nuclear policy.

b) India's maritime security.

c) India's internal security.

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

a) Explain India's foreign policy towards South Asian countries.

b) Discuss India's security consideration in nuclear age.

Total No. of Questions : 4]

SEAT No :

P1126

[Total No. of Pages : 2

[5017]-3068
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 302 : Defence Economics
(2013 Pattren)(Semester - III) (Paper - II)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 Sentences each: **[16]**

a) Define defence budgeting.

b) Define grand strategy.

c) Define national power.

d) Write any two Characteristics of war time economy.

e) Define economic mobilization of war.

f) Write full form of DPSU.

g) What do you mean by defence vs development?

h) Write any two domestic sources of war finance.

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

a) Explain economic consequences of war.

b) Describe elements of war potential.

c) Explain foreign sources of war finance.

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

a) Trends in India's defence expenditure.

b) Characteristics of Indian economy.

c) Concept of public good.

P.T.O.

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

a) Write a note on Defence vs Development.

b) Describe determinants of defence expenditure.

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Total No. of Questions :4]

SEAT No. :

P1127

[Total No. of Pages :2

[5017] - 3069

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 303 : Research Methodology

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

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

Instructions to candidates:

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

Q1) Answer in 2 to 4 sentences each. **[16]**

a) Introduce research.

b) What is meant by observation method?

c) Define secondary data.

d) Write the importance of scientific methods in research.

e) How Physical Sciences differ from Social Sciences in objectivity?

f) What do you understand by Action research?

g) What is Historical research?

h) What is concept?

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

a) write the role of research in Security Studies.

b) Write about the main features of research.

c) Write about the significance of research.

P.T.O.

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

a) Methodical Process and Steps in Research.

b) Characteristics of questionnaire.

c) Need of research in areas of National Security.

Q4) Answer in 16 to 20 sentences (any one). **[8]**

a) Discuss the justifications of Hypothesis and Research design in a research.

b) Explain about the Systematic Approach in Research Report.

Total No. of Questions : 4]

SEAT No. :

P1128

[Total No. of Pages : 2

[5017]-3070
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 304 : Science, Technology and National Security
(2013 Pattern) (Paper-IV) (Semester-III)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each: **[16]**

a) Define Science.

b) Define Technology.

c) Define National Security.

d) What is Space Science?

e) What is Material Science?

f) Define Aeronautics.

g) What is meant by High Energy Physics?

h) How is meant by RMA?

Q2) Answer in 8 to 10 sentences each (Any Two): **[8]**

a) Write about the strides in military technological revolution.

b) Write about the requirement of small arms weapons.

c) Write the strategic application of satellite.

P.T.O.

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

a) Political Impact of Transfer of Military Technology.

b) Military Impact of Transfer of Military Technology.

c) Economic Impact of Transfer of Military Technology.

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

a) Explain about the evolution of Science and its application in Theory of Flight.

b) Explain about the Foreign Collaboration in defence production.

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Total No. of Questions : 4]

SEAT No. :

P1129

[Total No. of Pages : 2

[5017]-3071
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-305: Defence Planning and Management In India
(2013 Pattern) (Semester-III) (Paper-V)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each. **[16]**

a) Define the term 'C4 ISR'

b) What is MANAGEMENT?

c) What do you mean by HR MANAGEMENT?

d) Define 'Management of Technology'.

e) Introduce GTRE.

f) What is Technology Life-Cycle?

g) Introduce Mig-29.

h) Where College of Defence Management is located and what is its purpose?

Q2) Answer in 8 to 10 sentences each (any TWO): **[8]**

a) Write about the nature of management.

b) Write the applications of war principles in corporate management.

c) Why Team Building is important in armed forces?

P.T.O.

Q3) Write Short notes on (any TWO) **[8]**

a) Industrial management vs military management.

b) Human Resource Management.

c) Concept of Defence Planning and Management.

