Total No. of Questions : 4]

SEAT No. : ____

PC-1291

[Total No. of Pages : 2

[6327]-101

T.Y. B.Sc.

MATHEMATICS

MT 351 : Metric Spaces

(2019 Pattern) (Semester - V) (35111)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) Attempt any Five of the following : **[5 × 1 = 5]**

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

b) Find the interior of the following subsets of R with discrete metric.
   i) Z
   ii) [0, 1)

c) Find the cluster points of (0, 1) and [0, 1] in usual metric space R.

d) Is it possible that $B(x, r) = B[y, s]$ with $x \neq y$, $r \neq s$? Justify.

e) Which subsets of discrete metric space are open as well as closed?

f) Give an example of subset of R with usual metric which is neither compact nor connected.

g) Give an example of open dense subset of R with usual metric.

Q2) A) Attempt any One of the following : **[5]**

a) Let (X, d) be a metric space. Show that any convergent sequence in (X, d) is cauchy sequence.

b) Prove that arbitrary union of open sets in a metric space (X, d) is an open set.

B) Attempt any One of the following : **[5]**

a) Show that (X, d) is a metric space where distance function d is define as $d(x, y) = 0 ; x = y$
$= 1 ; x \neq y.$

b) Let (X, d) be a metric space. A, B, $\subseteq$ X. Then show that $\overline{A \cup B} = \overline{A} \cup \overline{B}$.

P.T.O.

Q3) A) Attempt any One of the following : **[5]**

a) Let X, Y, Z be metric spaces. $f : X \to Y$ and $g : Y \to Z$ are continuous then show that $h : X \to Z$ is contionuous map.

b) Let X, Y be metric spaces. Show that a map $f : X \to Y$ is continuous if for every open set $V \subseteq Y$, it's inverse image $f^{-1}(V)$ is open in X.

B) Attempt any One of the following : **[5]**

a) Show that constant function and identity function are continuous on metric space X.

b) Show that any two closed and bounded intervals in R are homeomorphic.

Q4) A) Attempt any One of the following : **[5]**

a) Show that continuous image of compact metric space is compact.

b) Let A and B are connected subsets of metric space X with $A \cap B \neq \phi$ then prove that $A \cup B$ is connected.

B) Attempt any One of the following : **[5]**

a) Show that any finite subset of a metric space is compact.

b) Show that the circle $\{(x, y) \in R^2 / x^2 + y^2 = 1\}$ is connected.

♦ ♦ ♦

Total No. of Questions : 4]

SEAT No. : ____

PC-1292

[Total No. of Pages : 2

[6327]-102
T.Y. B.Sc.
MATHEMATICS
DSE1B - MT352 : Real Analysis - I
(2019 Pattern) (Regular) (Semester - V) (35112)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) Attempt any five of the following **[5]**

a) Show that $\sim(A \vee B)$ and $(\sim A) \wedge (\sim B)$ are logically equivalent.

b) if A = $\{x : x > 4\}$ and B = $\{x : x \leq 7\}$ then find A\B.

c) Define limit of a sequence of real numbers.

d) Find limit superior of the sequence $\left\{\sin\left(\frac{n\pi}{2}\right)\right\}_{n=1}^{\infty}$

e) Give an example of a sequence $\{s_n\}_{n=1}^{\infty}$ of real numbers for which $\{|s_n|\}_{n=1}^{\infty}$ converges but $\{s_n\}_{n=1}^{\infty}$ does not.

f) Show that the series $\sum_{n=1}^{\infty}\frac{n+1}{n+2}$ diverges.

g) Show that the series $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\ldots\ldots$ converges.

Q2) a) Attempt any one of the following. **[5]**

i) Define countable set. Show that the set of all ordered pairs of positive integers $S = \{(j,k); j,k \in N\}$ is countable.

ii) Show that the collection P of all polynomials with integer coefficients is countable.

P.T.O.

b) Attempt any one of the following. **[5]**

i) If $f: A \to B$ and $X \subseteq B, Y \subseteq B$ then prove that $f^{-1}(x \cup y) = f^{-1}(X) \cup f^{-1}(Y)$

ii) For any a,b, ∈ R, show that $||a| - |b|| \leq |a-b|$.

Also prove that if $\{s_n\}_{n=1}^{\infty}$ converges to L then $\{|s_n|\}_{n=1}^{\infty}$ converges to |L|.

Q3) a) Attempt any one of the following. **[5]**

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

ii) If $\{s_n\}_{n=1}^{\infty}$ is a convergent sequence of real numbers then prove that $\lim_{n\to\infty} \sup S_n = \lim_{n\to\infty} S_n$.

b) Attempt any one of the following. **[5]**

i) Prove that the sequence $\left\{\left(1+\frac{1}{n}\right)^n\right\}_{n-1}^{\infty}$ is convergent.

ii) Suppose $\lim_{n\to\infty} \frac{s_n - 1}{s_n + 1} = 0$. Prove that $\lim_{n\to\infty} s_n = 1$.

Q4) a) Attempt any one of the following. **[5]**

i) If $\sum_{n=1}^{\infty} a_n$ converges to A and $\sum_{n=1}^{\infty} b_n$ converges to B then prove that $\sum_{n=1}^{\infty} (a_n + b_n)$ converges to A +B.

ii) State and prove Minkowski inequality.

b) Attempt any one of the following. **[5]**

i) Prove that

a) $2 - 2^{1/2} + 2^{1/3} - 2^{1/4} + \ldots\ldots$ diverges

b) $(1-2) - (1-2^{1/2}) + (1-2^{1/3}) - (1-2^{1/4}) + \ldots\ldots$ converges.

ii) Show that

a) $\sum_{n=1}^{\infty} \frac{1+n}{1+n^2}$ is divergent

b) $\sum_{n=4}^{\infty} \frac{1}{[n(\log n)]^2}$ is convergent.

♦ ♦ ♦

Total No. of Questions : 4]

SEAT No. : ____

PC-1293

[Total No. of Pages : 2

[6327]-103

T.Y. B.Sc.

MATHEMATICS

DSE - 2A - MT - 353 : Group Theory

(2019 Pattern) (Semester - V) (35113)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any Five of the following. **[5 × 1 = 5]**

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

b) Find all subgroups of $\mathbb{Z}_6$.

c) Let $G = \langle \mathbb{Z}\ t \rangle$ and $H = 2\mathbb{Z}$. Find all distinct left cosets of H in G.

d) Show that union of subgroups need not be a subgroup.

e) Let G be the set of all odd permutations in S_n. Is the set G a subgroup of S_n? Justify.

f) Define normal subgroup of a group.

g) List all the elements of $\mathbb{Z}_2 \times \mathbb{Z}_2$.

Q2) a) Attempt any One of the following : **[5]**

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

ii) Let G be a group and let $a \in G$. Then prove that $H = \{a^n \mid n \in \mathbb{Z}\}$ is a subgroup of G.

b) Attempt any One of the following : **[5]**

i) Show that if H and K are subgroups of an abelian group G, then $\{hk \mid h \in H \text{ and } k \in K\}$ is a subgroup of G.

ii) List all subgroups of $\mathbb{Z}_{18}$ and draw its subgroup diagram.

P.T.O.

Q3) a) Attempt any One of the following. **[5]**

i) Let G be a cyclic group with generator a. If G has finite order *n*, then prove that G is isomorphic to $\langle \mathbb{Z}_n, t_n \rangle$.

ii) State and prove Lagrange's theorem for groups.

b) Attempt any One of the following : **[5]**

i) Show that $\frac{\mathbb{Z}_4 \times \mathbb{Z}_6}{\langle (0,1) \rangle}$ is isomorphic to $\mathbb{Z}_4$.

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

I) N is subgroup of G.

II) N is normal subgroup of G.

Q4) a) Attempt any One of the following. **[5]**

i) Let $\phi : \mathrm{G} \to \mathrm{G}'$ be a group homomorphism and let N be a normal subgroup of G. Show that

I) $\phi[\mathrm{N}] = \{\phi(n)/n \in \mathrm{N}\}$ is a subgroup of G′.

II) $\phi[\mathrm{N}]$ is a normal subgroup of $\phi[\mathrm{G}]$.

ii) Show that, following are three equivalent conditions for a subgroup H of a group G to be normal subgroup of G.

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

II) $g\mathrm{H}g^{-1} = \mathrm{H}$ for all $g \in \mathrm{G}$

III) $g\mathrm{H} = \mathrm{H}g$ for all $g \in \mathrm{G}$

b) Attempt any One of the following : **[5]**

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

ii) Let $\rho = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ 4 & 6 & 5 & 3 & 2 & 1 & 8 & 10 & 9 & 7 \end{pmatrix} \in \mathrm{S}_{10}$.

Then

I) Write ρ as product of disjoint cycles.

II) Write ρ as product of transpositions.

III) Determine whether ρ is odd or even permutation

IV) Find inverse of ρ.

V) Find order of ρ.

▽▽▽▽

Total No. of Questions : 4]

SEAT No. : ____

PC1294

[Total No. of Pages : 3

[6327]-104

T.Y. B.Sc. (Regular)

MATHEMATICS

MT - 354 : Ordinary Differential Equations

(2019 Pattern) (Semester - V) (35114)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any Five of the following : **[5×1=5]**

a) Solve the initial value problem

$y'' + 6y' + 5y = 0, y(0) = 3, y'(0) = -1$

b) Find particular integral of

$(D^3 - 2D^2 - 5D + 6)\, y = e^{4x}$

c) State the Principle of superposition.

d) Define regular singular point of the equation

$P_0(x)\, y'' + P_1(x)\, y' + P_2(x)\, y = 0.$

e) Find general solution of Euler equation

$x^2 y'' - x y' - 8y = 0.$

f) Rewrite the equation

$y^{(4)} + 4y''' + 6y'' + 4y' + y = 0$ as a 4×4 First order System.

g) Verify that $y_1 = e^{-x}$ and $y_2 = e^{x}$ are solutions of $y'' - y = 0$.

P.T.O.

Q2) a) Attempt any One of the following : **[5]**

i) Prove that $\frac{1}{F(D)}e^{\alpha x}V = e^{\alpha x}\frac{1}{F(D+\alpha)}V$.

ii) $I_b\ Y_p$ be a particular solution of $Y'' + P(x)y' + q(x)y = f(x)$ on (a, b) and $\{y_1, y_2\}$ be fundamental solution of complementry equation on (a, b) then show that y is solution of differential equation on (a, b) iff $y = y_p + c_1y_1 + c_2y_2$ where c_1 and c_2 are constants and p_1q_1f are continuous on (a, b).

b) Attempt any one of the following : **[5]**

i) Solve $(2D^2 + 2D + 3)y = x^2 + 2x - 1$.

ii) Find the general solution of $(x - 1)y'' - xy' + y = (x - 1)^2$ given that $y_1 = x$ and $y_2 = e^x$ are solutions of the complementry equations $(x - 1)y'' - xy' + y = 0$.

Q3) a) Attempt any one of the following : **[5]**

i) Show that the coefficients $\{a_n\}$ in any solution $y = \sum_{n=0}^{\infty} a_n (x - x_0)^n$ of $\left(1 + \alpha(x - x_0)^2\right)y'' + \beta(x - x_0)y' + \gamma y = 0$ satisfy the recurrence relation $a_{n+2} = \frac{-p(n)}{(n+2)(n+1)}a_n, n \geq 0$ where $p(n) = \alpha n(n-1) + \beta n + \gamma$.

ii) Explain the reduction of order method to solve the equation

$$p_0(x)y'' + p_1(x)y' + p_2(x)y = F(x).$$

b) Attempt any one of the following : **[5]**

i) Let x_0 be an ordinary real number. Find the power series in $(x - x_0)$ for the general solution of $y'' + y = 0$.

ii) Find the general solution of $y' = \begin{bmatrix} 11 & -25 \\ 4 & -9 \end{bmatrix} y$.

Q4) a) Attempt any one of the following : **[5]**

i) If roots of indicial equation $ar(r-1) + br + c = 0$ are r_1 and r_2. Then show that general solution of Euler equation $ax^2y'' + bxy' + cy = 0$ on $(0, \infty)$ is $y = c_1x^{r_1} + c_2x^{r_2}$ if r_1 and r_2 are distinct real numbers.

ii) Explain the method of variation of parameter to solve the equation

$$p_0(x)y'' + p_1(x)y' + p_2(x)y = F(x).$$

b) Attempt any one of the following : **[5]**

i) Find the particular solution of $y'' + 3y' + 2y = \dfrac{1}{1+e^x}$ using method of variation of parameters.

ii) Find the general solution of $y' = \begin{bmatrix} 3 & -1 & -1 \\ -2 & 3 & 2 \\ 4 & -1 & -2 \end{bmatrix} y$.

Total No. of Questions : 4]

SEAT No. : ____

PC1295

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[6327]-105

T.Y.B.Sc. (Regular)

MATHEMATICS

DSE - 3A-MT355(A) : Operations Research

(2019 Pattern) (Semester- V) (35115A)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any five of the following: **[5×1=5]**

a) Identify the direction of decrease in Z, with Minimize $Z = 4x_1 - 2x_2$.

b) Define surplus variable with an example.

c) Write the following LPP in equation form

Minimize $Z = 4x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

and $x_1, x_2 \geq 0$.

d) Write the dual of Minimize $Z = 10x_1 + 6x_2 + 2x_3$

Subject to $-x_1 + x_2 + x_3 \geq 1$

$3x_1 + x_2 - x_3 \geq 2$

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

e) Define transportation problem with an example.

f) Explain, how to convert following transportation problem (TP) as a balanced TP.

	D_1	D_2	D_3	Supply
O_1	1	4	2	20
O_2	2	2	3	40
O_3	1	9	7	35
O_4	3	5	4	15
Demand	50	50	20	

P.T.O.

g) State, why following assignment problem is unbalanced?

	I	II	III
A	3	4	7
B	6	5	3
C	1	2	4
D	7	3	5

Q2) a) Attempt any one of the following: **[5]**

i) Vitamin A and B are found in foods F_1 and F_2. One unit of food F_1 contains 3 units of vitamin A and 4 units of vitamin B. One unit of food F_2 contains 6 units of A and 4 units of B. One unit of food F_1 and F_2 costs Rs. 4 and Rs. 5 respectively. The minimum daily requirement (for a person) of vitamin A and B is 80 and 100 respectively. Assuming that anything in excess of daily requirement of vitamin A and B is not harmful. Find out the optimal mixture of foods F_1 and F_2 at the minimum costs which meets the daily requirements of vitamin A and B as an LPP.

ii) Solve the following LPP using graphical approach.

Maximize $Z = 5x_1 + 4x_2$

Subject to $6x_1 + 4x_2 \leq 24$

$x_1 + 2x_2 \leq 6$

$-x_1 + x_2 \leq 1$

$x_2 \leq 2$

and $x_1, x_2 \geq 0$.

b) Attempt any One of the following. **[5]**

i) Using simplex method, show that following problem has no feasible solution. Maximize $Z = 3x_1 + x_2$

Subject to $2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

and $x_1, x_2 \geq 0$.

ii) Obtain an initial basic feasible solution (IBFS) for following transportation problem using Vogel's Approximation Method (VAM).

	D_1	D_2	D_3	D_4	Supply
O_1	2	3	11	7	6
O_2	1	0	6	1	1
O_3	5	8	15	9	10
Demand	7	5	3	2	

Q3) a) Attempt any one of the following: **[5]**

i) Solve following LPP using Big-m method.

Minimize $Z = 4x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + x_2 \leq 4$

and $x_1, x_2 \geq 0$.

ii) Obtain the dual of following LPP.

Minimize $Z = 7x_1 + 4x_2$

Subject to $2x_1 + x_2 \geq 5$

$-3x_1 + 2x_2 \geq 10$

and $x_1 \geq 0$, x_2 is unrestricted.

b) Attempt any One of the following. **[5]**

i) Following is a solution for a transportation problem. Test it for optimality using MODI method. If it is not optimal, find its optimal solution.

	D_1	D_2	D_3	D_4	Supply
O_1	19 (5)	30	50	10 (2)	7
O_2	70	30 (8)	40	60 (1)	9
O_3	40	8	7 (7)	20 (11)	18
Demand	5	8	7	14	

ii) Solve following restricted assignment problem to minimize the total cost.

		Machines			
		M_1	M_2	M_3	M_4
Operators	P_1	5	5	-	2
	P_2	7	4	2	3
	P_3	9	3	5	-
	P_4	7	2	6	7

Q4) a) Attempt any one of the following: **[5]**

i) Explain, how to convert maximization of transportation problem into minimization of transportation problem.

ii) Solve following assignment problem to minimize the cost.

Machines

Jobs	M_1	M_2	M_3	M_4
J_1	5	7	11	6
J_2	8	5	9	6
J_3	4	7	10	7
J_4	10	4	8	3

b) Attempt any One of the following. **[5]**

i) Solve the following transportation problem using north-west corner rule.

	D_1	D_2	D_3	D_4	Supply
O_1	6	5	8	5	30
O_2	5	11	9	7	40
O_3	8	9	7	15	50
Demand	35	28	32	25	

ii) Solve the following assignment problem to maximize the total profit.

	A	B	C	D	E
I	80	80	85	95	90
II	78	90	104	95	93
III	70	72	80	60	70
IV	100	101	100	102	95
V	62	60	61	65	67

Total No. of Questions : 4]

SEAT No. : ____

PC1296

[Total No. of Pages :2

[6327]-106

T.Y.B.Sc. (Regular)

MATHEMATICS

MT-355B : Differential Geometry

(2019 Pattern) (Semester- V) (35115B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any five of the following: **[5×1=5]**

a) Find arc length function for the curve $\gamma(t) = (e^t \cos t, e^t \sin t)$.

b) Find parametrisation of the curve $\frac{x^2}{4}+\frac{y^2}{9}=1$.

c) Is $\gamma(t) = (t, t^2)$ a regular? Justify your answer.

d) Define a surface in $\mathbb{R}^3$.

e) Compute the curvature of the curve $\gamma(t)=\left(\frac{1}{3}(1+t)^{3/2}, \frac{1}{3}(1-t)^{3/2}, \frac{t}{\sqrt{2}}\right)$.

f) Give an example of a conformal map that is not an isometry.

g) State isoperimetric inequality.

Q2) a) Attempt any one of the following: **[5]**

i) Let $\gamma(t)$ be a regular curve in $\mathbb{R}^3$ then prove that its curvature is $K=\frac{\|\dot{\gamma}\times\ddot{\gamma}\|}{\|\dot{\gamma}\|^3}$ where the X denotes the vector product and dot denotes d/dt.

ii) Prove that a parametrised curve $\gamma:(a,b)\to\mathbb{R}^n$ is unit speed curve if and only if it is regular.

P.T.O.

b) Attempt any one of the following. **[5]**

i) Show the curve $\gamma(t) = \left(\frac{1+t^2}{t}, t+1, \frac{1-t}{t} \right)$ is planar curve.

ii) Show that if γ is a unit speed plane curve $\dot{n}_s = -K_s t$.

Q3) a) Attempt any one of the following: **[5]**

i) State and prove Wietinger's inequality.

ii) Prove that the area of a surface patch is unchanged by reparametrisation.

b) Attempt any One of the following. **[5]**

i) Find the equation of tangent plane of the surface patch $\sigma(r,\theta) = (r\cosh\theta, r\sinh\theta, r^2)$ at (1, 0, 1).

ii) Determine the area of the part of the paraboloid $z = x^2 + y^2,\ z \le 1$.

Q4) a) Attempt any one of the following: **[5]**

i) Prove that transition maps of a smooth surface are smooth.

ii) With usual notations show that $\|\sigma_u \times \sigma_v\| = (EG - F^2)^{1/2}$.

b) Attempt any one of the following. **[5]**

i) Find the first fundamental form of the surface

$\sigma(u,v) = (\sinh u \sinh v, \sinh u \cosh v, \sinh u)$.

ii) Show that the unit sphere S subset of $\mathbb{R}^3$ is a smooth surface.

Total No. of Questions : 4]

SEAT No. : ____

PC1297

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[6327]-107

T.Y.B.Sc. (Regular)

MATHEMATICS

MT - 355(C) : C-Programming

(2019 Pattern) (Semester- V) (35115C)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any five of the following: **[5]**

a) Define variables in C.

b) Explain the purpose of the statement (a%5) = = 0.

c) What is the purpose of put char( ) function?

d) Write syntax for do ..... while loop.

e) Explain the meaning of the following declaration int a[2] = {7, 13};

f) Describe the array that is defined by the statement int params [5][5];

g) Explain the output generated by the following programs

```
#include<stdio.h>
 main ( )
  {
    int i = 0, x = 0;
      while (i < 20)
        {
          if (i%5 = = 0)
            {
              x + = i;
         Printf (" % d",x);
           + + i;
             }
     Printf ("\ n x = %d", x);
                }
```

P.T.O.

Q2) a) Attempt any one of the following: **[5]**

i) Write a short note on go to statement.

ii) What is the purpose of printf function? How it is used with in a C-program? Compare the putchar function.

b) Attempt any One of the following. **[5]**

i) Write a C-program to generate fibonacci sequence upto n-term.

ii) Write a C-Program to find factorial of given an integer.

Q3) a) Attempt any one of the following: **[5]**

i) Compare conditional operator with if-else statement.

ii) Distinguish between while and Do-while loop.

b) Attempt any One of the following. **[5]**

i) Write a C-program to check whether a given number is palindrome or not.

ii) Write a C-program to find the real root of the quadratic equation $ax^2 + bx + c = 0$.

Q4) a) Attempt any one of the following: **[5]**

i) How are the multidimensional array defined? Compare the manner in which one dimensional arrays are defined.

ii) Explain need and advantages of function.

b) Attempt any One of the following. **[5]**

i) Define string with syntax and illustrations.

ii) Write a c-program to calculate the average of n - numbers.

Total No. of Questions : 4]

SEAT No. : ____

PC1298

[Total No. of Pages : 3

[6327]-108

T.Y. B.Sc. (Regular)

MATHEMATICS

DSE-3B-MT - 356(B) : Number Theory

(2019 Pattern) (Semester - V) (35116B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any FIVE of the following : **[5×1=5]**

a) If $(a,m) = 1$ and $(b, m) = 1$, then show that $(ab, m) = 1$.

b) If x and y are odd integers, prove that $x^2 + y^2$ is even but not divisible by 4.

c) State unique factorization theorem.

d) Let p be a prime, then $x^2 \equiv 1$ (modp) iff $x \equiv \pm 1$ (mod p).

e) What is the last digit in the ordinary decimal representation of 3^{400}?

f) Prove that $[x + m] = [x] + m$, if m is an integer and x is real number.

g) Find two Pythagorean triples whose terms are in arithmetic progression.

P.T.O.

Q2) a) Attempt any one of the following : **[5]**

i) Prove that $ax \equiv ay \pmod{m}$ if and only if $x \equiv y \left(\bmod \frac{m}{(m,a)} \right)$.

ii) If $(a, m) = 1$, then prove that $a^{\phi(m)} \equiv 1 \pmod{m}$.

b) Attempt any one of the following : **[5]**

i) Prove that $n^{13} - n$ is divisible by 3, 5 for any integer n.

ii) Find all integers that satisfy simultaneously $x \equiv 1 \pmod 3$, $x \equiv 2 \pmod 4$, $x \equiv 3 \pmod 5$.

Q3) a) Attempt any ONE of the following : **[5]**

i) Let p be odd prime and $(a, p) = 1$. Then prove that $\left(\frac{a}{p}\right) \equiv a^{\left(\frac{p-1}{2}\right)} \pmod p$.

ii) State and prove Wilson's theorem.

b) Attempt any ONE of the following : **[5]**

i) Find all primes p such that $\left(\frac{5}{p}\right) = -1$.

ii) Show that $7 \mid 3^{2n+1} + 2^{n+2}$, for all n.