Q4) Answer in 16 to 20 sentences (any ONE) **[8]**

a) Discuss the Principles of Management.

b) Do you think that today's battle dynamism needs a good planning and management? Discuss.

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Total No. of Questions : 4]

SEAT No. :

P1130

[Total No. of Pages : 4

[5017]-3072
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-306(A) : Military and Media(Optional)
(2013 Pattern) (Semester - III) (Paper - VI)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each. **[16]**

a) Write the duties of Defence Journalist.

b) Write the type of journalism.

c) Define Military Science.

d) What do you understand by an all weather aircraft?

e) What do you understand by one class and mixed class army?

f) What are the functions of Training Command of IAF?

g) Elaborate AWACS and write its application.

h) What do you mean by the ABC weapons?

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

a) Explain the functions of CCS.

b) Write a report on ensuing Aerospace Commands.

c) Comment on the excessive media coverage of 26/11.

P.T.O.

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

a) Induction of Women in armed Forces.

b) Role of Security Forces in Internal Security.

c) Media and Military.

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

a) Write a report on NDA passing out Parade.

b) What are the ingredients to Defence Journalism?

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Total No. of Questions : 4]

P1130

[5017]-3072
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 306(B) : Armed Conflicts and Human Rights (Optional)
(2013 Pattern) (Semester -III) (Paper - VI)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each. **[16]**

a) Define POW.

b) Define Combatants.

c) What is War Neurosis?

d) Define Propaganda.

e) Define Military Conflict.

f) Define Military Intervention.

g) What is Human Right?

h) Define War.

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

a) What is the application of armed conflict?

b) Explain the Theory of Military Intervention.

c) Write about the protections of human right.

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

a) Importance of Human right for Armed Forces.

b) Wounded and Sick Soldiers.

c) Theory of Justice.

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

a) Give good reason for, why protection of human right is essential during war?

b) Explain about the Coercive Humanitarianism.

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Total No. of Questions : 4]

P 1131

SEAT No. :

[Total No. of Pages :2

[5017] - 3073
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 307 (A) : Disaster Management
(2013 Pattern) (Semester -III) (Paper - VII)

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

Instructions to the candidates :

1) ***All questions are Compulsory.***
2) ***Figures to the Right indicate full marks.***

Q1) Answer in 2 to 4 Sentences each : **[16]**

a) Define disaster.
b) Define environmental disaster.
c) State the meaning of professional training in managing disaster.
d) State any two limitations of disaster Management.
e) Write any two roles of social scientist in disaster management.
f) Define Global warming.
g) State the meaning of public awareness in disaster management.
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 process of settlement during post disaster phase.

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.

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P.T.O.

Total No. of Questions : 4]

P 1131

[5017] - 3073
T. Y. B. Sc.
DEFENCE AND STRATEGIC STUDIES
DS : - 307 (B) : Global Security - I
(2013 Pattern) (Semester -III) (Paper - VII)

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

Instructions to the candidates :

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

Q1) Answer in 2 to 4 Sentences each : **[16]**

a) Define Global warming.
b) Define Terrorism.
c) Define Ethnicity
d) State the meaning of global governance.
e) Define world peace.
f) State any two objectives of U.N.O.
g) Define international law.
h) state the meaning of international politics.

Q2) Answer in 8 to10 Sentences each (any two) : **[8]**

a) Describe global warming and its causes.
b) Explain Kashmir dispute between India and Pakistan.
c) Discuss genesis of the Arab-Israel conflict.

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

a) India-China border issue.
b) Oil-as a source of conflict.
c) Terrorism as a global problem.

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

a) Explain peaceful uses of nuclear energy.
b) Discuss role of major powers in Afganistan.

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Total No. of Questions : 4]

SEAT No. :

P1132

[Total No. of Pages : 4

[5017]-3074
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 308(A): Indian Military Strategy (1857-1947)
(2013 Pattern) (Semester - III) (Paper - VIII)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each:- **[16]**

a) State the duration of world war-I.

b) What do you mean by "Military History"?

c) What do you mean by Blitzkrieg?

d) Define "Limited war".

e) What do you mean by "Battle cry"?

f) Define "Strategy".

g) During world war-I which division was moved to the Persian Gulf?

h) What was the Military Strategy of India during world war-II?