Q4) a) Attempt any ONE of the following : **[5]**

i) Show that the function $\mu(n)$ is multiplicative and $\sum_{d/n}\mu(d)=\begin{cases}1, & if\ n=1\\ 0, & if\ n>1\end{cases}$.

ii) If x, y, z is a primitive Pythagorean triple, then prove that one of the integers x or y is even while other is odd.

b) Attempt any ONE of the following : **[5]**

i) Find all solutions of $172x + 20y = 1000$.

ii) For what real numbers x, it is true that

1) $[x] + [x] = [2x]$

2) $[9x] = 9$

3) $[x + 3] = 3 + [x]$

Total No. of Questions : 4]

SEAT No. : ____

PC1299

[Total No. of Pages : 3

[6327]-109

T.Y. B.Sc. (Regular)

MATHEMATICS

DSE-3B : MT - 356(C) : Laplace Transform and Fourier Series

(2019 Pattern) (Semester - V) (35116C)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt any five of the following : **[5]**

a) Find $L^{-1}\left\{\frac{1}{s^2-4s+8}\right\}$.

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

c) Evaluate $\int_0^\infty e^{-2t}\sin t.dt$.

d) Find L[sin*t*.cos*t*].

e) Evaluate $\int_0^\infty x^5 e^{-x}dx$.

f) Give an example of a function which is not of exponential order.

g) Is sin *x* is odd function? Justify.

P.T.O.

Q2) a) Attempt any one of the following : **[5]**

i) If L[F(*t*)] = *f*(*s*), then show that $\mathrm{L}\left[\frac{\mathrm{F}(t)}{t}\right]=\int_{s}^{\infty}\mathrm{F}(s)\,ds$.

ii) If L[F(*t*)] = *f*(*s*), then prove that $\mathrm{L}\left[\int_{0}^{t}\mathrm{F}(u)\,du\right]=\frac{\mathrm{F}(s)}{s}$.

b) Attempt any one of the following : **[5]**

i) Evaluate $\int_{0}^{\infty}te^{-2t}\cos t\,dt$.

ii) Find L[F(t)], where $\mathrm{F}(t)=\begin{cases}0\ ;\ 0<t<1\\ t\ ;\ 1<t<2\\ 0\ ;\ t>2\end{cases}$.

Q3) a) Attempt any one of the following : **[5]**

i) Show that inverse laplace transform is linear.

ii) If $\mathrm{L}^{-1}\{\mathrm{F}(s)\}=\mathrm{F}(t)$, then prove that $\mathrm{L}^{-1}\{e^{-as}\mathrm{F}(s)\}=\begin{cases}\mathrm{F}(t-a)\ ;\ t>a\\ 0\quad\ ;\ \mathrm{t}<\mathrm{a}\end{cases}$.

b) Attempt any one of the following : **[5]**

i) Find $\mathrm{L}^{-1}\left\{\frac{3s+1}{s^2+6s+13}\right\}$.

ii) Find $\mathrm{L}^{-1}\left\{\frac{1}{2}\log\left(\frac{s^2-a^2}{s^2}\right)\right\}$.

Q4) a) Attempt any one of the following : **[5]**

i) Obtain the Fourier series of $f(x) = |x|$, $-\pi < x < \pi$.

ii) Show that $\int_{-\pi}^{\pi} \cos kx \cos nx \, dx = 0$, $k, n = 0, 1, 2, \ldots$ & $k \neq n$.

b) Attempt any one of the following : **[5]**

i) Solve $y'' + y = 6 \cos 2t$; $y(0) = 3$ and $y'(0) = 1$.

ii) Solve $ty'' + y' + 4ty = 0$; $y(0) = 3$ and $y'(0) = 0$.

Total No. of Questions : 5]

SEAT No. : ____

PC-1300

[Total No. of Pages : 2

[6327]-110

T.Y. B.Sc. (Regular)

PHYSICS

PHY-351 : Mathematical Methods in Physics - II

(2019 Pattern) (Semester - V) (Paper - I) (35121)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q 2 to Q 5.***
3) ***Question No. 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) **Solve any five of the following :** **[5]**

a) Define metric coefficient.

b) State postulates of theory of relativity.

c) Define orthogonal curvilinear coordinates.

d) State Fuch's theorem.

e) Define parity.

f) Define order of differential equation.

Q2) **Answer the following :** **[10]**

a) Explain Galilean transformation equation with suitable diagram. Prove that Newton's law is invariant under Galilean transformation. **[6]**

b) Prove that $J_{nH}(x)+J_{n-1}(x)=\frac{2n}{x}J_n(x)$. **[4]**

P.T.O.

Q3) **Answer the following :** **[10]**

a) Solve Laplace's equation in cylindrical co-ordinate system using separation of variable method. **[6]**

b) The length of a rod projected into a space with velocity v is shorten to $\frac{L_0}{4}$. Calculate the velocity v. L_0 is original length of the rod. **[4]**

Q4) **Answer the following :** **[10]**

a) Derive an expression of gradient operator in curvilinear co-ordinate system. Hence find $\vec{\nabla}u_1, \vec{\nabla}u_2$ and $\vec{\nabla}u_3$. **[6]**

b) Prove that Pn(O) = 0 when n is odd and Pn(O) = $(-1)^{n/2}$ $\frac{1.3.5.7.....(n-1)}{2^{n/2}\left(\frac{n}{2}\right)!}$, n is even. **[4]**

Q5) **Solve any four of the following :** **[10]**

a) What is meant by time dilation?

b) Express the point $P(x=1, y=1, z=-\sqrt{2})$ in spherical polor co-ordinates.

c) Explain ordinary differential equation with examples.

d) Show that $x = 0$ is an ordinary point of Hermite differential equation.

e) Explain curvilinear co-ordinate system.

f) Use Rodrigues formula to find first two Legendre polynomials $P_0(x)$ and $P_1(x)$.

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Total No. of Questions : 5]

SEAT No. : ____

PC-1301

[Total No. of Pages : 2

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T.Y. B.Sc.

PHYSICS

PHY - 352 : Electrodynamics

(2019 Pattern) (CBCS) (Semester - V) (2 Credits) (35122)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicates full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) **Solve <u>any Five</u> of the following :** **[5]**

a) Give two limitations of Coulomb's Law.

b) What is mean by non-polar molecule.

c) Write Lenz's law in electromagnetic.

d) What is magnetic flux? Give its S.I. unit.

e) Give physical significance of Maxwell's equations.

f) Calculate the velocity of propagation (c) in free space.

Given : $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am^2, $\varepsilon = 8.85 \times 10^{-12}$ C^2/Nm^2.

Q2) **Answer the following questions.** **[6]**

a) i) Explain the terms $\bar{B}, \bar{H}$ and $\bar{M}$.

ii) Obtain the relation between $\bar{B}, \bar{H}$ and $\bar{M}$

OR

Discuss magnetic induction due to straight current carrying conductor.

b) Calculate force of interaction in air between two point charges, if a dielectric medium having K=5.2 interact with a force of 8.85×10^{-3}N. **[4]**

P.T.O.

Q3) **Answer the following questions.**

a) Describe the magnetic vector potential. **[6]**

b) A plane monochromatic plane polarized electromagnetic wave is travelling eastward. The wave is polarized with E directed vertically up and down alternately. Calculate E and B provided that amplitude of electric field strength is 0.05V/m and the frequency is 6 MHz. **[4]**

Q4) **Answer the following questions.**

a) State Faraday's law of electromagnetic induction and prove that

$$\int_c \bar{E} \cdot \bar{dl} = \int_c \frac{\partial \bar{B}}{\partial t} \cdot \bar{ds}.$$ **[6]**

b) A parallel plate capacitor of area 0.5 m^2 and plate separation 3cm is filled with two dielectric slabs. The thickness of upper slab is 2cm with dielectric constant 6 and lower slab is of thickness 1cm with dielectric constant 12. If the potential of 200 V is applied to the capacitor. Find polarization P, electric displacement D and electric field E. **[4]**

Q5) **Solve any <u>Four</u> of the following :** **[10]**

a) Distinguish between diamagnetic and Ferromagnetic materials.

b) Write a note on electric polarization of the dielectric.

c) Write a note on Equation of continuity.

d) Explain the term linear charge density

e) Explain the term potential energy of system of charge

f) Write a note on Magnetization of matter

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Total No. of Questions : 5]

SEAT No. : ____

PC-1302

[Total No. of Pages : 2

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T.Y.B.Sc. (Regular)
PHYSICS
PHY-353: CLASSICAL MECHANICS
(2019 Pattern) (Semester - V) (35123)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

1) ***Question. 1 is compulsory.***
2) ***Solve any Three questions from Q 2 to Q 5.***
3) ***Question Nos. 2 to 5 carry equal marks.***
4) ***Frgures to the right indicates full marks.***
5) ***Use of calculator and logtable is allowed.***

Q1) Solve any FIVE of the following_____ **[5]**

a) What will be the nature of orbit if e = 0 & E = 0 ?

b) State kepler's first low of planetary motion.

c) State the nature of path described by particle when it enters in mutually perpendicular electric & magnetic field.

d) State condition of conservation of linear momeutum of system.

e) Define impact parameter.

f) What is meant by holonomic constraints.

Q2) a) Show that path of charged particle moving with uniform velocity in the constant magnetic field making some angle with field direction is spiral. **[6]**

b) Derive the differantial equation of orbit in central force field. **[4]**

P.T.O.

Q3) a) What is inelasting scattering obtain Q value equation in case of inelasting scattering process. **[6]**

b) Show that the gravitation force between two masses m_1 and m_2 separated by distance 'r' is conservative force. **[4]**

Q4) a) Use Lagrange's equation to obtain the motion of simple pendulum. **[6]**

b) Distinguish between elasting and inelasting scattering. **[4]**

Q5) Attempt any Four of the following_____ **[10]**

a) What are cyclic-co-ordinates.

b) Write short note on degree of Freedom.

c) What is meant by exoergic and endoergic process.

d) Write short note on Laboratory frame.

e) Discuss characterstics of central force.

f) For artificial statellite show that $T^2 \propto R^3$

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Total No. of Questions : 5]

SEAT No. : ____

PC1303

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T.Y.B.Sc. (Regular)

PHYSICS

PHY - 354 : Atomic and Molecular Physics

(CBCS 2019 Pattern) (Semester - V) (35124)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Attempt any three from question 2 to question 5.***
3) ***Q.2 to Q.5 carries equal marks.***
4) ***Use of calculator and logtable is allowed.***

Q1) Attempt any five **[5]**

a) State Bohr's third postulate.

b) For $^2D_{5/2}$, Calculate l, s, j.

c) Define principal quantum number.

d) Calculate atomic states for l = 2 and s = ½

e) Define stark effect.

f) Write electronic configuration of silicon (z = 14).

Q2) a) Derive an expression for radius of electron in Bohr's orbit $r_n = \frac{\in_o n^2h^2}{\pi me^2}$. **[6]**

b) Find singlet and triplet terms in p-d configuration for L-S coupling. **[4]**

Q3) a) Derive an expression for vibrational energy levels for diatomic molecule. **[6]**

b) Explain classical theory of Raman Effect. **[4]**

P.T.O.

Q4) a) What is anomalous zeeman effect? Explain in detail. **[6]**

b) Using p-d electron configuration, calculate all possible values of total angular momentum (J) for j-j coupling. Represent it in vector diagram.**[4]**

Q5) Attempt any four. **[10]**

a) Calculate energy of electron for 2^{nd} orbit of hydrogen atom.

b) For S = 0, We get singlet only, explain.

c) Explain L-S coupling.

d) Derive an equation for number of electron in different orbit $2n^2$.

e) Give applications of Raman spectroscopy.

f) Explain the term multiplicity with example.

Total No. of Questions : 5]

SEAT No. :

PC1304

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T.Y.B.Sc. (Regular)

PHYSICS

PHY-355 : Computational Physics

(2019 Pattern) (Semester- V) (35125)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log tables is allowed.***

Q1) Solve any five of the following. **[5]**

a) What are the types of programming languages?

b) What are the limitations of flowchart?

c) Write syntax of printf( ) and scanf( ) functions.

d) Define bottom tested loop with examples.

e) Define identifiers with example.

f) State Simpson's 1/3rd rule.

Q2) Answer the following questions:

a) What is operator? Describe types of operators with suitable examples. **[6]**

b) What are types of character set? Explain it with examples. **[4]**

Q3) Answer the following questions:

a) What are the types of decision making statement? Explain them with syntax and flowchart. **[6]**

OR

What are pointer variables? How are they different than types of variable? What are the applications of pointer?

b) Distinguish between for loop and while loop. **[4]**

P.T.O.

Q4) Answer the following questions:

a) Find the real root of the equation $x^3 - 2x - 5 = 0$ using bisection method. **[6]**

OR

Find the smallest root of the equation $x^3 - 5x + 3 = 0$ using Newton-Raphson method using 4 iterations.

b) Evaluate the following integral by using trapezoidal rule with 10 intervals

$$\int_0^1 \sin x \, dx \,. \qquad \textbf{[4]}$$

Q5) Answer the following. (any four) **[10]**

a) Explain the following functions with their syntax
   i) Ellipse
   ii) Circle
   iii) Arc
   iv) Rectangle
   v) Set color

b) What are the types of storage classes in c? Define any two of them.

c) What is function? Define types of functions.

d) What is the output of the following program?

```
#include<stdio.h>
main( )
{
int x, y;
for (x = 1; x<3; ++x)
{
for (y = 1; y<3; ++y)
{
if (x = = y)
continue;
printf ("%d%d \n", x, y);
}
   }
getch( );}
```

e) Draw a flowchart for Newton-Raphson Method.

f) Draw a flowchart for Trapezoidal Rule.

Total No. of Questions : 5]

SEAT No. :

PC1305

[Total No. of Pages :2

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T.Y.B.Sc. (Regular)

PHYSICS

PHY-356(A) : Astronomy and Astrophysics - I

(2019 Pattern) (Semester- V) (35126A)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) Solve any five of the following. **[5]**

a) With a suitable diagram, explain the concept of solar eclipse.

b) On the scale of apparent magnitude, two objects show magnitudes +5 and –3. What will be ratio of their apparent brightness?

c) With the help of suitable diagram, explain the concept of 'Resolution' for telescopes.

d) What do you mean by Event Horizon?

e) The surface of the moon has many more crateres than the surface of the earth. Why?

f) Write properties of 'G' type stars.

Q2) Answer the following questions.

a) What is CCD? With suitable diagram, explain its construction and working. What are limitations of CCD? **[6]**

b) A planet is revolving around the star. The orbit of revolution is circular with radius R and period T. What will hapen if - **[4]**

i) Size of a star is halved.

ii) R becomes +R.

P.T.O.

Q3) a) Explain - **[6]**

i) The pulsation of Cepheid variables.

ii) How cepheid variables are useful in estimating the distance.

b) Write a note on Dark Matter. **[4]**

Q4) a) Write a note on -

'Big Bang Theory and its evidences'. **[6]**

b) With suitable diagram, explain the concept of Celestial hemisphere. **[4]**

Q5) Solve any four of the following. **[10]**

a) What are essential conditions for nuclear fusion? How these conditions are achieved in stars?

b) How different elements are formed in the core of stars?

c) Explain the difference between -

i) Meteor

ii) Meteoroid

iii) Meteorite

iv) Comet

d) Spectral classification of stars. (Short Note)

e) Write a note on : Star dial.

f) What are filters?

Total No. of Questions : 5]

SEAT No. : ____

PC1306

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T.Y.B.Sc. (Regular)

PHYSICS

PHY-356(B) : Elements of Material Science

(2019 Pattern) (Semester- V) (Paper - VI) (35126B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) Solve any five of the following. **[5]**

a) What do you know about CRSS.

b) Give any two properties of single phase alloy.

c) What are hard Ferrite? Give any one example of hard ferrites.

d) Calculate the volume of unit cell of compound CdS having structure same as ZnS if lattice constant is 5.77×10^{-8}cm.

e) State Lever rule.

f) What are degree of freedom of a system of two components? When number of phases is three and four.

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

i) Explain different applications of smart material in brief. **[3]**

ii) Explain the phase diagram of NaCl and water. **[3]**

iii) Explain dielectric properties of ceramics. **[3]**

b) Discuss Ax-structure of CsCl type. **[4]**

P.T.O.

Q3) a) Answer any two of the following questions. **[6]**

i) Define term **[3]**

1) Alloy and

2) Deformation

ii) Explain semiconducting properties of ceramics. **[3]**

iii) State importance of phase diagram. **[3]**

b) Calculate thermal stress for the polymer, charge the dimension due to change in temperature 300° K Young's modulus is 2.3×10^{-12} N/m^2 and linear coefficient of thermal expansion for polymer is 120×10^{-6} °C^{-1}. **[4]**

Q4) a) Answer any two of the following questions: **[6]**

i) Write short note on "Grain boundaries". **[3]**

ii) Discuss the Ax-structure of NaCl type. **[3]**

iii) Explain impurities in solid with examples. **[3]**

b) The compund of CsBr has the same structure as CsCl. The centres of the two unlike ions are separated by 0.37 nm. What is density of CsBr? (Given : Atomic mass of Cs = 132.9 amu, Atomic mass of Br = 79.9 amu) **[4]**

Q5) Attempt any Four of the following: **[10]**

a) Give any three importance of phase diagram.

b) Explain super conducting properties of ceramic material.

c) What are the influencing factor in polycrystalline materials?

d) Explain Schottky defect.

e) What is atomic diffusion? State types of diffusion.

f) Define Plasticity and Toughness.

Total No. of Questions : 5]

SEAT No. :

PC1307

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T.Y.B.Sc. (Regular)

PHYSICS

PHY-356(C) : Biophysics

(2019 Pattern) (Semester- V) (Elective - I) (35126C)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 and question 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) Solve any five of the following. **[5]**

a) What do you mean by oxidation?

b) What is Gibb's free energy?

c) What do you mean by "halt cell potential"?

d) State the principle of TEM.

e) What is radioimmunoassays?

f) Define Radioactivity.

Q2) Answer the following:

a) Describe the construction and working of computed Tomography. **[6]**

b) Describe in detail Mitochondria with suitable examples. **[4]**

Q3) Answer the following:

a) State the Resting potential. Describe in detail resting potential with suitable examples. **[6]**

b) Describe the construction and working of scanning Electron Microscope (SEM). **[4]**

P.T.O.

Q4) Answer the following:

a) Distinguish between prokaryotic cell with Eykaryotic cell. **[6]**

b) Find the cardiac output for **[4]**

i) A patient whose heart rate is 60 beats/min. if the stroke volume is 50 ml/beat.

ii) A heart rate of 90 beats/min and stroke volume of 80 ml/beat.

Q5) Attempt any Four of the following: **[10]**

a) Write a short note on “Bioelectric Signals”.

b) Write a short note on “Action potential”.

c) Write a short note on “Centrifuge measurement”.

d) What is Magnetic Resonance imaging Techniques?

e) What is polarizable electrodes?

f) Write a short note on “Genetic code symmetry”.

Total No. of Questions : 5]

SEAT No. : ____

PC1308

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T.Y.B.Sc. (Regular)

PHYSICS

PHY-356(D) : Renewable Energy Sources - I

(2019 Pattern) (Semester- V) (35126D)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log tables is allowed.***

Q1) Solve any five of the following. **[5]**

a) What are non-conventional energy sources?

b) What is meant by Zenith?

c) What is the principle of solar dryer?

d) What is solar module?

e) State Photovoltaic principle.

f) What is the function of super capacitors?

Q2) Answer the following questions:

a) Describe the construction and working of Solar Concentrating Collectors (SCC). **[6]**

b) Explain use of hydrogen as potential source of energy. **[4]**

Q3) Answer the following questions:

a) Explain various applications of solar cells. **[6]**

b) Explain how chemical energy is stored? **[4]**

P.T.O.

Q4) Answer the following questions:

a) Draw a neat diagram of direct, diffuse and total solar radiation. **[6]**

b) Explain p - i - n solar cell. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Need of energy storage

b) PV system

c) Solar insolation

d) Heat conductor

e) Energy from sea waves

f) Solar radiation at earth's surface

Total No. of Questions : 5]

SEAT No. :

PC1309

[Total No. of Pages : 2

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T.Y. B.Sc. (Regular)

PHYSICS

PHY 356 (E) : Applied Optics

(2019 Pattern) (Semester - V) (35126 E)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Question no.2 to 5 carry equal marks.***
4) ***Figures to right indicates full marks.***
5) ***Use of calculators and log table is alloweded.***

Q1) Solve any Five of the following : **[5]**

a) What is an optical fibre?

b) What is polarization of light?

c) What is zone plate.

d) Define translational matrix of optical system.

e) Define quartz plate.

f) What is acceptance angle?

Q2) Answer the following questions.

a) What is holography? Describe process of recording and construction of hologram. **[6]**

b) At what angle light should be incident on a glass plate to get a plane polarized light by reflection (retractive index $\mu = 1.5697$) **[4]**

Q3) Answer the following questions.

a) Explain step index, graded index, single mode and multimode. **[6]**

b) What is numerical experature of an optical fibre cube with clade index of 1.378 and a core index of 1.546? **[4]**

P.T.O.

Q4) Answer the following.

a) What is system matrix? Obtain system matrix for an optical system. **[6]**

b) Describe principle and working of Fabry - perot interferometer. **[4]**

Q5) Solve any four of the following. **[10]**

a) What is critical angle and it's role in total internal reflection?

b) Define Dispersive power. What unit it has?

c) What are sign convenstion followed for lens system?

d) What is double refraction?

e) Write short note on unit planes and nodal planes in paroxial optics.

f) Distinguish between Fraunhofer and fresnel diffraction.

Total No. of Questions : 5]

SEAT No. : ____

PC1310

[Total No. of Pages : 2

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T.Y. B.Sc. (Regular)
PHYSICS
PHY-356 (F): C# Programming
(2019 Pattern) (Semester - V) (35126F)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Questions 2 to 5 carries equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) Solve any five of the following: **[5]**

a) Specify the type of declaration used to declare an 8-byte integer.

b) Define the term char int, float.

c) When CInteger ( ) Function can be used?

d) Which statement can be used to change execution of program depending on case?

e) What is an object in C#?

f) What is the size of a decimal?

Q2) Answer the following questions:

a) What is the difference between dynamic variables and object type variable? **[6]**

b) What is SQL, MYSQL and SQL server. **[4]**

P.T.O.

Q3) Answer the following questions:

a) What are various DDL commands in SQL? Give brief description of their purposes. **[6]**

b) Explain CLR? **[4]**

Q4) Answer the following questions:

a) Write a short note on ADO.NET. **[6]**

b) Write an algorithm to find the root of equation using Bisection method. **[4]**

Q5) Solve any four of the following. **[10]**

a) What is jaggers array and how can initialize it.

b) What are the reference types in C#.

c) What is the operator? Specify their types.

d) What are the value types in C#.

e) Which class acts as basic class in NET.

f) What is RDBMS.

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Total No. of Questions : 5]

SEAT No. :

PC1311

[Total No. of Pages :2

[6327]-121

T.Y.B.Sc. (Regular)

PHYSICS

PHY-356(G) : Acoustics - I

(2019 Pattern) (Semester- V) (Paper - VI) (35126G)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) Solve any five of the following. **[5]**

a) Define intensity level and sound power level.

b) Determine velocity of sound in air at 25° C.

c) Determine sound power level in an enclosure with 5.0 watt of acoustic power (re.10^{-12} watts).

d) What is a live room?

e) What do you mean by near field?

f) According to Haas effect, what is the ideal time difference between arrival times of sound?

g) Define reverberation time.