Q2) Answer in 8 or 10 sentences [Any Two] **[8]**

a) What do you know about H.M. Cheluram.

b) Explain the battle efficiency of Indian soldiers as per British perception.

c) Write a few lines on "Strategy".

P.T.O.

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

a) The Siege of Kutal Amara.

b) Goversingh Negi.

c) Indian National Army.

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

a) Explain the role of Indian Army during world war - I.

b) Discuss the sources of "Indian Military History".

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Total No. of Questions : 4]

P1132

[5017]-3074
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 308(B): Indian Military Strategy (1630-1680)
(2013 Pattern) (Semester - III) (Paper - VIII)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each:- **[16]**

a) What was the outcome from battle of Purandar?

b) Why Shivaji fought a war with Vankoji?

c) Who was Shahajiraje bhonsale?

d) State any four names of Shivaji's fort.

e) Write the basic aim of Shivaji's Karnataka campaign.

f) Why Shivaji conquerred Jawali territory?

g) What do you mean by Ashttapradhan Mandal.

h) Who was the chief of Shivaji's Navy?

Q2) Answer in 8 or 10 sentences [Any Two] **[8]**

a) Write in brief causes of Karnataka campaign.

b) Write a few lines on "Mirza Raje Jaisingh"

c) Explain in brief the role of Dilerkhan during battle of Purandar.

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

a) Fort of Purandar.

b) Religious conditions of Maharashtra before Shivaji.

c) Chandrarao More

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

a) Write an essay on "Shivaji's Karnataka campaign"

b) Explain in detail "Raid on Shahistekhan".

x x x

Total No. of Questions :4]

SEAT No. :

P1133

[Total No. of Pages :4

[5017]-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) What do you mean by Regional security?

b) State the previous title of W.T.O.

c) Who was the basic enemy of NATO?

d) Write the longform of SEATO.

e) What do you understand by OPEC?

f) State the names of observer countries of SAARC.

g) Write the basic aim of W.T.O.

h) What do you understand by NAFTA?

Q2) Answer in 8 or 10 sentences (Any Two): **[8]**

a) What were the objectives of USA for NATO?

b) Explain in brief a concept of Regional Security System.

c) Write in short a concept of European Union.

P.T.O.

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

a) Structure of SAARC.

b) SAFTA.

c) ASEAN.

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

a) Write a note on "OPEC".

b) Explain in detail the American interest for W.T.O.

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Total No. of Questions :4]

P1133

[5017]-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) What do you know about "Nose" of Indian sub-continent?

b) What is Maritime shopping?

c) Write the longform of B.I.O.T.

d) Define "Sea Piracy".

e) State the meaning of Maritime security.

f) Where the Diego-Garcia Islands is located.

g) What do you mean by C-3.

h) State the meaning of littoral countries.

Q2) Answer in 8 or 10 sentences each (Any Two): **[8]**

a) "Strategic importance of Diego-Garcia Islands". Discuss.

b) Why Indian Ocean is being called Indian Ocean since ancient period.

c) Explain in brief geopolitical significance of Indias Andaman & Nicobar Islands.

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

a) Lakshadweep Islands.

b) Security problems of littoral countries.

c) Naval strategy of China.

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

a) Explain in detail super powers rivalry in Indian Ocean & its impact on Indias National Security.

b) Discuss the concept of Indian Ocean - As a zone of peace.

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Total No. of Questions :4]

SEAT No. :

P1134

[Total No. of Pages :2

[5017] - 3076

T.Y.B.Sc. (Vocational)

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 side 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) Define electrophoresis.

b) What is the principle of capillary zone electrophoresis (CZE)?

c) What are hyphenated methods? Name two such methods.

d) What is the packing material used in most packed gc columns?

e) State the condition of x-ray diffraction in crystals.

f) Give two applications of x-ray fluorescence.

g) Give the sources of neutrons.

h) What is the temperature of hydrogen - air flame?

i) State the two forms of lead found in petrol.

j) Define base ion term used in mass spectrometry.

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

i) Explain the technique of two dimensional gel electrophoresis.

ii) Discuss why the combination of gc and mass spectrometry is so powerful.

iii) Draw and explain the typical x-ray absorption spectrum.

P.T.O.

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

i) Give the characteristics of total consumption burner used in FES.

ii) Write the expression for resolution in mass spectrometry peaks.

iii) Give any two applications of an x-ray diffraction technique.

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

a) Describe the method of capillary isotachophoresis for separation of ions.

b) Explain the principle and working of Faraday up detector.

c) Calculate the mass absorptive coefficient of an alloy which consists of 39 percent nickel and 61 percent copper at the wavelength corresponding to k_{α} radiation of copper. The mass absorptive coefficients at that wavelength are 49.3 and 52.7 cm^2/g for nickel and copper respectively.

Q4) a) With a neat labelled diagram, describe the technique of capillary electrophoresis. **[6]**

OR

a) Describe with a neat labelled diagram, single crystal method of an x-ray diffraction. **[6]**

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

i) State the principle of neutron diffraction analysis and give its applications.

ii) A powder diffraction pattern of lead was obtained with C_u - k_{α} radiation (λ = 1.539 Å). Calculate the interplanar distance in nanometer which gives rise to a first order line at $\sin\theta = 0.9210$.

Total No. of Questions : 4]

SEAT No. :

P1135

[Total No. of Pages :2

[5017] - 3077
T.Y.B.Sc. (Vocational)
BIOTECHNOLOGY
VOC- Biotech - 335 : Plant And Animal Biotechnology
(2013 pattern) (Semester - III) (Paper - V)

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

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

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

a) What are stem cells?

b) Name two cytokinins.

c) Give two disadvantages of samaclonal variation.

d) Define cell fusion.

e) What are vaccines?

f) What is electroporation?

g) Define established cell lines.

h) What is gynog enesis?

i) What is Agrobecterium rhizogenes?

j) Name two secondary metabolites.

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

a) What is meant by somatic embryogenesis? Explain production of Somatic embryos?

b) What is gene therapy? Explain types of gene therapy.

c) Explain production of monoclonal antibodies.

P.T.O.

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

a) In vitro fertilization.

b) Production of tPA.

c) Cell fusion.

Q4) Explain production of trangenics using stem cells. **[10]**

OR

What is anther culture? Give applications of haploid culture. **[10]**

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Total No. of Questions : 4]

SEAT No. : ____

P2207

[Total No. of Pages : 2

[5017]-3078

T.Y. B.Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Video Recording and Playback Systems

(Semester-III) (Paper-V)

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

Instructions to the candidates:

1) ***Attempt All questions.***
2) ***Give suitable examples wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Answer the following:

a) State the vertical scanning frequency used in TV. **[1]**

b) What is the colour sub-carrier frequency used in India? **[1]**

c) State bandwidth of TV channel in India. **[1]**

d) What is meant by helical scan? **[1]**

e) Recording and replay of video signal is difficult. Comment. **[2]**

f) HDTV shows more of the picture compared to standard TV. Comment. **[2]**

g) Why are solid state image sensors convenient compared to TV camera tubes? **[2]**

h) Draw neat labelled diagram of composite video signal. **[2]**

Q2) Answer Any Two of the following:

a) Giving block diagram explain the working of B/W TV camera. **[4]**

b) Discuss odd line interlaced scanning procedure used in TV. **[4]**

c) Discuss the working of CCD sensor. Compare its performance with CMOS Sensor. **[4]**

P.T.O.