Q2) Answer the following questions.

a) Explain the analogies between electrical, mechanical and acoustical systems. **[6]**

b) Distinguish between vibrato, Tremolo and Portamento. **[4]**

P.T.O.

Q3) Answer the following questions.

a) What is Helmoholtz Resonator? Give the equation and unit for acoustic inertance, acoustic compliance and acoustic resistance. Also define quality factor. **[6]**

b) Determine the room modes 800, 302, 122 and 222 for a seminar hall of size 54×36×15 ft. What do you conclude? [c = 1130 ft/sec] **[4]**

Q4) Answer the following questions.

a) Describe mechanism of hearing. Sketch the curves representing thresholds of the ear. **[6]**

b) On the level detector type T_{60} reverberation time measuring instrument the upper and lower levels are 2 V and 1 V respectively. The number of counts displayed by the counter is 1000 for an enclosure with T_{60} = 1.1 sec. Determine the onboard clock frequency. **[4]**

Q5) Write short notes on four of the following. **[10]**

a) Haas effect

b) Acoustic standards and reference condition

c) High-loss acoustic frame walls

d) Anechoic chamber

e) Pros and cons of headphones

f) FFT analysis

Total No. of Questions : 5]

SEAT No. : ____

PC1312

[Total No. of Pages : 2

[6327]-122
T.Y. B.Sc. (Regular)
PHYSICS
PHY- 3510 (H) Python Programming
(2019 Pattern) (Semester - V) (351210 H)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figure to the right indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

Q1) Solve any Five of the following. **[5]**

a) How to select an elements from list in python?

b) Which are data types in python?

c) Explain any two tuple operations with an example.

d) What is string slice?

e) How to call function?

f) Define Seaborn.

Q2) Answer the following questions.

a) Explain string data type in python. **[6]**

b) Which are basic tuple operations? Explain with example. **[4]**

P.T.O.

Q3) Answer the following questions.

a) Write short note on identifier and keyword. **[6]**

b) What are the advantages of using matplotlib library. **[4]**

Q4) Answer the following questions.

a) Write python program to find the factorial of a given number. **[6]**

b) Write a python program to calculate surface volume and area of a cylinder. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Dictionary data type in python.

b) Basic tuple operations.

c) Functools module.

d) Sys module.

e) What are the different output formats supported by matplotlib library?

f) Write a python function to check wheather a number is in a given range.

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Total No. of Questions : 5]

SEAT No. : ____

PC1313

[Total No. of Pages : 2

[6327]-123
T.Y. B.Sc. (Regular)
PHYSICS
PHY- 3510 (I) Energy Studies (Skill Enhancement Course - I)
(2019 Pattern) (Semester - V)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

Q1) Solve any Five of the following. **[5]**

a) State photovoltaic principle.

b) What are the examples of conventional energy sources.

c) Define the term "Air mass".

d) Define solar constant.

e) What are the various forms of energy storage.

f) What is the principle of solar heater.

Q2) Answer the following questions.

a) Explain Biogas generation and working Biogas plant. **[6]**

b) Calculate efficiency of flat plate collector for the given values such as Qk = 300 k cal/hr, Ac = 1.5m^2, I = 500 k cal/hr.m^2. **[4]**

P.T.O.

Q3) Answer the following questions.

a) Explain the structure of sun with neat diagram. **[6]**

b) Explain recent trends in batteries. **[4]**

Q4) Answer the following questions.

a) Explain Non-renewable energy sources in brief. **[6]**

b) Explain about types of concentrator collector. **[4]**

Q5) Attempt any four of the following. **[10]**

a) Facts and Myths about various sources of the energy.

b) Advantages and disadvantages of solar dryer.

c) Explain hybrid sources of energy.

d) Applications of solar cells.

e) Difference between Invertors & convertors.

f) Explain the term “Biomass”.

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Total No. of Questions : 5]

SEAT No. :

PC1314

[Total No. of Pages : 2

[6327]-124
T.Y. B.Sc (Regular)
PHYSICS
PHY- 3510 (J) Introduction to Arduino
(2019 Pattern) (Semester - V) (351210 J)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

Q1) Solve any Five of the following. **[5]**

a) What is arduino?

b) What language is a typical arduino code based on?

c) What is the microcontroller used in Arduino UNO?

d) Who is developer of Arduino?

e) Write the syntax of pin mode ( ).

f) Which function are contained in Arduino IDE?

Q2) Answer the following.

a) State the features of Arduino. **[6]**

b) Give specifications of Arduino UNO board. **[4]**

P.T.O.

Q3) Answer the following.

a) What is the function of AREF? **[6]**

b) List features of ATmega 328p microcontroller. **[4]**

Q4) Answer the following.

a) What is structure of Arduino program? Explain in brief. **[6]**

OR

What is function of SPI?

b) Explain analog pins of Arduino board. **[4]**

Q5) Attempt any four. **[10]**

a) What is IDE?

b) List control structure used in Arduino.

c) Write a program to blink LED on arduino.

d) Explain various loops in Arduino.

e) Explain arithmatic, logical, relational, module and assignment operator.

f) Describe-

i) Void

ii) Chor

iii) int

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Total No. of Questions : 5]

SEAT No. : ____

PC1315

[Total No. of Pages : 2

[6327]-125
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 3510 (K) : Sensors & Transducer
(Skill Enhancement Course - I)
(2019 Pattern) (Semester - V) (351210 K)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figure to the right indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

Q1) Solve any Five of the following. **[5]**

a) What do you mean by Electromechanical sensor?

b) What is a transducer?

c) What is the principle of capacitive transducer?

d) What are the two applications of capacitive transducer?

e) What is PTAT?

f) What is primary sensor?

Q2) Answer the following questions.

a) Describe the operation of an LVDT for measuring displacement. How is its operation dependent on the position of the core? **[6]**

b) Explain thermo emf sensors. **[4]**

P.T.O.

Q3) Answer the following questions.

a) Explain how the variable capacitor is used for displacement measurement. **[6]**

b) What are the different types of capacitive sensors used for displacement measurement? **[4]**

Q4) Answer the following questions.

a) Explain the working principle of variable capacitance transducer. **[6]**

b) Explain the working principle of resistive potentiometer transducer. **[4]**

Q5) Write short notes on any Four of the following. **[10]**

a) Strain gauge transducer.

b) Advantages of variable capacitance devices.

c) Importance of capacitive sensors.

d) RTD material.

e) Material expansion type sensors.

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Total No. of Questions : 5]

SEAT No. : ____

PC1316

[Total No. of Pages : 2

[6327]-126

T.Y.B.Sc. (Regular)

PHYSICS

SEC-II-PHY-3511(L): Physics Workshop Skill

(2019 Pattern) (Semester - V) (351211L)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figure to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

Q1) Solve any five of the following. **[5]**

a) Define precision.

b) State limitations of analog instruments.

c) Give the balancing condition of dc bridge.

d) What is the working principle of Q meter?

e) What is distortion factor?

f) What is pulse generator?

Q2) Answer the following questions.

a) Draw a neat block diagram of CRO. Explain function of each block **[6]**

b) Explain working principle of voltmeter. Draw block diagram of it. **[4]**

Q3) Answer the following questions.

a) Explain the working of low frequency signal generator. **[6]**

b) Write working principle of RLC bridge. Give the applications of RLC bridge. **[4]**

P.T.O.

Q4) Answer the following questions.

a) Explain the working of digital multimeter with the help of block diagram. **[6]**

b) The actual value of voltage across the resistor is 85 V but the measured value's 84 V Hence calculate absolute error, relative error and percentage error. **[4]**

Q5) Solve any four of the following. **[10]**

a) Draw block diagram of Ac milli voltmeter.

b) Enlist different types of errors. How errors can be minimized?

c) Explain effect of loading.

d) Write characteristics of digital meters.

e) Give applications of function generator.

f) Explain use of CRO in laboratory.

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Total No. of Questions : 5]

SEAT No. :

PC1317

[Total No. of Pages : 2

[6327]-127

T.Y. B.Sc. (Regular)

PHYSICS

SEC - II - PHY- 3511 (M): Biomedical Instrumentation

(2019 Pattern) (Semester - V) (351211M)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use calculator and log table is allowed.***

Q1) Solve any Five of the following : **[5]**

a) What is diastolic Pressure?

b) What is Resting Potential?

c) What are the different types of bioelectric signals.

d) Define Transducer.

e) What are the different types of biomedical sensors.

f) What is an ECG.

Q2) Answer the following :

a) Describe in detail phonocardiography with suitable examples. **[6]**

b) Describe in detail the effect of artifacts on ECG recording. **[4]**

P.T.O.

Q3) Answer the following.

a) Describe in detail the different types of ECG leads with suitable examples. **[6]**

b) Find the co for **[4]**

i) A patient whose heart rate is 60 beats / min. if the stroke volume is 50 ml/beat.

ii) A heart rate of 90 beats/min. and a stroke volume of 80 ml/beat.

Q4) Answer the following.

a) Describe in detail the action potential with suitable examples. **[6]**

b) Describe transducer for body temperature measurement. **[4]**

Q5) Attempt any four of the following. **[10]**

a) What is an ultrasound?

b) Write a short note on "Electro Conduction System of Heart".

c) How to interprete of an ECG.

d) What do you mean by pulse oximetry?

e) What are the basic and essential requirement of biomedical instrumentation system.

f) What are the different characteristics of transducers.

Total No. of Questions : 5]

SEAT No. :

PC1318

[Total No. of Pages : 2

[6327]-128
T.Y.B.Sc. (Regular)
PHYSICS
PHY-3511 (N) : Non-destructive Testing Techniques
(2019 Pattern) (Semester-V) (351211N)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

Q1) Solve any five of the following. **[5]**

a) What are the factors influencing on the selection of NDT method?

b) Define non-destructive testing.

c) What are the applications of thermography testing method?

d) What are the applications of liquid penetrant method?

e) State the principle of MRI testing method.

f) State the principle of eddy current testing technique?

Q2) Answer the following questions.

a) Explain in brief pulse echo method of ultrasonic testing techniques? **[6]**

b) Explain in brief liquid leak non-destructive testing method. **[4]**

Q3) Answer the following questions.

a) What are the advantages and limitation of dry powder developer? **[6]**

b) Explain importance of non-destructive testing in the field of medicine. **[4]**

P.T.O.

Q4) Answer the following questions.

a) Explain in brief the method of NDT with portable electromagnetic yokes. **[6]**

b) Explain radiography testing method. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Computer tomography

b) Single X-ray testing technique.

c) Advantages and limitation of water-soluble developer

d) Active approach of thermography testing method.

e) Helium leak testing method.

f) Applications of visual inspection method.

Total No. of Questions : 5]

SEAT No. :

PC1319

[Total No. of Pages : 2

[6327]-129
T.Y.B.Sc. (Regular)
PHYSICS
SEC-II-PHY-3511 (O) : Acoustics Applications
(2019 Pattern) (Semester-V) (351211 O)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

Q1) Solve any five of the following. **[5]**

a) What is sonic boom?

b) What is the function of mixers in sound systems?

c) What is an octave in musical scales.

d) Define reverberation time.

e) What is audiometry?

f) What is a passive sonar?

Q2) Answer the following.

a) Give the construction and working of a carbon microphone. Write equation of sensitivity. Draw equivalent circuit. **[6]**

OR

Give the construction and working of a direct radiator type loudspeaker.

b) With the help of a neat diagram, explain the monophonic sound recording system. **[4]**

P.T.O.

Q3) Answer the following. **[6]**

a) Define the following terms.

i) Pitch

ii) Loudness

iii) Consonance

iv) Dissonance

v) Harmonics

vi) Overtones

b) A direct radiator dynamic loudspeaker has mechanical impedance of 13.2 kg/s. The voice coil is 7.3 m in length and is suspended in a magnetic field of 1.2 wb/m^2. Find the transformation factor. **[4]**

Q4) Answer the following.

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

ii) Write a note on noise induced hearing loss. **[3]**

b) Find the reverberation time of an office which has a volume of 1600 m^3 and a total sound absorption of 100 metric sabines. What would be the sound absorption required for an optimum reverberation time of 1.2 sec. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) A-weighted sound level

b) Bass reflex cabinet

c) Classification of musical instrument.

d) Articulation test

e) Non destructive Testing (NDT)

f) Head phones and its noise cancellation features.

Total No. of Questions : 5]

SEAT No. : ____

PC-1320

[Total No. of Pages : 2

[6327]-130

T.Y. B.Sc. (Regular)

CHEMISTRY

CH - 501 : Physical Chemistry - I

(2019 Pattern) (CBCS) (Semester - V) (35131)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Figures to right indicates full marks.***
5) ***Draw neat and labelled diagram whenever necessary.***
6) ***Use of logarithm table and calculator is allowed.***

Q1) Solve any Five of the following. **[5]**

a) What is the necessary condition for a molecule, to obtain rotational spectrum in microwave region.

b) State Heisenbergs uncertainty principle.

c) What is the selection rule for IR spectra?

d) State Stark - Einstein law of photochemical equivalence?

e) Write the total energy expression for a particle performing motion inside the one dimentional box.

f) A certain system absorbs 5×10^{-4} Einstein of light in a given time. If 1×10^{-3} moles of a substance has reacted in the same time, calculate the quantum yield.

Q2) a) Answer any Two of the following. **[6]**

i) classify the following molecules as microwave active or inactive with reason :
HCl and H_2

ii) Explain the de-Broglie hypothesis.

iii) Explain the term 'Fluorescence'.

b) The dipole moment of chlorobenzene is 1.549D. If the bond distance of C-Cl bond is 2.8Å, calculate the ionic character of the bond ($e = 4.8 \times 10^{-10}$ e.s.u.) **[4]**

P.T.O.

Q3) a) Answer <u>any Two</u> of the following. **[6]**

i) Explain the rotational spectra of a rigid diatomic molecule.

ii) Sketch the plot for wave function (Ψ) and probability density (Ψ^2) verses displacement co-ordinate for the first three energy levels for a particle in one dimentional box.

iii) State and explain Grotthus - Draper law.

b) i) Calculate the energy per Einstein of the light of wavelength 2000Å. **[2]**

ii) Calculate the uncertainty in the position of an electron if uncertainty in velocity is 3×10^{-2} m/s (mass of electron = 9.1×10^{-31}kg, h = 6.626×10^{-34}). **[2]**

Q4) a) Answer <u>any Two</u> of the following. **[6]**

i) Define the following terms.

I) Photochemical reaction

II) Quantum yield

III) Photocatalysis

ii) Explain the properties of well-behaved wave function.

iii) What is Raman effect? Explain the term Rayleigh lines, stokes lines and anti stokes lines.

b) If the bond length of $^{1}H^{35}Cl$ is 1.274Å, calculate reduced mass and moment of Inertia of the molecule. **[4]**

Q5) Write short notes on <u>any Four</u> of the following : **[10]**

a) Effect of isotopic Substitution on Rotational spectra.

b) Quantum tunneling.

c) Vibrational spectra of a rigid harmonic rotator.

d) Chemical actinometers.

e) Fundamental modes of vibrations.

f) Photosensitization.

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Total No. of Questions : 5]

SEAT No. :

PC-1321

[Total No. of Pages : 2

[6327]-131
T.Y. B.Sc.
CHEMISTRY
CH-502 : Analytical Chemistry - I
(2019 Pattern) (Semester - V) (CBCS) (Paper - II) (35132)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question number 1 is compulsory.***
2) ***Solve any three questions from question 2 to question 5.***
3) ***Question 2 to Question 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagram with labelled wherever necessary.***
6) ***Use of logtable and calculators are allowed.***

Q1) Solve any five of the following : **[5]**

a) Define gravimetry.

b) What is group reagent for III B. group

c) Give Long form for DTA.

d) Define precision.

e) Calculate the transmittance if the absorption of solution is 0.8.

f) Calculate molar absorptivity of 0.4m solution when placed in 1.5cm path length cell whose absorbance is 0.2.

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

i) What is co-precipitation? Explain co-precipitation with suitable example.

ii) Discuss the effect of dilute HCl in presence of H_2S in inorganic qualitative analysis?

iii) Name the components of DTA apparatus?

b) Explain the classification of samples based on their size and analytes based on their weight percentage in the sample? **[4]**

P.T.O.

Q3) a) Answer any two of the following : **[6]**

i) Explain the term solubility product with suitable example?

ii) How phosphate anion interface in analysis of basic radicals? Explain phosphate anion removal by basic iron acetate method.

iii) Draw and explain in brief pyrolysis curve of $CuSO_4 \cdot 5H_2O$?

b) A solution of concentration 1×10^{-4}m placed in a cell of 3 cm path length shows an absorbance value of 0.45, what will be the absorbance of solution if the path length is doubled and concentration is reduced to half of its original? **[4]**

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

i) What is homogeneous precipitation method in gravimetric analysis? Explain homogeneous precipitation with suitable example.

ii) Draw neat labelled diagram of single beam spectrophotometer?

iii) Describe general procedure of colorimetric estimation?

b) Solubility product of AgCl is 1×10^{-10}. What is the minimum concentration of chloride ion that must be added to a solution containing 1×10^{-4} moles/wt of silver ion so as to precipitate AgCl? **[4]**

Q5) Answer any four of the following : **[10]**

a) Write any five conditions of ideal wash liquid in gravimetric analysis?

b) Calculate gravimetric factor for following conversions?

Analyte	Molar Mass	Precipitate	Molar Mass
Ni^{++}	58.71	Ni(Dmg)	288.7

c) Calculate the percent loss in mass for following reaction

$$CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_{2(g)}$$

[Given : At.Wt. G = 40, C = 12, O = 16]

d) The percentage of calcium in given white powder is reported by different students as 23.6, 23.7, 24.0, 23.9 and 23.8. Calculate standard deviation?

e) Define Beer's law? Give reasons of deviations from Beer's law?

f) Distinguish between co-precipitation and post precipitation?

Total No. of Questions : 5]

SEAT No. : ____

PC-1322

[Total No. of Pages : 2

[6327] - 132
T.Y. B.Sc.
CHEMISTRY
CH-504: Inorganic Chemistry - I
(2019 Pattern) (Regular) (CBCS) (Semester - V) (35134)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagrams wherever necessary***
6) ***Use of logorithms tables calculators is allowed.***

Q1) Answer the following (any five) : **[5]**

a) Write IUPAC name of element having atomic number 121.

b) Calculate the magnetic moment for SC^{2+}ion by using spin only formula (Sc at. no.21)

c) Define insulators

d) Define formation constant

e) What is symmetry symbol for $dx^2 - y^2$ and dz^2 orbital?

f) What is superconductor?

Q2) Answer any two of the following

a) i) Explain the electroneutrality principle. **[6]**

ii) Discuss stepwise formation constant.

iii) Explain most of the transition metals and their compound act's as catalyst' Explain?

P.T.O.

b) Answer the following

i) Why $cuso_4$ is blue while $znso_4$ is white? **[4]**

ii) Distinguish between combination and decomposition reactions.

Q3) Answer any two of the following

a) i) Explain the dissociative mechanism with the help of reactions profile. **[6]**

ii) Write the properties of lanthanides dependent on standard reduction potential values.

iii) What is n type semiconductivity? Explain with the help of NCE) VS E Curve.

b) Explain the ion exchange method for separation of lanthanides. **[4]**

Q4) Answer any two of the following

a) i) Explain the synthesis of transuranic elements by neutron bombardment method. **[6]**

ii) Why $KMnO_4$ is coloured?

iii) Define superconductivity. Give the applications of superconducter

b) Draw the molecular orbital energy level diagram for $[Ti (H_2O)6]^{3+}$ and comment on the magnetic property of the complex. **[4]**

Q5) Write a note on any four of the following : **[10]**

a) Multiple bonding

b) d – d transition

c) Non – stoichiometry

d) Effect of impurity on conductivity of metals.

e) Nuclear fuels

f) Nephelauxetic Effec and series.

Total No. of Questions : 5]

SEAT No. : ____

PC1323

[Total No. of Pages : 2

[6327]-133

T.Y.B.Sc. (Regular)

CHEMISTRY

CH - 505 : Industrial Chemistry - I

(2019 Pattern) (Semester - V) (35135)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Question from 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Define 'Quality control'.

b) Define the term 'Yield'.

c) Write any two uses of sulphuric acid.

d) What are surfactants?

e) What is fermentation?

f) What are dyes?

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

i) Explain the physicochemical principal involved in the manufacture of nitric acid.

ii) What are the characteristics of a good dye?

iii) Explain the concentration of cane juice by multiple effect evaporater.

b) Write a short note on **[4]**

i) Copy right act

ii) Washing action of detergent

P.T.O.

Q3) a) Answer any two of the following. **[6]**

i) Discuss condition favourable for fermentation.

ii) Distinguish between soap and detergent.

iii) Write the synthesis and use of phenolphthalein.

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

i) Write a note on trade marks.

ii) Write a note on detergent builders.

Q4) a) Answer any two of the following. **[6]**

i) Distinguish between platinum catalyst and vanadium catalyst.

ii) Write the synthesis and uses of Fluoresein.

iii) Give the synthesis and uses of crystal violet.

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

i) Explain the term 'Quality Assurance'.

ii) Discuss the function of HR.

Q5) Attempt any four of the following. **[10]**

a) Discuss the uses of molasses.

b) Write comparison between sulphitation and carbonation process.

c) Write a short note on sulphuric acid fog.

d) Write a short note on importance of fermentation Industry.

e) Explain the cationic and anionic surfactants.

f) Discuss the raw materials required for manufacture of soap.

Total No. of Questions : 5]

SEAT No. :

PC1324

[Total No. of Pages :2

[6327]-134

T.Y.B.Sc. (Regular)

CHEMISTRY

CH-507 : Organic Chemistry - I

(2019 CBCS Pattern) (Semester- V) (35137)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***

Q1) Attempt any FIVE of the following. **[5]**

a) Write the synthesis of pyridine from picoline.

b) How EAA is prepared? (Write reaction only)

c) What is β-elimination?

d) Pyrrole is aromatic in nature. Explain.

e) What is Cope rearrangement?

f) What is kinetic Isotopic effect?

Q2) a) Answer any TWO of the following. **[6]**

i) Describe Sulphonation reaction of Naphthalene.

ii) How will you prepare Succinic acid from Diethyl malonate.

iii) Explain $K_H/K_D = 7$ in E_2 elimination.

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

i) 2 - Bromobutane on heating with NaOMe gives 75% of 2 - butene. Explain.

ii) Discuss Beckmann Rearrangement.

P.T.O.

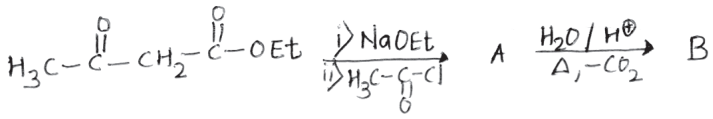
Q3) a) Attempt any TWO of the following. **[6]**

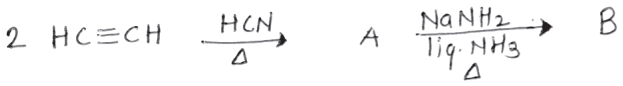
i) Pyrrole undergoes electrophillic substitution at c-2 position. Explain.

ii) What is McLafferty Rearrangement? Discuss the mechanism with suitable example.

iii) What is E_1 elimination? Discuss any two evidences of E_1-elimination.

b) Identify the products A and B. Justify your answer. **[4]**

i) 

ii) 

Q4) a) Solve any TWO of the following. **[6]**

i) What is Baeyer Villiger rearrangement reaction? Discuss Mechanism with suitable example.

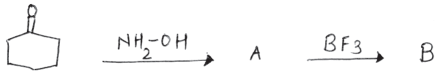
ii) What are benzenoids? What is the action of following reagents on Thiophene?

1) AC_2O/H_3PO_4

2) $2\ H_2/Pd/200\text{-}250°C$

iii) Discuss the sterochemistry of E_2 elimination.

b) Predict the products A and B. Justify your answer. **[4]**

i) 

ii) 

Q5) Attempt any FOUR of the following. **[10]**

a) Favorskii Rearrangement.

b) Haworth synthesis of Anthracene.

c) Write note on Pinacol-pinacolone rearrangement.

d) Give classification of Polynuclear hydrocarbons.

e) Write note on Sigmatropic Rearrangement reactions.

f) Give comparison between E_1 and E_2 reactions.

Total No. of Questions : 5]

SEAT No. :

PC1325

[Total No. of Pages :2

[6327]-135

T.Y.B.Sc. (Regular)

CHEMISTRY

CH-508 : Chemistry of Biomolecules

(2019 Pattern) (CBCS) (Semester- V) (35138)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Figures to the right indicate full marks.***
4) ***Questions 2 to 5 carry equal marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of logarithmic tables & calculator is allowed.***

Q1) Solve any FIVE of the following. **[5]**

a) Draw structure of lactose.

b) Give structure of trigluceride.

c) What are group I hormone?

d) What are golgi bodies?

e) Draw structure of serine.

f) What is prosthetic group?

Q2) a) Attempt any two. **[6]**

i) What are carbohydrates? How are they classified?

ii) What are amino acids? Explain the reaction of amino acid with ninhydrix and phenyl isocyanate.

iii) Write a note on thyroid hormone.

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

i) Explain types of stereospecificity of enzymes.

ii) Give biological significance of lipids.

P.T.O.

Q3) a) Attempt any two. **[6]**

i) What are Eukaryotes? Explain in detail.

ii) What is Rancidity? Write different types of rancidity.

iii) Define active site of enzyme. Discuss the effect of substrate conc. and pH on rate of enzyme catalysed reaction.

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

i) Discuss β-pleated sheet of proteins.

ii) Write a note on mutarotation.

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

i) What are polysaccharides? Discuss the structure of Amylose and Amylopectin.

ii) Discuss classification of proteins based on functions.

iii) Discuss hormones of anterior pituitary gland.

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

i) Write the industrial applications of enzymes.

ii) Classify lipids on the basis of fatty acids.

Q5) Write short notes on any four of the following: **[10]**

a) What are types of enzyme inhibitors?

b) Write following two reactions

i) Hydrolysis of lipids

ii) Emulsification of lipids

c) Write difference between unicellular and multicellular organisms.

d) Write a note on gastro intestinal hormones.

e) Explain the titration curve of glycine.

f) What are monosaccharides? Explain the reaction of excess of phenyl hydrazine with D. Glucose.

Total No. of Questions : 5]

SEAT No. : ____

PC1326

[Total No. of Pages : 2

[6327]-136
T.Y. B.Sc. (Regular)
CHEMISTRY
CH- 510 (A) : Introduction to Medicinal Chemistry
(2019 Pattern) (CBCS) (Semester - V) (351310 A)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and logarithm - tables is allowed.***
6) ***Draw neat diagrams wherever necessary***

Q1) Solve any five of the following. **[5]**

a) Who discovered penicillin?

b) What is disease?

c) Define : Broad spectrum antibiotics.

d) What is the chemical name of aspirin.

e) What is analogue?

f) What is the meaning of 'BBB' in drug action?

Q2) a) Attempt Any two. **[6]**

i) Define : Pain. Write structure of Ibuprofen. Write its mode of action.

ii) What are vaccines? Discuss covid-19 vaccines.

iii) State and explain Lipinski rule of 5.

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

i) What are the shortcomings of penicillin-G.

ii) Explain : Macrolides are known as protein synthesis inhibitors.

P.T.O.

Q3) a) Attempt Any two. **[6]**

i) Discuss various sources of drug.

ii) What are antacids? Explain mode of action of aluminium based antacids.

iii) What are psychoactive agents? How are they classified? Give one example each.

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

i) Explain the mode of action of suphonamides.

ii) Give classification of fungal infections.

Q4) a) Answer any 2. **[6]**

i) Discuss : Chemical properties of drugs.

ii) What is Therapeutic Index? Give its importance in drug design.

iii) Write structure and properties of paracetamol.

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

i) Name the steps involved in virus life cycle.

ii) What is acyclovir? Give its mode of action.

Q5) Write short notes on any 4. **[10]**

a) Uses and side effect of cis platin

b) Immunobiologicals

c) Pharmacophore

d) β-lactam antibiotics

e) SAR of tetracyclins

f) Selective toxicity

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Total No. of Questions : 5]

SEAT No. : ____

PC1327

[Total No. of Pages : 2

[6327]-137
T.Y. B.Sc. (Regular)
CHEMISTRY
CH- 510 (B) Polymer Chemistry
(2019 Pattern) (CBCS) (Semester - V) (351310 B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of the logarithm tables and calculator is allowed.***

Q1) Attempt the following (Any five). **[5]**

a) Define the term-polymer.

b) The word 'Macromolecules' was introduced by _____ .

c) Which polymerisation technique involves formation of micelles?

d) What is meant by step polymerisation?

e) The acronym PVC stands for _____ .

f) Calculate the degree of polymerisation of polyethylene having average molecular weight 11,200.

Q2) a) Attempt the following (Any two). **[6]**

i) Discuss in brief the mechanism of anionic polymerisation.

ii) Explain the methods of preparation of the monomer and polymer 'Polytetrafluoroethylene'.

iii) Describe the 'Bulk polymerisation' process. Give its merits.

b) Distinguish between the following. **[4]**

i) Organic and Inorganic polymer.

ii) Straight chain and branched chain polymer.

P.T.O.

Q3) a) Attempt the following (Any two). **[6]**

i) Comment on glass transition temperature value of Polyethylene and Polyvinyl carbazole.

ii) What is Polydispersity index? Explain the molecular weight distribution curve for Polydispersed polymer.

iii) What are Polyesters? Give their applications. Draw the structure of Polyethylene terephthalate.

b) What is free radical Polymerisation? Explain any three methods of termination in free radical Polymerisation. **[4]**

Q4) a) Attempt the following (Any two). **[6]**

i) Give full account of suspension polymerisation.

ii) Write the synthesis, properties and uses of polyvinyl alcohol.

iii) Explain in detail phenol-formaldehyde resin.

b) In a certain experiment, 0.980gram of polymer sample required 11.7 ml of 0.1N alcoholic KOH solution for neutralisation. Calculate the number average molecular weight $(\overline{Mn})$ of given polymer sample. (Functionality of polymer is 2). **[4]**

Q5) Write short notes on <u>any four</u> of the following. **[10]**

a) Low Density Polyethylene (LDPE).

b) Relation between degree of polymerisation & mechanical properties.

c) Primary and secondary bonding forces in polymers.

d) Co-ordination polymerisation.

e) Solution polymerisation.

f) Polyamides.

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Total No. of Questions : 5]

SEAT No. : ____

PC1328

[Total No. of Pages : 2

[6327]-138

T.Y.B.Sc. (Regular)

CHEMISTRY

CH-511(A): Environmental Chemistry

(2019 CBCS Pattern) (Semester - V) (351311A)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.No.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagram wherever necessary.***
6) ***Use of logarithm tables and calculator is allowed.***

Q1) Solve any five of the following. **[5]**

a) Define "Pollutant".

b) What is meant by pH?

c) Define "Pesticides"?

d) Which method used to calculate Dissolved Oxygen (DO)?

e) Which method used to detect Boron (B) in water analysis?

f) Define "Sludge digestion".

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

i) Explain the scope and importance of Environmental chemistry.

ii) Explain Water resources.

iii) How nitrate and nitrite are estimated from water sample?

b) Attempt the following. **[4]**

Explain segment of environment.

P.T.O.

Q3) a) Attempt any two of the following. **[6]**

i) Explain with diagram the Oxygen cycle.

ii) How we can determine Hardness of water?

iii) Discuss estimation of Iron from water sample.

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

Explain electrodialysis method for purification of water.

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

i) What is primary treatment of waste water?

ii) Explain the determination method of chemical oxygen diamand (COD).

iii) Explain Hydrological cycle.

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

What are the advantages and disadvantages of activated sludge process?

Q5) Write short note on any four of the following. **[10]**

a) Eutrophication.

b) Explain term COD and BOD.

c) Explain SPADNS method for determination of fluoride.

d) Explain Sampling of water.

e) What is De-nitrification?

f) Explain the function of atmosphere.

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Total No. of Questions : 5]

SEAT No. :

PC1329

[Total No. of Pages : 2

[6327]-139

T.Y. B.Sc. (Regular)

CHEMISTRY

CH- 511 (B): Chemo informatics

(2019 Pattern) (CBCS) (Semester - V) (351311B)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of logarithm table and calculator is allowed.***

Q1) Answer Any Five of the following : **[5]**

a) What is pharmacophore?

b) Define cheminformatics.

c) What is non-covalent bonding?

d) What is molecular modeling?

e) What are 3D structure?

f) What is Ab-initio method?

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

i) Write note on computational chemistry.

ii) Explain molecular dynamics simulation.

ii) Give application of PLIP analysis in drug discovery process.

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

i) Give the SMILE coding for tyrosine and anisole.

ii) Explain the significance of drug bank.

P.T.O.

Q3) a) Attempt any two of the following. **[6]**

i) Describe structure activity relationship with suitable example.

ii) What is synthesis? How it can be supported by cheminformatics?

iii) Write note on lead finding and optimization.

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

i) Write note on Gaussian software.

ii) Write IUPAC and WLN notation for phenylalanline.

Q4) a) Attempt any two of following. **[6]**

i) Highlights the significance of cheminformatics in modern science.

ii) Summarize different type of notations used for molecular representation.

iii) Explain the structure of Pdb file format.

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

i) Explain the comparative information extracted from full and sub structure search.

ii) Write note on Euclidean distance search method.

Q5) Attempt any four to the following. **[10]**

a) Write a note on machine learning and artificial intelligence.

b) Give milestone in the development of molecular modelling.

c) Write the common rules for the generation of SMILES notation for organic compound.

d) Write a note on computer aided drug design.

e) How hydrogen bonding studied using cheminformatics.

f) Write a note on graph theory.

Total No. of Questions : 5]

SEAT No. : ____

PC-1330

[Total No. of Pages : 2

[6327] - 140
T.Y. B.Sc.
BOTANY (Paper - I)
BO-351: Cryptogamic Botany
Algae & Fungi
(2019 Pattern) (Semester - V) (CBCS) (35141)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5***
3) ***Figures to the right indicate full marks.***
4) ***Questions 2 to 5 carry equal marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

Q1) Attempt any five of the following : **[5]**

a) Define algae

b) What is the cell wall composition in Fungi?

c) What is heterocyst?

d) Write any two significances of Lichens.

e) Enlist the types of vegetative reproduction in yeast.

f) Write occurrence of Batrachospermum.

Q2) a) Write general characters of Algae. **[6]**

b) Describe the thallus structure in Rhizopus? **[4]**

P.T.O.

Q3) a) Write significances of mycorrhiza. **[6]**

b) Explain the asexual reproduction in chara. **[4]**

Q4) a) Describe the types of Lichens? **[6]**

b) Explain thallus structure of Sargassum. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Endomycorrhiza

b) Uredospores

c) Economic importance of algae as fodder

d) Mode of Nutrition in Fungi

e) Nucule in Chara

f) Habit & Habitat of Oedogonium.

Total No. of Questions : 5]

SEAT No. : ____

PC-1331

[Total No. of Pages : 2

[6327] - 141
T.Y. B.Sc.
BOTANY
BO 352: Archegoniate
(2019 Pattern) (CBCS) (Semester - V) (35142)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat and labelled diagram wherever necessary.***

Q1) Attempt any five of the following : **[5]**

a) Define Archegoniate.

b) Name the parts of typical sporophyte of bryophytes.

c) What is mean by Antheridiophore?

d) What is protonema?

e) Define Heterospory.

f) Name spore producing organ in Psilotum.

Q2) a) Describe external morphology of Marchantia thallus. **[6]**

b) Write economic importance of Pteridophytes. **[4]**

P.T.O.

Q3) a) Describe external morphology of Psilotum sporophyte. **[6]**

b) Describe internal structure of Anthoceros thallus. **[4]**

Q4) a) Describe structure of Antheridiophore in Marchantia. **[6]**

b) Explain progressive evolution theory of bryophytes. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Life cycle of homosporous pteridophytes.

b) General characters of class Hepaticeae.

c) Alternation of generation in Marchantia.

d) Resemblances between pteridophytes and bryophytes.

e) Rhizophore of Selaginella.

Total No. of Questions : 5]

SEAT No. : ____

PC-1332

[Total No. of Pages : 2

[6327] - 142
T.Y. B.Sc.
BOTANY
BO-353: Spermatophyta and Paleobotany
(2019 Pattern) (Semester - V) (Paper - III) (35143)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat labelled diagram wherever necessary.***

Q1) Attempt any five of the following : **[5]**

a) Define herbarium specimen.

b) Mention probable place of origin of Angiosperms.

c) What is fossilisation?

d) Mention the fruit type in family cannaceae.

e) Give name of any one leading botanic garden in India.

f) Which is most evolved and advanced family according to Cronquists system of classification?

Q2) a) Give an account of distinguishing characters, floral formula, and economic importance of family Nymphaeaceae. **[6]**

b) Describe male cone of Gnetum. **[4]**

Q3) a) Describe sporophyte of Pinus and give its xerophytic characters. **[6]**

b) Comment on compression. **[4]**

Q4) a) What is species concept? Explain taxonomic species concept. **[6]**

b) Give an account of Royal Botanic garden kew. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Merits of Cronquist system of classification

b) Endemism

c) Economic importance of Amaranthaceae

d) Pseudanthial theory.

e) Characters of gymnosperms

f) Importance of herbarium.

Total No. of Questions : 5]

SEAT No. :

PC1333

[Total No. of Pages : 2

[6327]-143
T.Y.B.Sc. (Regular)
BOTANY
BO-354 : Plant Ecology
(2019 Pattern) (CBCS) (Semester-V) (35144)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right side indicate full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

Q1) Attempt any five of the following. **[5]**

a) Define Plant Ecology.

b) What is biogeography?

c) Define population.

d) Define biotic community.

e) What is remote sensing?

f) Define sustainability.

Q2) a) Explain quantitative characters of plant community. **[6]**

b) Define ecological pyramids. Explain pyramid of energy. **[4]**

Q3) a) Explain the checklist method of EIA. Give its advantages & limitations. **[6]**

b) Comment on significance of plant indicators. **[4]**

P.T.O.

Q4) a) Discuss about various types of environmental audits. **[6]**

b) Explain the sampling methods of population. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Sustainability indicators

b) Any four uses of GPS.

c) Certification process.

d) Benefits of EIA

e) Nitrification

f) Energy flow in Ecosystem

Total No. of Questions : 5]

SEAT No. : ____

PC1334

[Total No. of Pages :2

[6327]-144

T.Y.B.Sc. (Regular)

BOTANY

BO-355 : Cell and Molecular Biology

(2019 CBCS Pattern) (Semester- V) (35145)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat, labelled diagrams wherever necessary.***

Q1) Attempt any five of the following: **[5×1=5]**

a) Enlist any two functions of lysosomes.

b) State function of primase.

c) Enlist types of chromosomes based on position of centromeres.

d) What is transcription?

e) Define paracrine signalling.

f) Enlist types of RNA polymerases in eukaryotes.

Q2) a) What is golgi apparatus? Explain its structure and functions. **[6]**

b) Explain Hershey and chase experiment. **[4]**

Q3) a) Give a detailed account of initiation of DNA replication in eukaryotes. **[6]**

b) Discuss cell surface receptors in plants. **[4]**

P.T.O.

Q4) a) Give a brief account of regulation of lac operon. **[6]**

b) Explain structure and functions of nucleolus. **[4]**

Q5) Write short notes on any four of the followning. **[4×2½=10]**

a) Polytene chromosomes

b) One gene one enzyme hypothesis

c) Fluid mosaic model of cell membrane

d) Elongation of transcription in prokaryotes

e) Peroxisomes

f) tRNA

Total No. of Questions : 5]

SEAT No. :

PC1335

[Total No. of Pages :2

[6327]-145

T.Y.B.Sc. (Regular)

BOTANY

BO-356 : Genetics

(2019 Pattern) (CBCS) (Semester- V) (35146)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Attempt any three Questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Figure to the right indicate full marks.***
5) ***Draw neat labeled diagrams wherever necessary.***

Q1) Attempt any Five: **[5]**

a) What is somatic variation?

b) Give any two Applications of Genetics.

c) Give any two examples of Physical mutagens.

d) What is Self-Incompatibility?

e) Define Euploidy.

f) 2n – 1 denotes which type of aneuploidy?

Q2) a) What is Linkage? Add note on complete linkage. **[6]**

b) Comment on Supplementary Gene action (9:3:4). **[4]**

Q3) a) Explain the concept of Quantitative Inheritance. Give its characteristics. **[6]**

b) Comment on Deletion. **[4]**

P.T.O.

Q4) a) Describe in detail an inheritance of colour blindness in humans. **[6]**

b) Describe in brief Monohybrid cross with suitable example. **[4]**

Q5) Write short notes on any four. **[10]**

a) ABO Blood Group in Humans

b) Law of Dominance

c) Induced mutation

d) Translocation of chromosome

e) Three Point Test Cross

f) Cob length in Maize

Total No. of Questions : 5]

SEAT No. : ____

PC1336

[Total No. of Pages : 2

[6327]-146
T.Y. B.Sc. (Regular)
BOTANY
BO- 3510 : Medicinal Botany
(CBCS 2019 Pattern) (Semester - V) (351410)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Figure to the right indicate full marks.***
5) ***Draw neat and labelled diagrams whenever necessary.***

Q1) Attempt any Five of the following. **[5]**

a) Define Medicinal Botany.

b) What are the Sacred Groves?

c) Define Air-Layering.

d) What are the folk medicines?

e) Define endemic plants.

f) What is Ethnobotany?

Q2) a) What is Unani system of medicine? Mention various herbal formulations in Unani system. **[6]**

b) Enlist medicinal plants used as Folk medicines to cure blood pressure. **[4]**

Q3) a) What are the endangered plants? Add a note on Endangered plant species. **[6]**

b) Mention brief account of Ethnoecology **[4]**

P.T.O.

Q4) a) What is Grafting? Describe indetails approach grafting. **[6]**

b) Mention the concept of Tridosha. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Natural products used to cure Jaundice

b) Palaeoethnobotany

c) AYUSH

d) Umoor-e-tabiya

e) Green house

f) Applications of medicinal plants

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Total No. of Questions : 5]

SEAT No. :

PC1337

[Total No. of Pages : 2

[6327]-147

T.Y. B.Sc. (Regular)

BOTANY

BO - 3511 : Plant Diversity and Human Health

(2019 Pattern) (Semester - V) (351411)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q. No. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

Q1) Attempt Any Five of the following : **[5]**

a) Define hotspot.

b) What is inbreeding depression?

c) Define In - site conservation.

d) Give any two ornamental plants.

e) Write any two importance of forest.

f) Define Biodiversity loss.

Q2) a) Write note on IUCN. **[6]**

b) Give the scope of Biodiversity. **[4]**

Q3) a) Give an account of importance of foresty and its commercial aspects. **[6]**

b) Explain Hedonic Pricing method. **[4]**

P.T.O.

Q4) a) Give an account of world wide fund (WWF) for natural resources. **[6]**

b) Enlist objectives of Biodiversity Conservation. **[4]**

Q5) Write short notes on any Four of the following : **[10]**

a) NBPGR

b) Uses of microbes

c) Pomology

d) Change in productivity method

e) Cultivated plant taxa

f) Benefits of biodiversity

Total No. of Questions : 5]

SEAT No. : ____

PC-1338

[Total No. of Pages : 2

[6327] - 148
T.Y. B.Sc. (Regular)
ZOOLOGY
ZO 351: Pest Management
(2019 Pattern) (Semester - V) (CBCS) (35151) (Paper-I)

Time : 2 Hour] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Define predators

b) Ecological control

c) Enlist causes of damages.

d) Crop rotation

e) Biotechnique in pest management

f) Nature of damage of storegrain pest

Q2) a) Give an account of Biological control of insect **[6]**

OR

Explain comparative and non - comparative advantages and disadvantages of IPM

b) Describe the regulatory control a pest management with reference quarantine and crop free periods. **[4]**

P.T.O.

Q3) a) Describe the methods of residue detection releated with organochlorine. **[6]**

OR

What is the recent advance in use of fungi in pest management.

b) What is the role of cultural control in the tillage cropping system. **[4]**

Q4) a) Explain the type of insecticides based on mode of entry. **[6]**

OR

Describe the insectides formulation's and their uses.

b) Explain Biological control of weeds. **[4]**

Q5) Write short notes on any four of the following **[10]**

a) Pheromonal control

b) Entomopathogens

c) Insecticides

d) Mechanical control management

e) Contact poison

f) Microbial agent

Total No. of Questions : 5]

SEAT No. : ____

PC-1339

[Total No. of Pages : 2

[6327] - 149
T.Y. B.Sc.
ZOOLOGY
ZO-352: Histology
(2019 Pattern) (Semester - V) (Regular) (Paper - II) (35152)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Q.2 to Q.5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Define Histochemistry

b) What is cartilage

c) What is fungiform papillae

d) Define duplex gland

e) Explain the term Nephron

f) Explain the term polyphydont.

Q2) a) Describe the histological structure of liver with the help of neat labelled diagram. **[6]**

OR

With neat labelled diagram describe T.S. of stomach

b) Write short note on cardiac muscle. **[4]**

P.T.O.

Q3) a) Describe the histological structure of lung with the help of neat labelled diagram. **[6]**

OR

With the help of neat labelled diagram describe the structure of kidney.

b) Write note on structure of Graffian Follicle **[4]**

Q4) a) Explain the structure and role of thyroid gland **[6]**

OR

Describe the structure of Tooth (VS)

b) Write the location and function of peyer's patches **[4]**

Q5) Write short note on any four of the following **[10]**

a) Pacinian Corpuscles

b) Intestinal villus

c) Cells of Leydig

d) Brunner's gland

e) Neuron

f) Structure of Bone.

Total No. of Questions : 5]

SEAT No. : ____

PC-1340

[Total No. of Pages : 2

[6327] - 150
T.Y. B.Sc.
ZOOLOGY
ZO-353: Biological Chemistry
(2019 Pattern) (CBCS) (Semester - V) (Paper-III) (35153)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Give any two examples of aldoses.

b) Define the term conjugate base.

c) What are isoenzymes?

d) What are biocatalysts?

e) Define Buffer.

f) What are lipids?