Q3) Answer Any Two of the following:

a) Discuss the optical system used in a ACD player. **[4]**

b) What are the sections in an OB Van? List the equipment in a typical OB Van. **[4]**

c) Draw a diagram showing construdction of Vidicon camera tube. Discuss its spectral response and light transfer characteristics. **[4]**

Q4) Answer Any Two of the following:

a) Giving a neat block diagram explain working of VCD player. **[6]**

b) Explain the working of B/W TV receiver with special reference to tuner section. **[6]**

c) Explain the following terms in case of VCR. **[6]**

i) Rotating head mechanism.

ii) Tape transport mechanism.

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Total No. of Questions : 4]

SEAT No. :

P- 1136

[Total No. of Pages :2

[5017] - 3079

T.Y.B. Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE

Troubleshooting and Repair of Audio and Video Equipment

(2013 pattern) (New Course) (Semester - III) (Paper - V)

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

Instructions to the conditions:

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

Q1) Answer all the following : **[12]**

a) State the disadvantages of AM over FM. **[1]**

b) State the advantages of satellite receiver. **[1]**

c) State the advantages of smart phone. **[1]**

d) State the disadvantages of CD over DVD. **[1]**

e) State the advantages of blue ray disc over CD. **[2]**

f) State the uses of home theatre system. **[2]**

g) List the softwares required for the repair of laptop. **[2]**

h) Write any two common faults and their causes in home theater. **[2]**

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

a) Explain any four faults and their causes in PA system.

b) Explain any four faults and their causes in digital TV.

c) Explain any four faults and their remedies in set top box.

P.T.O.

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

a) Explain with neat diagram the working of DVD player.

b) Discuss the common faults and their causes in VCD player.

c) Discuss the common faults and their remedies in inkjet printers.

Q4) Answer the following : **[2×6=12]**

a) Draw the functional block diagram of LCD TV.State any three commonfaults in it.

b) Draw the functional block diagram of CRT monitor. State any three common faults in it.

OR

Q4) Answer the following : **[2×6=12]**

a) State any six tools and their functions required for repairing of smart phone.

b) Draw the block diagram of AM receiver. State any three faults in it.

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Total No. of Questions : 4]

SEAT No. :

P 1137

[Total No. of Pages :2

[5017] - 3080
T.Y.B.Sc.(Vocational)
INDUSTRIAL MICROBIOLOGY - B
VOC-IND-MIC- 335: Pollution Control Technology
(2013 pattern) (Semester - III) (Paper - V)

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

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

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

For (a) to (d) State whether the statement given is True or False :

a) Settling / Sedimentation tanks in primary and secondary both consider the unhindered settling principle for design.

b) Trickling filter systems are used to treat high volume low BOD effluents.

c) Anaerobic filters are the most common anaerobic unit processes used for high BOD / COD effluent treatment.

d) For the COD test of a wastewater, organic matter is oxidized by $K_2Cr_2O_7$.

e) State the formula for calculating the HRT in a tank.

f) Name any two coagulants widely used in sewage treatment processes.

For (g) to (j) choose the best correct option :

g) Flocculated particles settle faster as they change their :
i) Size ii) Weight
iii) Shape iv) Volume

h) ..... is the process for removing oil from wastewaters.
i) Screening ii) Skimming
iii) Filtration iv) Oxidation

P.T.O.

i) If the depletion of oxygen is found to be 1.0 mg/litre after incubating 2.5ml of sewage diluted to 250 ml for 5 days at 20^0C, BOD of the sewage is:

i) 100 mg/L. ii) 200 mg/L.

iii) 225 mg/L. iv) 250 mg/L.

j) BOD ..... with decrease in amount organic matter in water?

i) increases ii) decreases

iii) remains unchanged iv) is unrelated

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

a) Draw a neat labeled diagram of a rotating biological contactor, showing all the operational features.

b) Explain why recycling of sludge in an activated sludge process is critical for its operation.

c) Explain the principle of Type II setting of particles in a sedimentation tank.