Q2) a) Deduce Henderson. Hasselbalch equation. **[6]**

OR

Explain any two homopolysaccharides with examples.

b) What are peptide bond? How many peptide bonds are present in a tripeptides. **[4]**

Q3) a) What are enzymes? Enlist important properties of enzymes. **[6]**

OR

What is the effect of temperature on enzyme activity.

b) What is the difference between Essential and Non Essential amino acids **[4]**

Q4) a) Write an account on enzyme inhibition. **[6]**

OR

Write in brief biological significance of carbohydrates.

b) What are Holoenzymes? **[4]**

Q5) Write short notes on any four : **[10]**

a) Z - Helix

b) Allosteric enzymes

c) Myocardial infarction

d) Buffering capacity

e) Significance of gluconeogenesis

f) Hyperglycemia

Total No. of Questions : 5]

SEAT No. :

PC1341

[Total No. of Pages : 2

[6327]-151
T.Y.B.Sc. (Regular)
ZOOLOGY
ZO-354 : Genetics
(2019 Pattern) (Semester-V) (35154)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Define reverse mutation.

b) What are Gynandomorphs?

c) Define Gene frequency.

d) State 2 examples showing sex-linked inheritance.

e) Define codominance.

f) Define nonsense mutation.

Q2) a) Explain the concept of incomplete dominance with suitable example. **[6]**

OR

Explain different types of point mutations.

b) Explain XX-XO and ZZ-ZW method of sex determination **[4]**

Q3) a) Describe features of human karyotype & it's application. **[6]**

OR

Describe the role of various base analogs as mutagenic agent.

b) Discuss ABO & Rh blood group system. **[4]**

P.T.O.

Q4) a) Discuss the Mendel's law of independent assortment. **[6]**

OR

Discuss the Hardy Weinberg law and its application.

b) Explain the genetic background of Haemophilia. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Applications of Genetic counselling

b) Parthenogenesis

c) Turner syndrome

d) Frame shift mutation & its consequences

e) Lethal genes

f) UV radiation as mutagenic agent.

Total No. of Questions : 5]

SEAT No. : ____

PC1342

[Total No. of Pages :2

[6327]-152

T.Y.B.Sc. (Regular)

ZOOLOGY

ZO : 355 - Developmental Biology

(2019 Pattern) (Semester- V) (35155)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Question No. 2 to 5 carry equal marks.***

Q1) Solve any five of the following: **[5]**

a) What are primary egg membranes?

b) Define spiral cleavage.

c) What is polar body?

d) Define gastrulation.

e) What is Oogenesis?

f) What is dedifferentiation?

Q2) a) What is fertilization? Explain its types & significance. **[6]**

OR

What is polyspermy? Explain fast & slow block polyspermy.

b) Explain the process of Amphimixis. **[4]**

Q3) a) Describe the development of notochord in chick embryo. **[6]**

OR

Describe the types of eggs on the basis of distribution of yolk.

b) Explain the theory of preformation. **[4]**

P.T.O.

Q4) a) What is blastula? Describe any four types of blastulae. **[6]**

OR

Describe the process of activation of ovum.

b) Explain the structure of mammalian ovum. **[4]**

Q5) Solve any four of the following: **[10]**

a) Spermiogenesis

b) Holoblastic cleavage

c) Fertilization cone

d) Types of sperms

e) Cell determination

f) Cleiodic & non cleiodic eggs.

Total No. of Questions : 5]

SEAT No. : ____

PC1343

[Total No. of Pages :2

[6327]-153

T.Y.B.Sc. (Regular)

ZOOLOGY

ZO-356 : Parasitology

(2019 Pattern) (Semester- V) (35156)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Define Medical Helminthology.

b) Define Visceral Endoparasite.

c) What is intermediate host?

d) What is Host Specificity?

e) What is Excystation?

f) Define Vector.

Q2) a) Describe Life cycle of Ascaris lumbricoides and add note on prophylexis. **[6]**

OR

Describe Epidemiology, pathogenecity & prophylexis & treatment of plasmodium vivax.

b) Describe transmission of microorganism by Tick. **[4]**

Q3) a) Describe morphology, Epidemiology and Diagnosis of Entamoeba histolytica. **[6]**

OR

What is Host specificity & Describe, Ecological host specificity.

b) Control measures of Rat flea. **[4]**

P.T.O.

Q4) a) Describe Life cycle of Taenia solium in Man. **[6]**

OR

Describe ultrastructure of trophozoite in R.B.Cs.

b) Give an account of effect of parasites on hosts. **[4]**

Q5) Write a short note on any four of the following: **[10]**

a) Define Carrier Host.

b) Forensic Entomology.

c) Sexual dimorphism in A. lumbricoides.

d) Parasitic adaptations of Head Louse.

e) Preventive measures of malaria.

f) Prophylexis of Taenia Solium.

Total No. of Questions : 5]

SEAT No. : ____

PC1344

[Total No. of Pages : 2

[6327]-154
T.Y. B.Sc. (Regular)
ZOOLOGY
ZO- 3510 : Aquarium Management
(2019 Pattern) (Semester - V) (351510)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Question No.2 to Q.5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Exotic fishes

b) Define canning

c) Explain betta fish.

d) Sexual dimorphism of Guppy fish

e) Induced fish breeding

f) Types of fish food.

Q2) a) Explain potential scope of Aquarium maintenance & its importance. **[6]**

OR

Explain two methods of live fish packaging and their transportation.

b) Explain common diseases of fishes **[4]**

Q3) a) Explain rules and regulations of fish rearing. **[6]**

OR

Describe physico-chemical parameters of water for fish culture.

b) Describe Endemic species of Aquarium fishes. **[4]**

P.T.O.

Q4) a) Describe the composition of formulated fish feed. **[6]**

OR

Explain fish preservation techniques.

b) Explain nutritional value of fish. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Fish processing techniques.

b) Fish farm as a cottage Industry.

c) Natural fish breeding

d) Fish farming technique

e) Larvicidal fishes

f) Mortality in transport

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Total No. of Questions : 5]

SEAT No. :

PC1345

[Total No. of Pages : 2

[6327]-155

T.Y. B.Sc. (Regular)

ZOOLOGY

ZO - 3511 : Poultry Management

(2019 Pattern) (Semester - V) (351511)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q. No. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question No 2 to 5 carry equal marks.***

Q1) Solve Any Five of the following : **[5]**

a) What is starter feed?

b) Name any two poultry diseases.

c) What is AGMARK?

d) Explain hatching.

e) What is selection in breeding management?

f) Define poultry.

Q2) a) Describe breeds and strains of layer chicken. **[6]**

OR

Explain with neat labelled diagram, female reproductive system of chicken.

b) Explain present prospectus of poultry farming in India. **[4]**

Q3) a) Explain transmission, symptoms and economic importance of Ranikhet and Marek's diseases in poultry birds. **[6]**

OR

Explain in detail transport strategies of poultry birds.

b) Explain control of external parasites of poultry birds. **[4]**

P.T.O.

Q4) a) Describe digestive system and digestion mechanism of chicken with neat labelled diagram. **[6]**

OR

Describe general aspects of breeding for better egg production and body weight gain of chickens.

b) Explain layer housing management. **[4]**

Q5) Write short note on any Four of the following : **[10]**

a) Feed ingradients.

b) Poultry manure as by product.

c) Housing equipement in poultry.

d) Egg powder.

e) Control of internal parasites of poultry birds.

f) Disinfectant in housing management.

Total No. of Questions : 5]

SEAT No. :

PC-1346

[Total No. of Pages : 2

[6327]-156
T.Y.B.Sc.
GEOLOGY
GL-311: Geology of India - I
(2019 Pattern) (Semester - V) (35161)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

1) ***Question. 1 is compulsory.***
2) ***Solve any Three questions from Q 2 to Q 5.***
3) ***Question Nos. 2 to 5 carry equal marks.***

Q1) Answer the following in 2-3 sentences. (Any five) **[5]**

a) What are Khondalites?

b) On which craton Dongargarh Granite is found?

c) Name older greenstone belt of Dharwar craton.

d) Give geographical location of Vaikrita Group.

e) Give economic importance of Mansar formation.

f) Name subdivisions of Cuddapah Supergroup.

Q2) Write notes on:

a) Sausar group. **[6]**

b) Singhbhum Granite. **[4]**

Q3) Write notes on:

a) Stratigraphic succession of Vindhyan Supergroup. **[6]**

b) Stratigraphic succession of Dharwar Supergroup. **[4]**

P.T.O.

Q4) Write notes on:

a) Stratigraphic succession of Chattisgarh group. **[6]**

b) Charnockite series. **[4]**

Q5) Answer the following. (Any five) **[10]**

a) Banded Gneissic complex.

b) Mineral deposits of Aravalli craton.

c) Chamundi granite.

d) Iron ore series.

e) Lithology of Kurnool group.

f) Stratigraphic succession of Delhi Supergroup.

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Total No. of Questions : 5]

SEAT No. : ____

PC-1347

[Total No. of Pages : 2

[6327] - 157
T.Y. B.Sc.
GEOLOGY
GL 312: Mineral Resources
(2019 Pattern) (Semester - V) (Regular) (35162)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Attempt any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Answer in 2-3 sentences. (Any five) : **[5]**

a) Mention 2 non-metallic minerals used as abrasives.

b) What are breccia filling deposits?

c) Name the rock formations of Zawar Pb-Zn belt.

d) Tenor of ore.

e) Name two Copper bearing minerals.

f) Epithermal deposits.

Q2) Explain the following.

a) Magmatic segregation. **[6]**

b) Wall rock alteration. **[4]**

P.T.O.

Q3) Explain the following.

a) Geological and geographical distribution of Copper deposits of India. **[6]**

b) Breccia filling deposits. **[4]**

Q4) Explain the following.

a) Describe early magmatic concentration deposits. **[6]**

b) What do you mean by immiscible liquid segregation? **[4]**

Q5) Write short notes. (Any five) **[10]**

a) Residual concentration.

b) Metasomatic replacement.

c) Non-metalliferous deposits.

d) Saddle reefs.

e) Geographical distribution of Gold deposits of India.

f) Residual liquid injection.

Total No. of Questions : 5]

SEAT No. : ____

PC-1348

[Total No. of Pages : 2

[6327] - 158
T.Y. B.Sc.
GEOLOGY
GL 313: Marine Geology
(2019 Pattern) (Semester - V) (Paper- III) (Revised Syllabus) (35163)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Answer any five of the following question in 2-3 lines : **[5]**

a) Give the density of oceanic crust and Continental crust.

b) Name the three countries with longest shorelines & EEZ.

c) Name the various parts of Echo-sounder

d) Define lithogenous sediments.

e) Give the full form of DDT and PCBs

f) Define Exclusive Economic Zone.

Q2) Answer the following :

a) Describe the Indian Ocean with respect to its Origin and Structure. **[6]**

b) What controls the configuration of the continental slope? **[4]**

Q3) Answer the following :

a) Explain marine environmental problems associated with Non-Petroleum chemical pollution **[6]**

b) Explain Explosion seismology **[4]**

Q4) Answer the following :

a) Explain the origin of Continental shelves **[6]**

b) Give the origin and composition of Cosmogenous sediments. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Echo Sounding

b) Mineralogy of basaltic rocks

c) Give the importance of continental shelves

d) DDT and PCBs Linger in the environment

e) Origin & History of EEZ of India

f) Manganese nodules

Total No. of Questions : 5]

SEAT No. :

PC1349

[Total No. of Pages : 2

[6327]-159
T.Y.B.Sc. (Regular)
GEOLOGY
GL-314 : Engineering Geology
(2019 Pattern) (Semester-V) (35164)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question No. 1 is compulsary.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer the following questions in 2-3 lines. (any five) **[5]**

a) Define Engineering Geology

b) Name two types of dams. Give examples.

c) Density of a rock

d) Name different types of aggregates

e) Give examples of tunnels from Deccan Traps

f) Write in brief about Jawahar Tunnel

Q2) Answer the following.

a) Write a note on scope of engineering geology. **[6]**

b) Write a note on rock mechanics. **[4]**

Q3) Answer the following.

a) What is a Tunnel? Describe geological investigations for site selection of a tunnel. **[6]**

b) Explain the parts of gravity dam with diagram. **[4]**

Q4) Answer the following.

a) What is compressive strength & Tensile strength of a rock. **[6]**

b) Write a note on foundation **[4]**

P.T.O.

Q5) Write short notes on any four of the following. **[10]**

a) Applications of Engineering Geology

b) Bridges & its types

c) Components of a bridge

d) Porosity

e) Building stones

f) Factors influencing engineering usefullness of rocks.

Total No. of Questions : 5]

SEAT No. : ____

PC1350

[Total No. of Pages :2

[6327]-160

T.Y.B.Sc. (Regular)

GEOLOGY

GL-315 : Hydrogeology

(2019 Pattern) (Semester- V) (35165)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Answer any FIVE of the following question in 2-3 line. **[5×1=5]**

a) What is lamellar flow?

b) Define storativity.

c) Enlist major cations in groundwater.

d) What is piezometric surface?

e) What is permeameter?

f) Define hydrogeology.

Q2) Answer the following.

a) What is Darcy's law? Explain its validity. **[6]**

b) Explain vertical distribution of groundwater. **[4]**

Q3) Answer the following.

a) What is well inventory? Explain the procedure. **[6]**

b) Explain saline water intrusion in coastal aquifer. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain groundwater contamination. **[6]**

b) Explain W.H.O. standards of drinking water. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Perched watertable

b) Turbulent groundwater flow

c) APT

d) Vadose zone

e) Aquiclude

f) Tracers in groundwater flow studies.

Total No. of Questions : 5]

SEAT No. :

PC1351

[Total No. of Pages : 2

[6327]-161

T.Y. B.Sc. (Regular)

GEOLOGY

GL 316: Applied Geophysics

(2019 Pattern) (Semester - V) (35166) (Paper - VI) (Revised)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***

Q1) Answer Any Five of the following question in 2-3 lines : **[5]**

a) Define latitude correction.

b) Give the principle of seismic method.

c) Name the types of body waves.

d) Define Self potential method.

e) Define Schlumberger array.

f) What is electrode polarization?

Q2) Answer the following :

a) Explain magnetic Survey method. How it is useful in mineral exploration? **[6]**

b) Describe resistinty method. **[4]**

Q3) Answer any the following.

a) Explain self potential method. What is the difference between self potential and resistinty method? **[6]**

b) Describe Bouguer anomalies. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain Seismic reflection method with neat labeled diagram. **[6]**

b) Describe intorpretation of gravity data. **[4]**

Q5) Write short notes on any Four of the following : **[10]**

a) Air borne survey.

b) Seismic instruments and field procedure.

c) Differentiate between gravity and magnetic method.

d) Induced polarisation method.

e) Electromagnetic method.

f) Interpretation of resistinity data.

Total No. of Questions : 5]

SEAT No. : ____

PC1352

[Total No. of Pages : 2

[6327]-162
T.Y. B.Sc. (Regular)
GEOLOGY
SEC-I : Geotechnology
(2019 Pattern) (Semester - V) (351610)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no.1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Question No.2 to Q.5 carry equal marks.***

Q1) Answer ANY FIVE of the following question in 2-3 lines. **[5]**

a) Define change points.

b) Enlist the componants of dumpy level.

c) Give applications of Total station.

d) Define packer permeability test.

e) Enlist the shallow foundations.

f) Enlist the Alterbergs limits.

Q2) Answer the following.

a) Explain the Seive analysis of soil in brief. **[6]**

b) Describe Rock mass Rating and parameters considered for RMR. **[4]**

Q3) Answer the following.

a) Explain the difference between Rise and fall method and the collimation method of calculating Reduced level. **[6]**

b) Define plane surveying and Geocletic surveying. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain the sand replacement method of unit weight measurement. **[6]**

b) Elaborate the safe bearing capacity of soil in brief. **[4]**

Q5) Write notes on any Four of the following. **[10]**

a) Draw neat sketch of Casagromd's Apparatus

b) Define vane shear test and it's application

c) Define core recovery and Rock quality determination

d) Enlist 5 uses of surveying

e) Enlist 5 uses of levelling

f) Define Horizantal plane.

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Total No. of Questions : 5]

SEAT No. :

PC1353

[Total No. of Pages : 2

[6327]-163

T.Y. B.Sc. (Regular)

GEOLOGY

SEC - II: Gemology and Gem testing

(2019 Pattern) (Semester - V) (Revised) (351611)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q. No. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question No 2 to 5 carry equal marks.***

Q1) Answer Any Five of the following question in 2-3 lines : **[5]**

a) Give the hardness of corundum.

b) Define double refraction.

c) Name two gem varieties of feldspar group.

d) Distinguish between mineral and gemstone.

e) Define Refractive index.

f) Define Birefringence.

Q2) Answer the following :

a) Explain causes of colours in gemstones. **[6]**

b) Write a note on Gem synthesis. **[4]**

Q3) Answer any the following.

a) Explain opaque gem varieties. **[6]**

b) Write a note on formation of gem stones. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain the various uses of refractometer. **[6]**

b) Explain 10x loupe & give its uses. **[4]**

Q5) Write short note on any Four of the following : **[10]**

a) Specific gravity.

b) Pleochroic gemstones.

c) Heavy liquid method for gemstones

d) Varieties of Corundum.

e) Organic gemstone.

f) Basic properties of gems.

■■■■

Total No. of Questions : 4]

SEAT No. : ____

PC-1354

[Total No. of Pages : 3

[6327]-164
T.Y. B.Sc.
STATISTICS
ST-351 : Distribution Theory - I
(2019 Pattern) (Semester - V) (35171)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt each of the following :

A) In each of the following cases, choose the correct alternative :**[1 each]**

i) If $X \to C$ ($\mu = 0$, $\lambda = 1$) then distribution of X^2 is _____.

a) $\beta_1(0, 1)$ b) $\beta_2\left(\frac{1}{2}, \frac{1}{2}\right)$

c) $\beta_2\left(\frac{1}{2}, 1\right)$ d) $\beta_1\left(\frac{1}{2}, \frac{1}{2}\right)$

ii) Let $X \to \beta_1(3, 12)$ and let $Y = \frac{1-X}{X}$ then the distribution of Y is _____.

a) $\beta_1(3, 12)$ b) $\beta_2(12, 3)$

c) $\beta_1(3, 12)$ d) $\beta_1\left(\frac{1}{3}, \frac{1}{12}\right)$

iii) A sequence of random variables $X_1, X_2, \ldots\ldots X_n$ is said to converge in probability to α if for any $\varepsilon > 0$, the $\lim_{n\to\infty} P(|X_n - \alpha| > \varepsilon)$ = _____

a) 1 b) 0

c) $\frac{1}{2}$ d) $\frac{2}{3}$

P.T.O.

B) In each of the following, state whether the given statement is true or false: **[1 each]**

i) If $X \to C(\mu, \lambda)$ then the moment generating function of X does not exist.

ii) The distribution function of first order statistics $X_{(1)}$ based on the random sample of size 'n' with distribution F(x) is $[F(x)]^n$

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

a) A symmetric die is thrown 600 times. Find the lower bound for the probability of getting 80 to 120 sixes.

b) If X and Y are independently distributed G(1,1) variates, then state the distribution of $U=\frac{X}{X+Y}$ Also find $P\left(U \le \frac{1}{2}\right)$

c) Let x_1, x_2, x_3 be a random sample taken from U (9,10) distribution. Then compute the probability that the smallest of (x_1, x_2, x_3) is less than 9.2

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

a) State and prove Weak Law of large Numbers.

b) Let X be a random variable with p.d.f. $f(x)=\begin{cases}2x, & 0<x<1\\ 0, & otherwise\end{cases}$ Using Chebycheve's inequality, compute lower bound for $P\left(\left|X-\frac{2}{3}\right|<1/3\right)$

c) If $X \to \beta_1(m,n)$ with $E(X)=\frac{1}{4}$ and $Var(X)=\frac{1}{8}$ then find the values of 'm' and 'n'

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

a) i) Let X and Y be two independent gamma variates with parameters (α, λ_1) and (α, λ_2) respectively. Show that U = X + Y and $V=\frac{X}{Y}$ are independently distributed and identify their distributions. **[7]**

ii) Let $X \to C(0,1)$ then find $P(X \le 1)$ **[3]**

b) i) If X_n takes the values 1 and 0 with probabilities P and (1-P) respectively then examine whether the Weak Law of Large Numbers can be applied to the sequence $\{ X_n \}$, where the variables X_n are independent. **[6]**

ii) Let $X_1, X_2,.....X_n$ are independently and identically distributed U(0,1) random variates. Obtain distribution of max $(X_1, X_2,.....X_n)$. **[4]**

Total No. of Questions : 4]

SEAT No. : ____

PC-1355

[Total No. of Pages : 3

[6327]-165

T.Y. B.Sc. (Regular)

STATISTICS (Principal)

ST-352 : THEORY OF ESTIMATION

(2019 Pattern) (CBCS) (Semester - V) (35172) (Paper - II)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) **Attempt each of the following :** **[5]**

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

i) Let $X_1, X_2, \ldots\ldots X_n$ is a random sample from U(–θ, θ), the bias in estimation of θ by the estimator $T = \bar{X}$ is

A) 0 B) $-\frac{\theta}{2}$

C) θ D) – θ

ii) Let $X_1, X_2, X_3, \ldots\ldots X_n$, is a random sample from *Gamma* (α, β) population with p.d.f given by

$$f(x) = \frac{\alpha^{\beta}}{\Gamma\beta} e^{-\alpha x} x^{\beta-1} \quad x>0, \alpha>0, \beta>0$$

$$= 0 \qquad \text{o.w.}$$

the moment, estimator of β for known value of α is

A) $\alpha\bar{X}$ B) $\frac{\bar{X}}{\alpha}$

C) $\frac{\alpha}{X}$ D) $\bar{X}$

P.T.O.

iii) A statistic T is sufficient for parameter θ if

A) Conditional distribution any statistic T_1 given T depends on θ

B) Distribution of T is independent of θ

C) Conditional distribution of random sample $X_1, X_2, ...X_n$ given T depends on θ

D) If likelihood function L(θ) can be written as $L(\theta x_1, x_2,...x_n) = g\theta(t)h(x_i, x_2, ...x_n)$

b) In each of the following, state whether the given statement is true or false: **[1 each]**

i) U(0, θ) is a member of exponential family.

ii) If T is unbiased for θ then T^2 is also unbiased for θ^2.

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

a) The p.d.f of random variable X is given by

$$f(x,\theta) = \frac{1}{\theta} \quad 0 < x < \theta$$
$$= 0 \qquad o.w.$$

find the maximum likelihood estimator of θ.

b) Let $X_1, X_2, ...X_n$ be a random sample from *Poisson* (λ) then show that $T = \bar{X}^2 - \frac{\bar{X}}{n}$ is unbiased estimator of λ.

c) Let $X_1, X_2, ...X_n$ be a random sample from exponential distribution with mean θ Find Fisher information function I(θ). Check whether $\bar{X}$ is minimum variance bound unbiased estimator (MVBUE) of θ.

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

a) Describe method of moments to estimate the parameters. Find moment estimator of parameter p of Geometric (p) distribution.

b) Let $X_1, X_2,...X_n$ be a random sample from $N(\mu, \sigma^2)$, $S^2 = \frac{\sum_1^n (X_i - \bar{X})^2}{n-1}$

Check whether S^2 is unbiased for σ^2?

c) Let $X_1, X_2, ...X_n$, is a random sample from Poisson (λ). Verify whether sample mean $\bar{X}$ is consistent estimator of λ.