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

a) What is F/M radio? Explain why it is critical in operation of biological unit processes used for treating wastewaters.

b) Draw a neat labeled diagram of a typical Enhanced Biological Phosphorus Removal (EBPR) reactor configuration used in treatment of wastewater.

c) Explain why it is necessary to determine the value of 'breakpoint chlorination' in disinfection in wastewater treatment.

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

a) Draw a flow chart of a wastewater treatment of a dairy wastewater. Explain its working.

b) Describe any two problems associated with operation of activated sludge processes, and their remedies.

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Total No. of Questions : 4]

SEAT No. :

P3090

[Total No. of Pages : 2

[5017]-3081

T.Y. B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Network Concepts - I

(2013 Pattern) (New Course) (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.***

Q1) Attempt all of the following: **[10 × 1 = 10]**

a) Give the default Port no for FTP Service.

b) What is a VLAN?

c) What is a Mail Server?

d) Why do we use a Static IP?

e) Why do we need a Desktop Operating System?

f) Give the importance of HTTP protocol in internet world.

g) Linux is used only as a Network Operating System. State True or False.

h) Name any two Network Topologies.

i) Which type of Server is used to host a Website?

j) What is a WINS?

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

a) Explain in brief importance of Client Server Technology.

b) Name any Five different Protocols and their applications.

c) Why do we need to create Users and Groups?

P.T.O.

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

a) What types of cables are used in Computer Networks?

b) What is a Database Server? Explain its need.

c) Differentiate between: Desktop OS and Network OS.

Q4) Attempt any One of the following: **[1 × 10 = 10]**

a) Explain the various Layers of OSI Model with correct diagram.

b) Specify the Applications of :

i) DHCP Server

ii) DNS Server

Total No. of Questions :4]

SEAT No. :

P1138

[Total No. of Pages :2

[5017] - 3082

T.Y.B.Sc. (Vocation)

SEED TECHNOLOGY

Seed Pathology and Entomology

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

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

Instructions to the candidates:

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

Q1) Answer the following: **[10×1=10]**

a) What is a seed borne pathogen?

b) Give one example of Hemipteran pest.

c) What are storage fungi?

d) Mention the important symptom developed on cereals due to the insect pest.

e) Give one example of seed borne bacteria.

f) Mention one stage in the life cycle of storage grain pest.

g) Mention one method employed in testing the seed health.

h) What does seed entomology deal with?

i) Mention one control measure adopted for insect pest of a crop.

j) Give one example of the impact of seed borne viruses on crop.

Q2) Answer any two of the following: **[2×5=10]**

a) Explain the mechanism of seed transmission.

b) Write an account on the seed treatment.

c) Explain the damages caused by any two storage grain pests.

P.T.O.

Q3) Write notes on (any two): **[2×5=10]**

a) Seed storage structures.

b) Insects as vectors of plant diseases.

c) Entry points for seed infection.

Q4) Explain the influence of seed borne diseases. **[10]**

OR

Explain the life cycle and ways of infestation of insect pest of pulses.

Total No. of Questions :4]

SEAT No. :

P1139

[Total No. of Pages :2

[5017] - 3083

T.Y.B.Sc. (Vocational Course)

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) Draw the structure of DDT.

b) Write two uses of sulphuric acid.

c) What is tetryl?

d) Write two good qualities of paint.

e) What are Screening Smokes?

f) What is denaturation of alcohol?

g) What is NPK ratio?

h) What is refining of sugar?

i) Write is basic requirements for fermentation.

j) What is varnish? Give one example.

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

i) Explain classification of explosives.

ii) What are the operations involved in fermentation?

iii) Write a note on coffee still.

P.T.O.

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

i) Write good qualities of fertilizers.

ii) Discuss the characteristics of paints.

iii) What are fungicides? Give one suitable example.

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

a) Describe the manufacturing of refined sugar from raw sugar.

b) Explain the working operations involved in burner and purifying unit of sulphuric acid manufacturing.

c) Describe the manufacturing of urea with flow - sheet diagram.