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

a) i) Suppose X_1, X_2, X_3, X_4, X_5 be a random sample from P(λ) Consider the following estimators of λ **[5]**

$$T_1 = \frac{X_1 + X_2 + ... + X_5}{5}$$

$$T_2 = \frac{2X_1 + 3X_3 + 3X_5}{8}$$

Check whether T_1 and T_2 are unbiased for λ. Also decide which among them is more efficient.

ii) Let $X \rightarrow$ *Bernoulli*(p). Check whether ΣX_i is sufficient for *p*. **[5]**

b) i) State and prove Neyman Factorization theorem. **[6]**

ii) T is MVBUE for θ then T is sufficient for θ. **[4]**

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Total No. of Questions : 4]

SEAT No. : ____

PC-1356

[Total No. of Pages : 2

[6327]-166
T.Y. B.Sc.
STATISTICS (Principal)
ST-353 : Desing and Analysis of Experiments
(2019 Pattern) (Semester - V) (Paper - III) (35173) (CBCS)

Time : 2 Hour] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) Attempt each of the following : **[1 each]**

A) In each of the following cases, choose the correct alternative :

i) In completely randomized design with three treatments, each replicated nine times the F-ratio will have, degrees of freedom

a) $n_1 = 3, n_2 = 9$ b) $n_1 = 2, n_2 = 24$

c) $n_1 = 2, n_2 = 9$ d) $n_1 = 3, n_2 = 24$

ii) In Randomized block design which among the following principle/s are used

a) Only replication

b) Only local control

c) Only randomization

d) Randomization, replication and local control

iii) In 2^2 factorial experiments, the expression for interaction effect AB is

a) $\frac{1}{2}(a-1)(b-1)$ b) $\frac{1}{2}(a-1)(b+1)$

c) $\frac{1}{2}(a+1)(b+1)$ d) $\frac{1}{2}(a+1)(b-1)$

B) In each of the following, state whether the given statement is true or false: **[1 each]**

i) As variability due to chance increase , the value of F-ratio in Analysis of Variance (ANOVA) will decrease.

ii) The principal of local control is used in case of completely randomized design.

P.T.O.

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

a) Derive an expression for the expectation of sum of squares due to treatment for Randomized Block Design(RBD).

b) Explain how ANOVA model for completely randomized design can be considered as a particular case of regression model.

c) Explain the procedure for Statistical analysis of 2^2 factorial design.

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

a) Write a note on uniformity trials.

b) Compute the efficiency of LSD relative to RBD when

i) Rows are used as blocks

ii) Columns are used as blocks by using the following information
Treatment Sum of Squares =58.4, Row Sum of Squares =46.8, Column Sum of Squares =50.7, Total Sum of Squares=190.5, Number of Rows= 5

c) Explain the procedure for testing the equality of two specified treatment effects using critical difference method in case of Latin Square Design (LSD).

Q4) Attempt any one of the following.

a) i) Explain how treatments comparisons can be done using Box-plot in Completely Randomized Design (CRD). **[4]**

ii) State two real life situations where Completely Randomized Design (CRD) can be applied. Also explain how the basic principles of design of experiments are used in those situations. **[6]**

b) i) Explain Yate's procedure to obtain factorial effect totals in 2^3 factorial experiment. **[5]**

ii) Explain the analysis of non-normal data using **[5]**

I) Square root transformation for counts data

II) $Sin^{-1}(.)$ transformation for proportions.

Total No. of Questions : 4]

SEAT No. :

PC1357

[Total No. of Pages : 2

[6327]-167

T.Y.B.Sc. (Regular)

STATISTICS (Principal)

ST-354 : Statistical Process and Product Control

(2019 Pattern) (CBCS) (Semester-V) (35174)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

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

Q1) Attempt each of the following:

A) In each of the following cases, choose the correct alternative: **[1 each]**

i) A production process does not meet specifications if:

a) $C_P = 1$ b) $C_P = 2$

c) $C_P = 1.5$ d) $C_P = 0.5$

ii) Which of the following is not one of the seven Process Control (PC) Tools?

a) Check sheet b) Histogram

c) Scatter plot d) Pie diagram

iii) Which type of control chart should be used when it is possible to have more than one defect per item?

a) $\overline{X}$ chart b) c-chart

c) R-chart d) p-chart

B) In each of the following, state whether the given statement is true or false: **[1 each]**

i) If $C_P = C_{Pk}$ then the process is centered at the Lower Specification Limit (LSL) of the specifications.

ii) In case of single sampling plan Average Total Inspection (ATI) is always n.

P.T.O.

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

a) Explain the construction of $\overline{X}$ and R chart when standards are not given.

b) State the advantages and disadvantages of Acceptance Sampling in comparison to 100% inspection.

c) For a single sampling plan with N = 10000, n = 100, c = 3, obtain ATI if p = 0.02.

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

a) Define and compare natural tolerance limits and specification limits.

b) For a production process with n=5, k=25, $\sum_{i=i}^{25} R_i = 850$, and $\sum_{i=i}^{25} \overline{X}_i = 5750$. Assuming that the process is under statistical control, estimate the process average and process standard deviation. If the specifications limits are 240 ± 25, calculate process capability index (C_P) and hence conclude whether or not the process meets specifications?

c) State the different criteria for detecting a lack of control situations with illustrative sketches.

Q4) Attempt any one of the following:

a) i) What is the purpose of Statistical Quality Control? State any 4 dimensions of quality. Describe in brief the following Process Control Tools: **[6]**

A) Scatter diagram

B) Design of Experiments

ii) Obtain an expression of Average Sample Number (ASN) for double sampling plan. **[4]**

b) i) 25 samples each of size 4 were inspected for a quality characteristics X. It was found that mean of the sample means $(\overline{\overline{X}})$ is 0.43 and the mean range $(\overline{R})$ is 0.01, obtain 3σ control limits for $(\overline{X})$ and R chart. If the process average shifts to 0.435, what would be the probability of catching the shift on first sample after the shift? **[6]**

ii) Explain the construction and working of p - chart for process fraction defective not specified and unequal subgroup sizes. **[4]**

Total No. of Questions : 4]

SEAT No. : ____

PC1358

[Total No. of Pages :4

[6327]-168

T.Y.B.Sc. (Regular)

STATISTICS (Principal)

ST-355 : Operations Research - I

(2019 CBCS Pattern) (Semester- V) (35175)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt each of the following:

A) In each of the following cases. choose the correct alternative: **[1 each]**

a) If the solution of primal Linear Programming Problem (L.P.P.) is unbounded, then the solution of its dual is:
i)Unbounded
ii) Infeasible
iii) Same as that of primal
iv) Unrestricted in sign for all variables

b) If in Critical Path Method (C.P.M), T: Total Float, I: Independent Float and F: Free Float, then which of the following is always true?
i) $T \geq F \geq I$ ii) $T \geq I \geq F$
iii) $T = F = I$ iv) $T \leq F \leq I$

c) In a Transportation Problems (T.P.), if the opportunity cost $\Delta_{ij} = C_{ij} - (u_i + v_j)$ are calculated for unoccupied cells, then which of the following indicates that the solution is not optimal?
i) All $\Delta_{ij} = 0$ ii) All $\Delta_{ij} \geq 0$
iii) One or more $\Delta_{ij} < 0$ iv) All $\Delta_{ij} = 1$

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) In C.P.M., the critical path is always unique.
b) For a T.P. with four sources and three destinations expressed as L.P.P., the number of decision variables involved is twelve.

P.T.O.

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

a) Explain the following terms with respect to Critical Path Method:

i) Critical Activity

ii) Earliest Finish Time

iii) Latest Finish Time

iv) Free float of an activity

v) Independent float of an activity

b) Solve the following Linear Programming Problem (LPP) using the Simplex Method:

Maximize $Z = 25x_1 + 20x_2$

Subject to $6x_1 + 4x_2 \leq 3600$

$2x_1 + 4x_2 \leq 2000$

$x_1 \geq 0, x_2 \geq 0$

c) What is degeneracy of solution in Transportation Problem (T.P.) and when can degeneracy arise? Explain how it is resolved.

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

a) Obtain the dual of the following LPP:

Minimize $Z = 3x_1 + 4x_2$

Subject to $x_1 + x_2 \geq 4$

$2x_1 + 5x_2 = 5$

$x_1 + 3x_2 \geq 6$

x_1 unrestricted, $x_2 \geq 0$

b) A project consists of nine activities with the following relevant information.

Activity	Immediate Predecessor	Time Duration
A	---	5
B	---	16
C	A	8
D	B	9
E	A	21
F	B	10
G	C, D	10
H	G, F	6
I	E	18

Construct the project network diagram and find the critical path.

c) Explain the following terms with respect to L.P.P.:

i) Optimal Solution

ii) Canonical form of L.P.P.

iii) Feasible Solution

Q4) Attempt any one of the following:

a) i) A plant has four operators assigned to four machines. The times (in minutes) required by each worker to produce a product on each machine are as given in the table below. Determine the optimal assignment and compute total minimum time. **[4]**

Operator	Machine			
	A	B	C	D
1	10	12	9	11
2	5	10	7	8
3	12	14	13	11
4	8	15	11	9

ii) A timber company processes raw timber - Oak and Pine logs. The logs are of a fixed standard length. Two steps are required to process the logs. The first step is debarking the logs, and the second step is cutting the debarked logs into boards. It takes 2 hours to debark an Oak log and 3 hours to debark a Pine log. It takes 2.4 hours for an Oak log to be cut into boards while it takes 1.2 hours for a Pine log to be cut into boards. The bark removing machine can operate for a maximum of 60 hours per week and the cutting machine cannot operate for more than 48 hours per week. The company can purchase a maximum of 18 Oak logs and 12 Pine logs in a week. The profit figures are 1800 Rupees per processed Oak log and 1200 Rupees per processed Pine log respectively. Formulate the above as a Linear Programming Problem in order to determine the number of logs of both types that should be processed per week in order to earn maximum possible profit. **[6]**

b) i) ABC Oil Mills manufactures detergents in three plants situated at Delhi, Mumbai and Kolkata with capacity of 75, 80 and 75 tonnes per day respectively. They market these from three warehouses located at Nagpur, Lucknow and Baroda with requirements of 70, 100 and 40 tonnes per day respectively. The transportation cost per tonne of detergent from different plants to different warehouses are as follows: **[6]**

From		To	
	Nagpur	Lucknow	Baroda
Delhi	5	10	10
Mumbai	20	30	20
Kolkata	10	20	30

1) Obtain the Initial Basic Feasible Solution (IBFS) of the above T.P by Vogel's Approximation Method (V.A.M).

2) Is the obtained solution degenerate? Justify your answer.

ii) Explain how the solution to primal L.P.P. can be obtained from the solution to its corresponding dual. What can be said about the solution to dual if primal has: **[4]**

1) Unbounded solution

2) Infeasible solution

Total No. of Questions : 4]

SEAT No. : ____

PC1359

[Total No. of Pages :4

[6327]-169

T.Y.B.Sc. (Regular)

STATISTICS (Principal)

ST - 356 : Regression Analysis

(2019 CBCS Pattern) (Semester - V)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt each of the following :

A) In each of the following cases, choose the correct alternative : **[1each]**

a) In the simple linear regression, the standard error of $\hat{\beta}_0$ is given by

i) $\sqrt{MS_{res}}\left(\frac{1}{n}+\frac{(x_i-\bar{x})^2}{S_{xx}}\right)$ ii) $\sqrt{MS_{res}\left(\frac{1}{n}+\frac{(x_i-\bar{x})^2}{S_{xx}}\right)}$

iii) $\sqrt{MS_{res}\left(\frac{1}{n}+\frac{\bar{x}^2}{S_{xx}}\right)}$ iv) $\sqrt{MS_{res}}\left(\frac{1}{n}+\frac{\bar{x}^2}{S_{xx}}\right)$

b) If all residuals are equal to zero, then the value of the coefficient of determination (R^2) is

i) -1 ii) 0

iii) 0.5 iv) 1

P.T.O.

c) In simple linear regression model, the least square estimator $\left(\hat{\beta}_1\right)$ of β_1 is

i) non - linear function of observation y_i

ii) linear function of observation y_i

iii) constant function of observation y_i

iv) none of these

B) In each of the following, state whether the given statement is true or false : **[1each]**

a) An unbiased estimator of error variance (σ^2) depends on the distribution of regressors.

b) The multiple logistic regression model has more than one regressors.

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

a) Consider the simple linear regression model, $y = \beta_0 + \beta_1 x + \varepsilon$ with E (ε) = 0, Var (ε) = σ^2 and ε_i, i = 1,2,..,*n* uncorrelated. Show that,

$$Cov\left(\hat{\beta}_0, \hat{\beta}_1\right) = \frac{-\bar{x}\sigma^2}{\sum_{i=1}^{n}\left(X_i - \bar{X}\right)^2}.$$

b) For a multiple linear regression model $y = X\beta + \varepsilon$, construct 100 $(1-\alpha)$% confidence interval for the regression coefficient β_j, j = 0,1,2,..,k.

c) Discuss in brief Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC).

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

a) Explain how residual plots are useful in verifying the assumptions in linear regression model.

b) State the basic assumptions of multiple linear regression model and define standardized residual and studentised residual. Also, state the difference between error and rasidual.

c) The table below show the output produced by *glm* command in R.

call :

glm (formula = $y \sim x$, family ="binomial")

Deviance Residuals :

Min	1Q	Median	3Q	Max
–2.0620	–0.4868	0.3915	0.5476	2.1682

Coefficients :	Estimate	Std. Error	Zvalue	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,

- Write a logistic regression model to the response variable y.
- Does the model deviance indicate that logistic regression model is adequate.
- Provide an interpretation of the parameter β_1 in the model.

Q4) Attempt any One of the following.

a) i) Suppose that a linear regression model with k = 5 regressors has been fitted to 50 observations and $R^2 = 0.95$. Test the significance of regression model at 5% level of significance. **[5]**

ii) Show that, the sum of residuals weighted by corresponding fitted values is always zero. **[5]**

b) i) What are outliers? How do they affect regression coefficients? Discuss how outliers are to be treated in regression analysis. **[5]**

ii) Explain the procedure of estimating the parameters in logistic regression model. **[5]**

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Total No. of Questions : 5]

SEAT No. : ____

PC-1360

[Total No. of Pages : 2

[6327] - 170
T.Y. B.Sc.
GEOGRAPHY
GG 351: Regional Geography of India - I
(2019 Pattern) (Semester - V) (CBCS) (35181)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Mention the latitude and longitude of India

b) Where does krishna river originate?

c) Define perennial river

d) Write any two species of conifer forest.

e) Write how many states are in India

f) Write a names of Himalayan passes.

Q2) a) Describe the significance of coastal plains **[6]**

OR

Explain in detail political division of India

b) Explain the kaveri river system **[4]**

P.T.O.

Q3) a) Describe mechanism of monsoon. **[6]**

OR

Explain the characteristic of laterite soil.

b) Explain the Historical background of India. **[4]**

Q4) a) Describe the economical importance of forest **[6]**

OR

Explain the benefit of soil conservation.

b) Explain the mahanadi river system. **[4]**

Q5) Write short note on any four of the following **[10]**

a) Glaciers of India

b) Brahmaputra river

c) Characteristics of rainy season

d) India's frontier

e) Evergreen forest

f) Indus river

Total No. of Questions : 5]

SEAT No. : ____

PC-1361

[Total No. of Pages : 2

[6327] - 171
T.Y. B.Sc.
GEOGRAPHY
GG 352: Geography of Economic Activities - I
(2019 Pattern) (CBCS) (Semester - V) (35182)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any Five of the following : **[5]**

a) Define Resource

b) Give two examples of Primary economic activities

c) Write any two benefit of forest resource?

d) What is Non-renewable resource?

e) Give any two examples of renewable resources.

f) Which are the types of natural resources?

Q2) a) Describe the characteristics of tertiary economic activities. **[6]**

OR

Describe the Pre and Post industrilization development of Economic activities.

b) Explain the distribution of forest resources in India. **[4]**

Q3) a) Explain the role of energy resources in economic development. **[6]**

OR

Explain the land and labour role in economic activities.

b) Describe the indices of network analysis. **[4]**

Q4) a) Discuss the Physical and Biological factors affecting economic activities. **[6]**

OR

Discuss the flow theory of network analysis.

b) Write an assumptions of the chistaller's central place theory. **[4]**

Q5) Write short note on any four of the following **[10]**

a) Human resources

b) Quaternary economic activities

c) Range and Treshold

d) Market Principle (K.3)

e) Agglomeration

f) Global Energy Crisis.

Total No. of Questions : 5]

SEAT No. : ____

PC-1362

[Total No. of Pages : 2

[6327] - 172
T.Y. B.Sc.
GEOGRAPHY
GG 353: Fundamental of Tourism
(2019 Pattern) (Semester - V) (CBCS) (35183)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Write the full form of M.T.D.C.

b) Define Tourism

c) What is ecotourism?

d) What do you mean by recreation?

e) Write any two name of famous costal tourist places in India.

f) Write any two places of agro tourism in India.

Q2) a) Describe the pilgrimage Tourism and its significance in India. **[6]**

OR

Describe the Medical Tourism and its Significance in India

b) Explain the concept of Geotourism **[4]**

P.T.O.

Q3) a) Explain the role of MICE in tourism development. **[6]**

OR

Explain the need and importance of sustainable tourism

b) Describe the nature of tourism geography. **[4]**

Q4) a) Discuss the positive and Negative impact of Economic factors on tourism. **[6]**

OR

Discuss the Positive and Negative impact of social factors on tourism.

b) Explain the different types of tourist activity. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Elements of tourism.

b) Role of exhibitions in tourism

c) Leisure

d) Scope of tourism geography.

e) Natural tourism

f) Cultural tourism.

Total No. of Questions : 5]

SEAT No. :

PC1363

[Total No. of Pages : 2

[6327]-173
T.Y.B.Sc. (Regular)
GEOGRAPHY
GG-354 : Geography of Soil - I
(2019 Pattern) (Semester-V) (35184)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions Q.2 to Q.5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Define soil profile.

b) What do you mean by weathering.

c) Define soil density

d) Mention any two process of the humas formation.

e) Write any two features of soil moisture?

f) What do you mean by soil.

Q2) a) Explain the nature of soil geography. **[6]**

OR

Describe the scope of soil geography.

b) Explain the ion exchange in soil. **[4]**

Q3) a) Discuss the soil NPK & Boil pH. **[6]**

OR

Describe the physical properties of the soil.

b) 'Biological properties of the soil' Write the short note. **[4]**

P.T.O.

Q4) a) Explain the various types of physical weathering. **[6]**

OR

Describe the factors responsible for soil formation.

b) Discuss the importance of soil studies in geography. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Field capacity.

b) Soil Geography approaches.

c) Soil water relationship.

d) Soil organic matter.

e) O' Horizon of soil properties.

f) Carbonation process of soil formation.

Total No. of Questions : 5]

SEAT No. :

PC1364

[Total No. of Pages :2

[6327]-174

T.Y.B.Sc. (Regular)

GEOGRAPHY

GG - 355 : Management of Natural Disaster

(2019 Pattern) (Semester- V) (35185)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following: **[5]**

a) What is atmospheric disaster?

b) Define the term Vulnerability.

c) List any two impact of drought.

d) Mention any two places where earthquake took place in India.

e) Define the term hazard.

f) What is tsunami?

Q2) a) Write in brief about the disaster mapping in India. **[6]**

OR

Discuss the application of RS and GIS in disaster planning and management.

b) Describe the concept of community based disaster management. **[4]**

Q3) a) Discuss in detail the concept of disaster management. **[6]**

OR

Write in detail about distribution of atmospheric disaster in India.

b) Explain in brief the causes and impact of landslides. **[4]**

P.T.O.

Q4) a) Discuss the role of governmental and non-governmental organisation in disaster risk reduction. **[6]**

OR

Write in brief about the distribution of Geo-physical disaster in India.

b) Write in brief about disaster management cycle. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Do's during post disaster

b) Mitigation to disaster

c) Warning and alarm system

d) Cyclone

e) Survival kit

f) Flood

Total No. of Questions : 5]

SEAT No. : ____

PC1365

[Total No. of Pages : 2

[6327]-175

T.Y. B.Sc. (Regular)

GEOGRAPHY

GG - 356 : Geoinformatics - I

(2019 Pattern) (Semester - V) (35186)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***

Q1) Solve any five of the following: **[5]**

a) Define the term Geoinformatics.

b) Name any two functions of GIS.

c) What do you understand by the term visualization?

d) Define the term surveying.

e) What is buffer analysis?

f) What do you mean by the term merge in GIS?

Q2) a) Write in detail about the GIS task. **[6]**

OR

Discuss in detail the Component of GIS.

b) Write in brief about Non-Spatial data types in GIS. **[4]**

Q3) a) Explain raster data and give its characteristics. **[6]**

OR

Describe in detail the data models in GIS.

b) Write in brief about query analysis in GIS. **[4]**

P.T.O.

Q4) a) Write in brief the errors involved in GIS data editing. **[6]**

OR

Describe the relationship between entites and attribute data linking.

b) Write in brief about aerial Photographs as a data source in GIS. **[4]**

Q5) Write short notes on any four of the following: **[10]**

a) TIN

b) DTM

c) Spatio temporal

d) Locational error

e) Toposheets

f) Importance of Geoinformatics

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Total No. of Questions : 5]

SEAT No. : ____

PC1366

[Total No. of Pages : 2

[6327]-176
T.Y. B.Sc. (Regular)
GEOGRAPHY
GG 3510 : Research Methodology - I
(2019 Pattern) (Semester - V) (351810)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no.1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Question No.2 to Q.5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) What is research method?

b) Write any two objectives of research.

c) Define concept of research.

d) Define research design.

e) Why research design is essential?

f) What is research problem?

Q2) a) Explain various steps in research process. **[6]**

OR

Describe analytical and descriptive research

b) Write a short note on purpose of research **[4]**

Q3) a) Describe the purpose of research design. **[6]**

OR

Describe the importance of research design.

b) Write in short on identification of a research problem. **[4]**

P.T.O.

Q4) a) Explain the techniques involved in a research problem **[6]**

OR

Describe the Sources of the research problem

b) Write objectives of assumption about research problem. **[4]**

Q5) Write short notes on any Four of the following. **[10]**

a) Meaning and definition of research.

b) Descriptive research

c) Research methodology

d) Null hypothesis

e) Research problem

f) Research process

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Total No. of Questions : 5]

SEAT No. : ____

PC1367

[Total No. of Pages : 2

[6327]-177

T.Y. B.Sc. (Regular)

GEOGRAPHY

GG - 3511 : Elementary Surveying

(2019 Pattern) (Semester - V) (351811)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any Five of the following. **[5]**

a) Define reduce level.

b) Write any two features of plane table surveying.

c) What is total station?

d) Write the methods of theodolite surveying.

e) Define surveying.

f) What do you mean by prismatic surveying?

Q2) a) Explain in detail about methods of dumpy level. **[6]**

OR

Describe the setting up of dumpy level instrument.

b) Write the advantages of drone surveying. **[4]**

Q3) a) Describe the instrument used in surveying. **[6]**

OR

Explain the types of surveying.

b) Write the features of total station. **[4]**

P.T.O.

Q4) a) Explain the various parts of total station. **[6]**

OR

Describe the importance of surveying.

b) Write the merits of total station. **[4]**

Q5) Write short notes on any Four of the following. **[10]**

a) Methods of prismatic surveying.

b) Demerits of total station.

c) DGPS surveying.

d) Merits of plane table surveying.

e) Collimation level.

f) Geodetic surveying.

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Total No. of Questions : 5]

SEAT No. : ____

PC-1368

[Total No. of Pages : 2

[6327] - 178
T.Y. B.Sc.
MICROBIOLOGY (Regular)
MB-351: Medical Microbiology - I
(2019 Pattern) (Semester - V) (CBCS) (35191)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Give the name of media used for cultivation of Pseudomonas aeruginosa

b) Treponema is associated with _____ system.

c) Give any two source of infection.

d) What is the causative agent for spotted fever?

e) True or False: Inflammation of kidney is called as pyelonephiritis

f) What is chronic infection?

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

1) Mode of transmission of infection
2) Pathogenesis of salmonella
3) Cohort studies

b) Describe diagrammatically gastrointestinal system. **[4]**

P.T.O.

Q3) a) Explain the following any two : **[6]**

1) Disease control measures

2) Principles of clinical trials of the vaccine

3) Laboratory diagnosis of Treponema

b) Write down pathogens, diseases and symptoms of urogenital systems. **[4]**

Q4) a) Describe the following any two **[6]**

1) Randomised control trials

2) Bacterial and viral diseases of the central nervous system.

3) Laboratory diagnosis of Mycobacterium leprae

b) Represent diagrammatically respiratory system. **[4]**

Q5) Write a short notes on any four of the following : **[10]**

a) Reservoirs of infection

b) Non - vaccine preventable bacterial diseases

c) Function of liver

d) Viability characteristics of streptococcus pneumoniae.

e) Classification vibrio

f) Case control studies

Total No. of Questions : 5]

SEAT No. : ____

PC-1369

[Total No. of Pages : 2

[6327] - 179
T.Y. B.Sc.
MICROBIOLOGY
MB 352: Immunology - I
(Regular) (2019 Pattern) (CBCS) (Semester-V) (35192)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) **Answer any <u>five</u> of the following** : **[5]**

a) Write any two functions of secondary lymphoid organs.

b) Define PRP with one example.

c) Define antibody avidity

d) Define Xenograft with any one example.

e) Write any two diagnostic applications of monoclonal antibody.

f) Write any two differences between B cell epitope and T cell epitope.

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

a) i) Describe the structure of spleen with the help of diagram.

ii) Write any three differences between thymus dependent and thymus independent antigens.

iii) Explain precipitation reaction in fluids. Write its applications

b) Diagrammatically describe the mechanism of classical complement pathway. **[4]**

Q3) **Answer any <u>two</u> of the following** : **[6]**

a) i) Explain the process of negative selection of B-cells in bone marrow.

ii) Describe functions of light and heavy chain domains of antibody molecule

iii) Explain passive agglutination reaction. Write its applications.

b) Write names of four PMNLs and their function in immune response. **[4]**

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

a) i) Describe structure and function of MHC - II molecule.

ii) Draw neat labelled diagram of any one method of ELISA. Write its applications

iii) Diagrammatically explain organisation of heavy chain multigene family.

b) With neat labelled diagram explain the method of ELISpot assay. Write its applications. **[4]**

Q5) **Write short notes on any <u>four</u> :** **[10]**

a) Kinins

b) Soluble and particulate antigens

c) Structure of H_2 complex

d) Biotin - avidin system

e) Prevention of allograft rejection

f) Preparation of monoclonal Ab by hybridoma technology.

Total No. of Questions : 5]

SEAT No. : ____

PC-1370

[Total No. of Pages : 2

[6327] - 180
T.Y. B.Sc.
MICROBIOLOGY
MB 353: Enzymology
(2019 Pattern) (Semester - V) (CBCS) (35193)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any five of the following : **[5]**

a) Define specific activity.

b) State any two materials used in column for Adsorption Chromatography.

c) State any two commonly occurring amino acids at the active site of enzyme

d) Name the active form of vitamin B.

e) State true or false

Glycogen phosphorylase a is active form of enzyme.

f) State true or false
Dialysis is a method of purification of enzymes

Q2) Answer any two of the following

a) i) What is the significance of V_{max}? **[6]**

ii) Derive lineweaver Burk equation.

iii) Enlist the enzymes present in Pyruvate dehydrogenase complex.

b) With the help of diagram explain molecular Exclusion Chromatography.**[4]**

P.T.O.

Q3) Describe any two of the following

a) i) Radioisotope Assay **[6]**

ii) Solvent precipitation as a method of enzyme purification.

iii) Allosteric Enzymes.

b) Describe salting in and salting out. **[4]**

Q4) Attempt any two of the following

a) i) Describe spectrophotometric assay **[6]**

ii) State Michaelis menton's equation and give its graphical representation.

iii) Describe zymogens with suitable example.

b) Explain the concept of Isoelectric Focusing. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Feedback inhibition.

b) Applications of Immobilized Enzymes.

c) K_m

d) Biochemical function of thiamine.

e) Methods of cell disruption.

f) X-ray Crystallography.

Total No. of Questions : 5]

SEAT No. :

PC1371

[Total No. of Pages : 2

[6327]-181
T.Y.B.Sc. (Regular)
MICROBIOLOGY
MB-354 : Genetics
(2019 Pattern) (Semester-V) (35194)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question No. 1 is compulsary.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Define Intron.

b) Define Operon.

c) Competence factors are not required for the competence development in Gram negative bacteria. State True/False.

d) c AMP stands for _____.

e) Define F-plasmid.

f) Define specialized transduction.

Q2) a) Explain the following. (any two) **[6]**

i) Okazaki fragments.

ii) Initiation of bacterial transcription.

iii) Salient features of Eukaryotic translation.

b) With the help of neat label diagram, Explain lac operon. **[4]**

Q3) a) Explain the following (any two) **[6]**

i) Types of Eukaryotic RNA polymerases.

ii) Factors affecting natural transformation

iii) Properties of F plasmid.

b) Diagrammatically illustrate-post transcriptional modifications. Steps in bacterial transcription process. **[4]**

P.T.O.

Q4) a) Discuss the following: **[6]**

i) Generalised transduction.

ii) Interrupted mating experiment.

iii) Griffith experiment.

b) Diagramatically illustrate post transcriptional modifications. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Structure of bacterial Ribosome

b) HFr clones

c) Mapping of genes by co-transformation.

d) Pre-priming and priming reactions.

e) Recombination mapping

f) Initiation of translation

Total No. of Questions : 5]

SEAT No. :

PC1372

[Total No. of Pages :2

[6327]-182

T.Y.B.Sc. (Regular)

MICROBIOLOGY

MB - 355 : Fermentation Technology - I

(2019 Pattern) (Semester- V) (35195)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following: **[5]**

a) Define strain improvement.

b) Write any two examples of products obtained by using rDNA technology.

c) What is RSM?

d) Define Del factor.

e) State any two objectives of scale-up.

f) State any two centrifuge used in downstream processing.

Q2) a) Describe the following (Any two): **[6]**

i) Any 1 method for selection of auxotrophic mutants.

ii) Any 1 method for continous sterilization of media.

iii) Scale-down.

b) Explain Plackett-Burman design. **[4]**

Q3) a) Explain the following (Any two): **[6]**

i) Turbidometric method for detection and quantification of fermentation product.

ii) Toxicity testing.

iii) Any 2 methods for cell disruption.

b) Explain recurring expenditure in fermentation economics. **[4]**

P.T.O.

Q4) a) Describe the following (Any two) **[6]**

i) Types of IPR

ii) Ames test

iii) Drying

b) Explain sterility testing of fermentation product. **[4]**

Q5) Write short notes (Any four) **[10]**

a) Shelf-life determination

b) Analogue resistant mutants

c) Enzymatic method for quantification of fermentation products.

d) Multichamber centrifuge.

e) Methods for media optimization.

f) LAL test.

Total No. of Questions : 5]

SEAT No. :

PC1373

[Total No. of Pages : 2

[6327]-183

T.Y. B.Sc. (Regular)

MICROBIOLOGY

MB - 356 : Agricultural Microbiology

(2019 Pattern) (Semester - V) (35196)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any Five of the following. **[5]**

a) What is Polycyclic disease?

b) Mention any 2 examples of bacterial plant pathogens.

c) Define diazotrophy.

d) What is Rhizosphere?

e) Define invasion.

f) What are GM crops?

Q2) A) Describe any Two of the following. **[6]**

a) Downy mildew disease.

b) Disease triangle.

c) Intergrated Test Management.

B) How forecasting of plant diseases is done? **[4]**

Q3) A) Explain any Two of the following. **[6]**

a) Disease resistance in plants by genetic engineering.

b) Applications of Plant biofilms.

c) GM crops by Antisense RNA technology.

B) What are the methods used to study plant microbiome of soil. **[4]**

P.T.O.

Q4) A) Answer any two of the following. **[6]**

a) Role of soil microflora in soil conservation.

b) Herbicide resistance in GM crops.

c) RNA : technology applications in plants.

B) Explain how shuttle vectors are used in GM crop development. **[4]**

Q5) Write a short notes on any Four of the following. **[10]**

a) Colonization of Pathogens.

b) Canker disease.

c) Phytonutrient availability by Soil microflora.

d) Potassium mobilization.

e) Biological control of plant diseases.

f) Edible vaccines.

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Total No. of Questions : 5]

SEAT No. : ____

PC1374

[Total No. of Pages : 2

[6327]-184
T.Y. B.Sc. (Regular)
MICROBIOLOGY
MB - 3510 : Marine Microbiology
(2019 Pattern) (Semester - V) (351910)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question NO.1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Question No.2 to Q.5 carry equal marks.***

Q1) Attempt any 5 of the following. **[5]**

a) Define 'VBNC'.

b) Enlist types of sediment samplers.

c) What are alkalophiles? Write an example.

d) Name any two types of marine habitats.

e) Write any two examples of thermophiles.

f) What is marine loop?

Q2) a) Explain any two of the following. **[6]**

i) Mangroves as marine habitat

ii) Role of coastal ecosystems

iii) Stress responses in archaebacteria

b) Describe the role of extremophiles in bioremediation of heavy metals. **[4]**

Q3) a) Describe any two of the following. **[6]**

i) Nutrient cycling in marine environment

ii) Niskin sampler

iii) Hydrothermal vents

b) Describe in detail "formation of marine snow" **[4]**

P.T.O.

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

i) Salt marshes as marine habitat

ii) Types of extremophiles

iii) Adaptations in archaebacteria.

b) Describe the sediment sampling methods. **[4]**

Q5) Write short note no any four. **[10]**

a) Bioremediation of tar balls

b) Polar habitat - arctic

c) Cellular level modifications in marine microflora

d) Culturing of 'VBNC'

e) Marine fungi

f) Biofilms in marine environment

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Total No. of Questions : 5]

SEAT No. : ____

PC1375

[Total No. of Pages : 2

[6327]-185

T.Y.B.Sc. (Regular)

MICROBIOLOGY

MB-3511: Dairy Microbiology

(2019 Pattern) (Semester - V) (351911)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Name the principle protein present in milk.

b) Define toned milk.

c) Define pasteurization.

d) Give the name of causative agent of stormy fermentation in milk.

e) Give the full form of GMPs

f) Name any 2 sources of contamination in milk.

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

i) Role of sanitory standard operating procedures.

ii) Difference between colostrum & milk.

iii) Importance of bactofugation.

b) Describe ropiness of milk. **[4]**

Q3) a) Explain the following any two. **[6]**

i) Role of pasteurization.

ii) Any two milk borne disease.

iii) Homogenized milk.

b) Explain preservation of milk by physical & chemical agent. **[4]**

P.T.O.

Q4) a) Describe the following any two. **[6]**

i) Any one preservation method of milk.

ii) Role of beneficial microflora in milk.

iii) Boiling of milk.

b) Compare the methods of pasteurization. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Food grade biopreservatives.

b) Themisation.

c) Skimmed milk.

d) Role of immunoglobulins.

e) Flavour defects in milk.

f) Good Manufacturing practices.

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Total No. of Questions : 5]

SEAT No. :

PC-1376

[Total No. of Pages : 2

[6327] - 186
T.Y. B.Sc. (Regular)
DEPARTMENT OF NANOSCIENCE AND NANOTECHNOLOGY
NS 351: Polymer Nanocomposites
(2019 Pattern) (Semester - V) (paper - I) (35261)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Draw neat and labelled diagram wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) Attempt any five of the following : **[5]**

a) Define the method 'solution mixing'.

b) Polymerisation

c) Fillerse/ Fillers as a reinforcement material

d) Define thermoplast polymer

e) Define dispersion method

f) Define nucleating effect

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

i) Explain in detail metal - matrix nanocomposites

ii) Explain in detail method of In-situ polymerization with neat and labelled diagram.

b) Explain application of Non-layeral nanoparticles in polymer modifications **[4]**

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

i) Explain dispersion and nucleating effect

ii) Explain in detail application of composite material

b) Explain in detail Laser - ablation method **[4]**

Q4) a) Attempt any one of the following **[6]**

i) Write in detail applications of layered and non-layered nano and micro particles

ii) Explain in detail latex stage mixing and melt mixing. **[4]**

Q5) Write short note on any four of the following **[10]**

a) Applications of composite

b) Melt - mixing

c) Functionalisation of carbon based nanotubes

d) Particulate fillers

e) Thermoplastic rubber

f) Continuous fiber

Total No. of Questions : 5]

SEAT No. : ____

PC-1377

[Total No. of Pages : 2

[6327] - 187
T.Y. B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
NS 352: Nanophysics
(2019 Pattern) (Semester - V) (Paper - II) (35262)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Draw the neat and labelled diagram.***
4) ***Figure to the right indicates full marks.***

Q1) Attempt any five of the following : **[5]**

a) Write the properties of nanocluster

b) Define quantum dots?

c) Write application of x-ray absorption fine structure.

d) What is probability distribution?

e) Draw the diagram of photoluminescence.

f) Define metal?

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

a) i) Explain quantum size effect.

ii) Explain optical absorption spectroscopy.

b) Explain Insulator and semiconductor. **[4]**

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

a) i) Explain Instrumentation of ESR spectroscopy

ii) Explain maxwell - Boltzmann statistics.

b) Consider binomial distribution for system for which P=1/3, q=2/3, N =6.

Determine standard deviation and find probability that is *n* is in range $\langle n \rangle - \sigma$ to $\langle n \rangle + \sigma$. **[4]**

Q4) Attempt any one of the following : **[6]**

a) i) Explain NMR spectroscopy with working principle and Experimental setup.

ii) Explain energy band gap structure with suitable diagram

b) Explain poisson's distribution. **[4]**

Q5) Attempt any four of the following **[10]**

a) Explain photoluminescence.

b) Write the uses of nanocluster

c) Draw block diagram of ESR spectroscopy

d) Explain Fermi-Dirac statistics

e) Draw the diagram of quantum dots.

f) Explain Thermoluminescence.

Total No. of Questions : 4]

SEAT No. : ____

PC-1378

[Total No. of Pages : 2

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T.Y. B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
NS-353: Nanobiotechnology
(2019 Pattern) (Semester - V) (35263)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Attempt the following questions : **[11]**

1) Define the term plasmid ? **[2]**

2) List the function of flagella and cilia. **[2]**

3) What are disaccharides? **[2]**

4) Give examples of storage polysaccharides. **[2]**

5) What are lipoproteins? **[2]**

6) Define the term proteins. **[1]**

Q2) Attempt any two of the following : **[8]**

1) With the help of diagram describe the secondary structure of protein. **[4]**

2) Draw labelled diagram of ATP synthase and write its function. **[4]**

3) Elaborate various types of lipoproteins. **[4]**

P.T.O.

Q3) Answer any two of the following : **[8]**

1) Explain types of DNA with diagram. **[4]**

2) What are restriction enzymes? Give example. **[4]**

3) Explain primary structure of protein. **[4]**

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

1) Explain the classification of monosaccharides. **[4]**

2) Write the various functions of lipids. **[4]**

3) What are globular proteins? Give example. **[4]**

Total No. of Questions : 5]

SEAT No. : ____

PC1379

[Total No. of Pages : 2

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T.Y.B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS - 354 : Carbon Based Nanomaterials

(2019 Pattern) (Semester - V) (Paper - IV) (35264)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Draw neat and labelled diagram wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) Attempt any five of the following. **[5]**

a) Give the reagents in cutting of carbon nonotubes.

b) Why diamond is bad conductor of electricity.

c) What is dielectric constant? Give its value for diamond.

d) What is balostic transport in CNT'S?

e) Give any two optical properties of CNT's.

f) What is flow sensor?

Q2) A) Attempt any one of the following. **[6]**

a) Explain in detail shopes of graphite.

b) Explain in detail carbon nanotubes.

B) Differentiat between diamond and graphite. **[4]**

P.T.O.

Q3) A) Attempt any ONE of the following. **[6]**

a) Explain in detail electric - are - discharge method with neat and labelled diagram.

b) Explain the Battery applications in carbon based Nanomaterials.

B) Explain in detail diamond synthesis route - HPHT (High pressure high temperature). **[4]**

Q4) A) Attempt any ONE of the following. **[6]**

a) Explain in detail production methods of Nanodiamonds.

b) Explain the Allotropes of carbon.

B) Describe the various applications on Nanodiamonds. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Electrical properties of CNT's.

b) Laser ablation method.

c) Shear modulous.

d) Application of CNT's.

e) Nanodiamond.

f) Atomic Bonding of Fulierens.

Total No. of Questions : 5]

SEAT No. :

PC1380

[Total No. of Pages :2

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T.Y.B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS-355 : Energy Conversion Devices and Applications

(2019 Pattern) (Paper-V) (Semester- V) (35265)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Draw the neat and labelled diagram wherever necessary.***
4) ***Figure to the right indicate full marks.***

Q1) Attempt any FIVE of the following: **[5]**

a) Define Artificial Photosynthesis.

b) Define Photovoltaic solar cell.

c) What is Polymer solar cell?

d) Write equation of photon energy.

e) Define kinetics.

f) Write equation of efficiency of solar cell.

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

i) Explain and Draw equivalent circuit of solar cell.

ii) Explain design and working principle of Perovskite solar cells.

b) A certain source emit radiation of wavelength 500 nm. What is energy in KJ of 1 mole of Photon of these radiation. [Given : Avagadro's number = 6.022×10^{23}/mole] **[4]**

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

i) Explain mechanism of Dye sensitized solar cell.

ii) Explain bulk heterojunction solar cell.

b) Explain properties of working photoelectrode. **[4]**

P.T.O.

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

i) Explain working and construction of P3HT : PCBM solar cell.

ii) Explain planer heterojunction solar cell.

b) What is energy perphoton of lower frequency of electromagnetic radiation with can use of observe gold atom with wavelength 280 Picometer. **[4]**

Q5) Attempt any FOUR of the following: **[10]**

a) Explain Greenhouse Effect.

b) Explain Losses of solar cell.

c) Write properties of sunlight.

d) Write Applications of DSSCs.

e) Explain hybrid solar cell.

f) Write advantages and disadvantages of Perouskite solar cells.

Total No. of Questions : 5]

SEAT No. :

PC1381

[Total No. of Pages : 2

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T.Y. B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS - 356 : Environmental Nanotechnology and Applications

(2019 Pattern) (Semester - V) (Paper -VI) (Elective -I) (35266)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Draw neat and labelled diagram wherever necessary.***
5) ***Figures to the right indicates full marks.***

Q1) Attempt any Five of the following. **[5]**

a) What is seive effect.

b) Industrial Effluents in water pollution.

c) Define Anaerobic digestion.

d) Define domestic waste water.

e) Carbon nanotubes.

f) Air pollution.

Q2) a) Attempt any One of the following. **[6]**

i) Explain in brief methods for waste water treatment.

ii) Explain methods for the measurements of air pollution and its controlled.

b) Explain "Air Pollution". **[4]**

Q3) a) Attempt any One of the following. **[6]**

i) Give the detail properties of sensores.

ii) Explain synthesis and characterisation of tin oxide.

b) Explain toxicity due to air born nanomaterials. **[4]**

P.T.O.

Q4) Attempt any One of the following. **[6]**

a) i) Explain water pollution.

ii) Explain in brief water and waste water treatment.

b) Write a note on Activated Sludge. **[4]**

Q5) Write a short notes on any Four of the following. **[10]**

a) Oxidation ponds

b) Explain cyclone separator

c) Oxidation ditches

d) Anaerobic filters

e) Airborn pollution

f) Cyclone Separator

■■■■

Total No. of Questions : 5]

SEAT No. :

PC1382

[Total No. of Pages : 2

[6327]-192
T.Y. B.Sc. (Regular)
NANOSCIENCE AND NANOTECHNOLOGY
NS-3510 : Basic Instrumentation Skills
(2019 Pattern) (Semester - V) (352610)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question no.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Draw the neat and labelled diagram wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Attempt any Five of the following. **[5]**

a) Define range?

b) What is Error?

c) Define Accuracy?

d) Define CRO?

e) Define sensitivity?

f) What is Q- meter?

Q2) a) Attempt any ONE of the following. **[6]**

i) Explain the Block diagram and working of digital multimeter.

ii) What is Error measurement? Explain it's different types.

b) Write down the characteristics of digital instrument. **[4]**

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

i) Explain Basic controls of CRO.

ii) Explain construction and working of DC bridges.

b) Explain the screen phosphor of CRT. **[4]**

P.T.O.

Q4) Attempt any ONE of the following: **[6]**

a) i) Write down measurement of distortion.

ii) Explain chemical composition of CRO.

b) Explain specifications of function generator. **[4]**

Q5) Attempt any Four of the following: **[10]**

a) Explain the measurement of Q-meter.

b) Write down Applications of DSO.

c) Explain different types of pulse generation.

d) Write down different between square wave and pulse.

e) Write short note on multimeter.

f) Write down difference between analog Instrument and digital Instrument.

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Total No. of Questions : 5]

SEAT No. :

PC1383

[Total No. of Pages : 2

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T.Y. B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS - 3511 : C - PROGRAMMING

(2019 Pattern) (Semester - V) (Paper -I) (352611)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.No. 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any Five of the following. **[5]**

a) Why c-language is middle level language?

b) What is algorithm.

c) What is integer constant?

d) Write syntax to draw line.

e) What is use of closegraph?

f) Write syntax for scanf function.

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

a) Write C-program for addition, subtraction, multiplication, division and modulo of two number using switch statement.

b) Write short note on constant in C.

c) What is identifier? State its rule and give example.

Q3) a) Explain use of **[6]**

i) #include<stdio.h>

ii) main()

iii) gm

OR

Write C-Program to draw circle, line, ellipse, rectangle, arc using graphics programming.

b) Explain difference between if and if....else statement. **[4]**

P.T.O.

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

a) Find Integration of an given eq^n $\int_4^{5.2} ln\ x\ dx$ using trapezoidal rule (n = 6)

b) Draw flowchart to find factorial of given number.

c) Explain character set in C.

Q5) Write short note on any Four of the following. **[10]**

a) Output function used in C.

b) For statement.

c) Break statement.

d) goto statement.

e) Advantages of Flowchart.

■■■■

Total No. of Questions : 5]

SEAT No. : ____

PC-1384

[Total No. of Pages : 2

[6327] - 194
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL 351: Digital Design using Verilog
(2019 Pattern) (CBCS) (Semester - V) (paper - I)

Time : 2 Hour] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q. 2 to Q. 5.***

Q1) Attempt any five of the following : **[5]**

a) What is HDL?

b) List different types of operators use in verilog.

c) Write most important advantage logic synthesis tool.

d) RTL in logic synthesis stands for .....

e) \\ A = 1'b1 B = 2'b00 then {B,A} = ?

f) Which type of IC's can be design using verilog?

Q2) Attempt the following

a) i) How to declare comments in verilog? Explain with suitable example. **[2]**

ii) Explain Arithmetic and logical operators in verilog with suitable example. **[4]**

b) Compare VHDL and Verilog HDL. **[4]**

P.T.O.