Q4) a) Describe the manufacturing of ammonia by Haber - Bosch process with flow - sheet diagram. **[6]**

OR

a) Describe the manufacturing of alcohol from molasses. **[6]**

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

i) Explain in detail importance of toxic chemicals with one example.

ii) Give classification of pesticides with proper examples.

Total No. of Questions :4]

SEAT No. :

P1140

[Total No. of Pages :2

[5017] - 3084

T.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

VOC - Biotech - 336 : Microbial Biotechnology and Fermentation

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All question 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 yield coefficient.

b) What is microbial biotechnology.

c) What is fed - batch fermentor.

d) What is GMP?

e) Give two examples of secondary metabolites.

f) Name the organism used for industrial production of Vitamin B12.

g) Define obligate anaerobes. Give one example.

h) What are growth linked products?

i) Give two examples of oriental fermented foods.

j) Give one application of microbial biotechnology in the field of medicine.

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

a) Microbial growth kinetics.

b) Whole cell immobilization.

c) Typical batch fermentor.

P.T.O.

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

a) What are Alkaliphiles? Discuss the adaptions of these organisms to alkaline environment.

b) Define Screening. Explain primary and secondary Screening

c) Describe the industrial production of anylase.

Q4) Describe in detail the industrial production of pericillin. Add a note on harvest and recovery of pericillin. **[10]**

OR

Discuss with the help of an example the applications of GMO'S in the field of agriculture and industry.

Total No. of Questions :4]

SEAT No. :

P2208

[Total No. of Pages :2

[5017]-3085

T.Y.B.Sc. (Vocational)

PHOTOGRAPHY & AUDIO-VISUAL PRODUCTION

Television Software

(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 labeled diagrams and provide suitable examples wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) What is an 'establishing' a shot?

b) When are compact shots and an extreme close ups useful?

c) What is a story board? How is it useful?

d) What is white balance? Explain how it is set in any camera.

e) What are the different 'budget heads' in a production?

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

a) What are camera movements? Explain their significance.

b) Script and screen play are not the same. Explain with suitable examples.

c) Importance of research in film-making.

P.T.O.

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

a) Write a script for a 1-minute social advertisement on 'Use, misuse and abuse of social media'.

b) Write a script for a 1-minute social advertisement on 'Gender neutrality'.

Q4) Write short notes on ANY TWO: **[10]**

a) Importance of 'characterization'.

b) Preproduction stage in film making.

c) What is composition? What are the various elements of composition? Discuss their significance.

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Total No. of Questions :4]

SEAT No. :

P1141

[Total No. of Pages :2

[5017] - 3086

T.Y.B.Sc. (Vocational)

ELECTRONIC EQUIPMENT & MAINTENANCE (EEM)

Electronic Instrumentation

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

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

Instructions to the candidates:

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

Q1) Answer the following:

a) Define - Accuracy as percentage of true value. **[1]**

b) Give one example of passive transducer. **[1]**

c) What is PLC? **[1]**

d) What is proximity type instrument? **[1]**

e) Classify the instrument - Mercury thermometer. **[2]**

f) What are static characteristics of instrument? **[2]**

g) What is 'Impedance'? Express it in polar form. **[2]**

h) What is load cell? **[2]**

Q2) Answer Any Two: **[2×4=8]**

a) Write short note on 'calibration' of an instrument.

b) Discuss digital phase meter.

c) Explain with a block diagram - PLC.

P.T.O.

Q3) Answer Any Two: **[2×4=8]**

a) Explain photo emissive transducers.

b) Explain ladder diagram of PLC with example.

c) Discuss relative motion devices.

Q4) Answer Any Two: **[2×6=12]**

a) Explain with a block diagram - basic spectrum analyzer.

b) Discuss servo potentiometric DVM.

c) Give brief account of digital signal processing.

OR

Q4) Answer the following: **[3×4=12]**

a) Explain pneumatic load cell-

b) Explain with a block diagram- "general instrumentation system".

c) Discuss distortion analyzer.

Total No. of Questions :4]

SEAT No. :

P1142

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[5017] - 3087

T.Y.B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC - IND - MIC - 336 : Animal and Plant Tissue Culture

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

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

Instructions to the candidates:

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

Q1) Answer as directed: **[10]**

a) What is a gene gun?

b) Enlist the antibiotics used in PTC medium.

c) What is hairy root disease?

d) What is antisense RNA technology?

e) State whether True or False. Plant cells have shorter generation time than bacteria.

f) Define / Explain in one line: Cell Culture.

g) Define / Explain in one line - Feeder cells.

h) Mark True or False: Established cell lines derived by transformation differ from primary cell lines with respect to chromosome numbers.

i) State whether True or False: Presence of chelating agents in the animal cell culture media is necessary to promote adherence of cells and better growth.

j) Mark the correct choice.

Following are the histological features of anchorage dependent cells in culture, EXCEPT:

i) Epithelial
ii) Fibroblast
iii) Lymphocytic
iv) Endothelial

P.T.O.

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

a) Explain in brief role of serum in cell culture media.

b) Discuss the advantages and disadvantages of enzymatic disaggregation techniques.

c) How animal cells are employed for manufacture of viral vaccines?

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

a) Discuss in detail nutritional requirements of a plant cell.

b) Enlist the compounds which are commercialized from Plant Cell Culture and comment on the use of bioreactor for large scale production.

c) What is haploid culture? How is it obtained?

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

a) Explain the Principle, methods and applications of cell viability assays.

b) Explain in detail development of Bt varieties of plants.

Total No. of Questions : 4]

SEAT No. :

P3091

[Total No. of Pages : 2

[5017]- 3088

T.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Computer/IT Service Management

(2013 Pattern) (Paper - VI) (Semester - 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.***

Q1) Attempt all of the following: **[10 × 1 = 10]**

a) What is SOD?

b) What are the contents of a SLA?

c) ITT stands for-

d) Who manages a Helpdesk?

e) Use of single License of WinXP on Multiple PCs is allowed. State True or False.

f) Give any one Standard for Information Security.

g) CIO stands for-

h) Database Maintenance is done by a Security Administrator. State True or False.

i) What is COBIT?

j) What is an Incident?

P.T.O.

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

a) What are different Types of Access Controls?

b) Write a note on RFP?

c) Explain the importance of Change Management Process.

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

a) Explain the Concept of Social Engineering.

b) What is an 'IS Audit'?

c) Testing plays an important role in IT Service Delivery - Explain.

Q4) Attempt any One of the following: **[1 × 10 = 10]**

a) What is a Helpdesk? Explain the Procedure for Problem Escalation.

b) Comment on 'Study of Requirements' and 'Software Licensing'.

Total No. of Questions :4]

SEAT No. :

P1143

[Total No. of Pages :2

[5017] - 3089

T.Y.B.Sc. (Vocational)

SEED TECHNOLOGY

VOC - ST - 312 : Seed Farm Management, Processing & Storage

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

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

Instructions to the candidates:

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

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

a) Give any one objective of farm management.

b) What is seed marketing?

c) Enlist methods of seed bagging.

d) What is chemical seed treatment?

e) Define seed processing.

f) What is farm business.

g) Give the name of any one seed organization in seed marketing.

h) Enlist storage containers.

i) What is specialized farming?

j) Define seed cleaning.

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

a) Write an account on general farming for the beginners.

b) Explain in detail maintenance of seed processing plant.

c) What is bagging? Write in detail any two methods of bagging.

P.T.O.

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

a) Need of seed treatment.

b) Farm management as personal matter.

c) Major components of seed marketing.

Q4) What is farm management? Explain with the help of graph the place of farm management. **[10]**

OR

Sketch a flow chart including various steps in seed processing & describe in detail management of seed processing plant. **[10]**