Q3) Attempt the following

a) i) A = 4'b0111, B = 4' b0100 // A and B are register vector **[2]**
Y = A*B //

Z = A +B //

What is value Y and Z after arithematic operations.

ii) What is the role of concantenation operator in verilog. Explain it with suitable example. **[4]**

b) Write a short note on verilog abstraction levels in brief **[4]**

Q4) Attempt the following

a) i) List the various conditional statements used in verilog. **[4]**

ii) Explain with suitable example programmable array logic (PAL).**[4]**

b) What are the design constraints in logic synthesis? Explain each in brief. **[4]**

Q5) Attempt any four of the following **[10]**

a) Write a code in verilog (RTL) for two bit magnitude comparator.

b) Draw the block diagram for programmable Logic Array (PLA)

c) Write down verilog code for 2:1 multiplexer in gate level abstraction.

d) Differentiate blocking and non blocking statement.

e) Write a short note on FPGA

f) Draw the flow chart for logic synthesis from RTL to gate.

Total No. of Questions : 5]

SEAT No. : ____

PC-1385

[Total No. of Pages : 2

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T.Y. B.Sc.
ELECTRONIC SCIENCE
EL 352: Microcontroller Architecture & Programming
(2019 Pattern) (Semester - V) (Regular) (Paper - II)
(CBCS -2 Credits) (35222)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Attempt any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any five of the following : **[5]**

a) Write the full form of RISC.

b) What do you mean by '____ delay - u5(300);'?

c) What is high level language?

d) Write the role of PINB register.

e) Define linker.

f) State the role of RW Pin in LCD.

Q2) Attempt the following :

a) i) Write a short note on 'Flash' memory of AVR ATmega16 **[2]**

ii) Write note on relational operators in C. **[4]**

b) Explain 8-bit format of TIFR register. **[4]**

P.T.O.

Q3) Attempt the following :

a) i) What is function? Give the use of return function. **[2]**

ii) Write AVRC program to interface stepper motor on PORT B. **[4]**

b) Explain data types for AVR with size and range. **[4]**

Q4) Attempt the following :

a) i) List the any four interrupts of AVR ATmega16. **[2]**

ii) Explain ADMUX register in detail **[4]**

b) Give name and role of any four library functions in C. **[4]**

Q5) Attempt any four of the following **[10]**

a) Give the any five applications of microcontroller

b) Write the syntax of 'if - else' statement

c) Give the structure of C program.

d) Draw the block diagram of Timer O programming.

e) Write AVR C program to toggle all bits of PORTD, continuously.

f) Write AVR C program to generate sawtooth wave using DAC connected at PORTD.

Total No. of Questions : 5]

SEAT No. :

PC-1386

[Total No. of Pages : 2

[6327] - 196
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL 353: Analog Circuit Design and Applications
(CBCS) (2019 Pattern) (Semester - V) (Paper - III) (35223)

Time : 2 Hour] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Write diode current equation (I_D)

b) State the formula for frequency of Twin - T oscillator.

c) Define the term offset out put voltage of op-amp.

d) What is the condition to produce symmetric square wave using IC 8038 as a function generator?

e) To produce +12V regulated dc voltage, which voltage regulator IC is used?

f) What is the ideal value of percentage line regulation.

Q2) Attempt the following :

a) i) Draw the block diagram of analog multiplier for multiplying V_x and V_y. **[2]**

ii) With help of circuit diagram of log amplifier using diode as a log element, obtain the expression for output -voltage **[4]**

b) Explain the working of crystal oscillator using transistor. **[4]**

P.T.O.

Q3) Attempt the following :

a) i) In a square wave generator using op-amp, calculate the frequency of output. Given R = 500 Ω, C = 10 μF and Beta = 0.05. **[2]**

ii) Draw the circuit diagram of triangular wave generator using op-amp as a square wave generator and integrator and explain it. **[4]**

b) Explain the working of op-amp as zero crossing detector with sine wave as one input and draw input-output waveforms. **[4]**

Q4 Attempt the following :

a) i) Draw the circuit diagram of +9v regulated power supply using voltage regulator IC and rectifier circuit **[2]**

ii) Draw the circuit diagram of LM317 as an adjustable voltage regulator and write the formula for output voltage. **[4]**

b) Draw the circuit dagram of offset nullifying circuit used as op-amp as inverting amplifier and explain it. **[4]**

Q5) Attempt any four of the following : **[10]**

a) Calculate the percentage load regulation of power supply. Given no load voltage = 10v and full load voltage = 9.99V.

b) Draw the circuit diagram of SMPS using transistor and PWM.

c) For function generator using IC 8038. calculate frequency of square wave if duty cycle is 50% Given R=50KΩ, C = 0.01μf

d) Draw equivalent circuit diagram of crystal and write the formulae for series and parallel resonating circuit.

e) Draw the circuit diagram of op-amp in which earth loop is used to minimize the noise

f) Draw the circuit diagram of full wave precision rectifier using two op-amps and equal resistors.

Total No. of Questions : 5]

SEAT No. : ____

PC1387

[Total No. of Pages : 2

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T.Y.B.Sc. (Regular)

ELECTRONIC SCIENCE

EL-354 : Nanoelectronics

(Revised 2019 Pattern) (Semester - V) (Paper - IV) (35224)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) State any two applications of Nanoelectronics.

b) What is tunneling in Pn junction diode.

c) What is use of UV visible spectroscopy.

d) What is magnification of electron microscope.

e) What is CNT.

f) Which fullerene has most stable structure.

Q2) Attempt the following.

a) i) State special features of nanoelectronics over microelectronics. **[2]**

ii) Write short note on metamaterials. **[4]**

b) What is RTD? Explain current voltage characteristics of RTD. **[4]**

P.T.O.

Q3) Attempt the following.

a) i) Explain O-D nanomaterials with example. **[2]**

ii) State basic principle used in scanning tunneling microscope (STM). **[4]**

b) What is UV visible spectroscopy? State basic principle used in this spectroscopy. **[4]**

Q4) Attempt the following.

a) i) Why TEM images have much higher resolutions than light microscope. **[2]**

ii) Explain Quantum LED. State its applications. **[4]**

b) What is the principle of quantum dot laser. State its advantages and applications. **[4]**

Q5) Attempt any four of the following. **[10]**

a) What is TEM? List different types of lenses used in TEM?

b) What is XRD? State range of wavelength of X-ray used in XRD.

c) Explain Quantum well laser.

d) What is semiconductor Nanowire. State its applications.

e) Explain coulomb blockade effect

f) What is difference between lattice - matched and lattice - mismatched materials.

Total No. of Questions : 5]

SEAT No. :

PC1388

[Total No. of Pages :2

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T.Y.B.Sc. (Regular)

ELECTRONIC SCIENCE

EL - 355 : Signals and Systems

(Revised 2019 Pattern) (Paper - V) (Semester- V) (35225)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Attempt any 3 questions from Q2 to Q5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any FIVE of the following: **[5]**

a) State the condition for periodicity of DT signal.

b) Define a signal.

c) List any two examples of CT system.

d) Find Laplace transform of 1.

e) What is meant by sampling of a signal?

f) State Shannon's sampling theorem.

Q2) Attempt the following:

a) i) Find Laplace transform of cos 2*t*. **[2]**

ii) Explain the periodic and non-periodic CT signals. **[4]**

b) Determine whether the following discrete time system is linear or non-linear. $y(n) = x^2(n)$. **[4]**

Q3) Attempt the following:

a) i) Draw a block diagram of DSP system. **[2]**

ii) Find Laplace transform of $f'(t)$. **[4]**

b) Find Laplace transform of e^{at}. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) What is aliasing effect in sampling of a signal? **[2]**

ii) State and prove second shifting property of Laplace transform. **[4]**

b) Explain the process of sampling of a continuous-time signal. **[4]**

Q5) Attempt any FOUR of the following: **[10]**

a) State Nyquist's rate for sampling of a signal.

b) Define inverse Laplace transform of a function.

c) Define CT static and dynamic systems.

d) State Nyquist frequency in sampling of a signal.

e) Define Laplace transform of a functions.

f) Define a system. Give its classification.

Total No. of Questions : 5]

SEAT No. :

PC1389

[Total No. of Pages : 2

[6327]-199

T.Y. B.Sc. (Regular)

ELECTRONIC SCIENCE

EL - 356 (A) : Optics and Fiber Optic Communication

(Revised 2019 Pattern) (Semester - V) (Papar -VI (A)) (35226A)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***

Q1) Attempt any Five of the following. **[5]**

a) State total internal refection phenomena.

b) Compare between step index and graded index optical fiber.

c) Define the term attenuation in optical fiber.

d) List types of optical sources used in fiber optic communcation.

e) What do you mean by coherent source?

f) State the function of Optical Transport Network.

Q2) Attempt the following.

a) i) Explain Star network topology with suitable diagram. **[2]**

ii) Explain the method for measurement of fiber dispersion with suitable block diagram. **[4]**

b) Draw the block diagram of optical fiber communication system. Explain function of each block. **[4]**

Q3) Attempt the following.

a) i) What do you mean by SONET? **[2]**

ii) Explain propagation of light in graded index multimode fiber with suitable diagram. **[4]**

b) Explain the working principle of P-N photodiode with suitable diagram. state its limitations. **[4]**

P.T.O.

Q4) Attempt the following.

a) i) Explain the term acceptance angle of optical fiber. **[2]**

ii) Explain bending loss in optical fiber. Write the relation for critical radius of curvature at which large bending loss occur. **[4]**

b) Calculate the quantum efficiency of PIN silicon photodiode, if the responsivity is 0.58 A/W at 850 nm warelength. **[4]**

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

c = 3×10^{8} m/s]

Q5) Attempt any Four of the following. **[10]**

a) Write a note on fiber splicing.

b) State the advantages of optical fiber.

c) Explain scattering loss in optical fiber.

d) Explain operating principle of LED. List the structures of LED.

e) Write a short note on Synchronous digital hierarchy.

f) State the levels of OTN.

Total No. of Questions : 5]

SEAT No. :

PC1390

[Total No. of Pages :2

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T.Y.B.Sc. (Regular)

ELECTRONIC SCIENCE

EL - 356(B) : Electronic Product Design and Entrepreneurship

(2019 Pattern) (Semester- V) (35226B)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any 3 questions from question 2 to question 5.***
3) ***Question 2 to question 5 carry equal marks.***

Q1) Attempt any FIVE of the following: **[5]**

a) What is brochure?

b) What is EMI in product testing?

c) What is product prototyping?

d) Give the meaning of integration of components.

e) Define ergonomics.

f) Give the definition of entrepreneurship development.

Q2) Attempt the following:

a) i) Give the main intension of writing a proposal. **[2]**

ii) What is environmental testing in electronic product design? Explain in short dry heat test. **[4]**

b) Explain failure rate Vs time curve with neat labelled diagram. **[4]**

Q3) Attempt the following:

a) i) Explain the different techniques of troubleshooting in product design. **[2]**

ii) Product documentation is an integral part to any product, justify. **[4]**

b) Write in detail the various stages in electronic product design. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) What is pilot production? Give purpose of it. **[2]**

ii) List various functions of entrepreneur. **[4]**

b) Explain the role of in-circuit emulator. **[4]**

Q5) Attempt any FOUR of the following: **[10]**

a) Write a short note on characteristics of successful entrepreneur.

b) Write a short note on Bill of Material.

c) Explain the role of DSO in product testing.

d) Explain bottom-up approach with neat labelled diagram.

e) Explain role of inspection in quality control of product.

f) Describe use of logic probe in product testing.

Total No. of Questions : 5]

SEAT No. : ____

PC1391

[Total No. of Pages : 2

[6327]-201
T.Y. B.Sc. (Regular)
ELECTRONIC SCIENCE
ELSEC- 351 : Electronic Design Automation Tools
(CBCS 2019 Pattern) (Semester - V) (352210) (Paper - X)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question no.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions No.2 to Q.5 carry equal marks.***

Q1) Attempt any 5 of the following. **[5]**

a) What is EDA?

b) Write full form of LTSPICE.

c) Write the flow of Schematic.

d) What is proteus?

e) Write the components used in LTSPICE.

f) What is wiring of components?

Q2) Attempt the following.

a) i) What are the features of PS pice? **[2]**

ii) Draw and explain the diagram of half wave rectifier. What will be out put on multisim. **[4]**

b) Write the design How of PCB. **[4]**

Q3) Attempt the following:

a) i) Write the application of circuitmod **[2]**

ii) Write the steps in proteus to make any circuit **[4]**

b) What is the difference between schematic and wiring diagram? **[4]**

P.T.O.

Q4) Attempt the following:

a) i) Write features of O2CAD. **[2]**

ii) Write the steps of simulation using multisim. **[4]**

b) Draw the circuit of transistor biasing? What will be the output on simulation using LTSPICE. **[4]**

Q5) Attempt any four of the following: **[10]**

a) Write the steps SPICE analysis.

b) What is the simulation command.

c) Draw the circuit diagram of positive clipper circuit. What is the output on multisim.

d) Expand the online DRC window.

e) What is circuit design and circuit analysis.

f) How to select components in proteus software? Explain it.

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Total No. of Questions : 5]

SEAT No. : ____

PC1392

[Total No. of Pages : 2

[6327]-202

T.Y.B.Sc. (Regular)

ELECTRONIC SCIENCE

ELSEC-352: Internet of Things & Applications

(Revised 2019 Pattern) (Semester - V) (Paper - XI) (352211)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***

Q1) Attempt any five of the following. **[5]**

a) What is the full form of IoT & IIoT?

b) What is mean by BLE.

c) How smart grid works?

d) What is Raspberry Pi?

e) Which are the IoT devices used for health monitoring?

f) How does IoT work in the smart forming?

Q2) Attempt the following.

a) i) Which layer of IoT uses TCP & UDP protocol. **[2]**

ii) Write a Raspberry Pi program to interface LED on/off. **[4]**

b) Explain how the IoT Technology is impacting the health care sector. **[4]**

Q3) Attempt the following.

a) i) Write the features of Raspberry Pi. **[2]**

ii) Explain the use of HDMI output port on Raspberry Pi. **[4]**

b) Describe how the enviornment can be more protected with the help of IoT technology. **[4]**

P.T.O.

Q4) Attempt the following.

a) i) Why the Internet of everything is important. **[2]**

ii) Determine the IoT levels for designing home automation system including smart lightning & intrusion detection. **[4]**

b) Write the difference between IoT & Machine to Machine (M2M) **[4]**

Q5) Attempt any four of the following. **[10]**

a) Write advantages of IoT.

b) Which are the applications used in IoT smart homes?

c) Why there is a need for on IoT management?

d) Write the IoT protocols.

e) What are the components of a Machine to Machine (M2M) system?

f) What are the examples of IoT?

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Total No. of Questions : 5]

SEAT No. : ____

PC-1393

[Total No. of Pages : 2

[6327] - 203
T.Y. B.Sc.
PSYCHOLOGY
Paper-I: Cognitive Psychology
(2019 Pattern) (Semester - V) (35201)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions from 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Gagnitive oefine cognitive psychology

b) Define sensation.

c) Define warning

d) Define perception

e) Define memory

f) Define Conditioning.

Q2) a) Explain the various gestalt principles of perception. **[6]**

OR

Describe the components of classical conditioning with experiment.

b) Critically analyse the piagets cognitius developmental theory. **[4]**

P.T.O.

Q3) a) Discuss the various types of cognitive processes **[6]**

OR

Compare the various functions and types of memory.

b) Analyse the various types of problem. **[4]**

Q4) a) Describe the vygotsky's sociocultural theory. **[6]**

OR

Explain the different types of memory improvement techniques

b) Analyse the types of reinforcement and its application in details. **[4]**

Q5) Write short notes on any four of the following **[10]**

a) Application of cognitive psychology

b) Process of sensation

c) Trial error method of learning

d) Types of Learning

e) Problem solving cycle

f) Process of memory

Total No. of Questions : 5]

SEAT No. :

PC-1394

[Total No. of Pages : 2

[6327] - 204
T.Y. B.Sc.
PSYCHOLOGY
Psychopathology - I
(2019 Pattern) (Semester - V) (Regular) (Paper - II) (35202)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions from 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) What is abnormal behaviour?

b) Define stress.

c) What is generalized anxiety?

d) Define depression.

e) What is intellectual disability?

f) State the criteria of abnormal behaviour.

Q2) a) Explain the Pre DSM classification of abnormal behaviour. **[6]**

OR

Critically evaluate the Diathesis stress model.

b) Discuss the Symptoms of Mania. **[4]**

P.T.O.

Q3) a) Explain the Symptoms of Schicophrenia. **[6]**

OR

Explain the Psychotheraptic interventions for Schicophrenia.

b) Critically evaluate the clinical sign of brain damage. **[4]**

Q4) a) Discuss the causes of abnormal behaviour. **[6]**

OR

Explain the concept and criteria of abnormal behaviour.

b) Explain the Psychodynamic model of abnormality. **[4]**

Q5) Write short notes on any five of the following **[10]**

a) Panic disorder

b) Cognitive disorder

c) Mood disorder

d) DSM.5

e) Biological model of Abnormality

f) Humanistic Model

Total No. of Questions : 5]

SEAT No. : ____

PC-1395

[Total No. of Pages : 2

[6327] - 205
T.Y. B.Sc.
PSYCHOLOGY
Statistical Methods
(2019 Pattern) (Semester - V) (Paper - III) (35203)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Define graph

b) What is mode?

c) Define variable

d) Define percentile rank.

e) Who introduced the product moment method of correlation.

f) State the types of graph.

Q2) a) Compute average deviation from the following data. **[6]**

Scores	80-84	85-89	90-94	95-99	100-104	105-109	110-114
Frequency	4	4	3	0	3	3	1

OR

What is pictogram? How can statistical data be represented through such diagram? Illustrate with an example

b) Evaluate the inferential statistics. **[4]**

Q3) a) Explain the various types of scales of measurement. **[6]**

OR

Find rank order correlation coefficient from the following data

Individuals	a	b	c	d	e	f	g	h
Marks in A	10	15	14	25	14	14	20	22
Marks in B	6	25	12	18	25	40	10	7

b) Evaluate the types of measures of variability **[4]**

Q4 a) Enumerate the needs and advantages of statistics in the field of Psychology. **[6]**

OR

Compute the median from the following data

Scores	f
90-94	1
85-89	4
80-84	2
75-79	8
70-74	9
65-69	14
60-64	6
55-59	6
50-54	4
45-49	3
40-44	3
	N:

b) Evaluate the application of Normal distribution curve **[4]**

Q5) Write the short notes on any four of the following : **[10]**

a) Application of range

b) Characteristics of normal probability

c) Ratio Scale

d) Basics of graph

e) Product moment correlation

f) Application of central tendency

Total No. of Questions : 5]

SEAT No. : ____

PC1396

[Total No. of Pages : 2

[6327]-206

T.Y.B.Sc. (Regular)

PSYCHOLOGY

Organizational Behaviour

(2019 Pattern) (Semester - V) (Paper - IV) (35204)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions from 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) What is incentive?

b) Define job stress.

c) What is job enrichment?

d) Define leadership.

e) Define motivation.

f) What is Organizational behavior?

Q2) a) Explain the Sources and consequenceses of stress. **[6]**

OR

Explain management grid.

b) Describe the characteristics of successful leader. **[4]**

P.T.O.

Q3) a) Explain the flexi times, flexi plan in organizational planning. **[6]**

OR

Discuss the consequences of conflicts.

b) Critically evaluate Maslow's theory of motivation. **[4]**

Q4) a) Discuss the opportunities of organizational behaviour. **[6]**

OR

Explain the application of emotional intelligence in organizational setting.

b) Discuss the nature and process of motivation. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Group dynamic

b) Job enrichment

c) Time management

d) Trait approach to leadership

e) Conflict resolution

f) Types of leadership

Total No. of Questions : 5]

SEAT No. : ____

PC1397

[Total No. of Pages : 2

[6327]-207

T.Y. B.Sc. (Regular)

PSYCHOLOGY

Positive Psychology

(2019 Pattern) (Semester - V) (Paper - V) (35205)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following: **[5]**

a) Define Positive Psychology.

b) Define happiness.

c) Define well being.

d) What is emotion?

e) Define self realization.

f) Define resilience.

Q2) a) Explain the hedonic basis of happiness. **[6]**

OR

Describe the relationship between positive emotion and well being.

b) Evaluate the goals of Positive Psychology. **[4]**

Q3) a) Elaborate the importance and significance of Positive Psychology as wholly emerging branch of Psychology. **[6]**

OR

Explore in details the 7c of resilience.

b) Analyze the relationship between Positive emotion and health. **[4]**

P.T.O.

Q4) a) Explain the relationship of Positive Psychology with health clinical & developmental Psychology. **[6]**

OR

Compare the hedonic & eudaimonic happiness.

b) Relate the Positive traits and virtues in happiness. **[4]**

Q5) Write short notes on any Four of the following: **[10]**

a) Assumptions of positive psychology.

b) Types of Positive emotions.

c) Subjective well being & happiness.

d) Component of well being.

e) Trauma & resilience.

f) Human Virtues.

Total No. of Questions : 5]

SEAT No. :

PC1398

[Total No. of Pages :2

[6327]-208

T.Y.B.Sc. (Regular)

PSYCHOLOGY

Counseling Psychology

(2019 Pattern) (Semester- V) (Paper - VI) (35206)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any 3 questions from question 2 to question 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any Five of the following: **[5]**

a) Define positive regard.

b) Define counseling.

c) What is initial disclosure?

d) What is directive counseling?

e) Define empathy.

f) Name the types of psychological test.

Q2) a) Explain the stages of positive regards in counseling. **[6]**

OR

Describe the goals of counseling.

b) What are the core conditions of counseling? **[4]**

Q3) a) Explain the main concepts of humanistic approach. **[6]**

OR

Explain the stages of counseling process.

b) Explain the various applications of psychological testing. **[4]**

P.T.O.

Q4) a) Describe the behaviouristic approach of counseling. **[6]**

OR

Explain the ethics in counseling.

b) Differentiate between premarital and marital counseling. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Non directive counseling

b) Genuineness

c) Communication skills of counselar

d) Career counseling

e) Family counseling

f) Scope of counseling

Total No. of Questions : 5]

SEAT No. :

PC1399

[Total No. of Pages : 2

[6327]-209
T.Y. B.Sc. (Regular)
PSYCHOLOGY
SEC-I : Basic Counselling Skills
(2019 Pattern) (Semester - V) (352010)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question no.1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Questions from 2 to 5 carry equal marks.***

Q1) Solve any Five of the following. **[5]**

a) Define counselling.

b) What is body posture?

c) Define closed-ended question.

d) What is grooming?

e) State the communication skills of counsellor.

f) Define Empathy.

Q2) a) Discuss the role of facial expression and body gaze in counselling. **[6]**

OR

Describe the Immediacy and self-disclosure in Counselling.

b) Explain the Gloals of counselling. **[4]**

Q3) a) Elaborate the types of counselling. **[6]**

OR

Explain the concept of concreteness indetail.

b) Explain the process of self disclosure in counselling. **[4]**

P.T.O.

Q4) a) Discuss the stages of counselling. **[6]**

OR

Explain the role of clothing and grooming in counselling.

b) Analysis the concept of additive empathy as a skill of counselor. **[4]**

Q5) Write short notes on any Four of the following. **[10]**

a) Role of paraphrasing in counselling.

b) Positive Regard.

c) Types of questions in counselling.

d) Genuineness.

e) Purpose of counselling.

f) Attending behaviour of counselor.

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Total No. of Questions : 5]

SEAT No. : ____

PC1400

[Total No. of Pages : 2

[6327]-210
T.Y.B.Sc. (Regular)
PSYCHOLOGY
SEC-II: Personality Development
(2019 Pattern) (Semester - V) (352011)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following. **[5]**

a) Define personality.

b) Define extraversion.

c) Define communication.

d) What is goal setting.

e) What is career planning.

f) Define etiquettes.

Q2) a) Explain the various determinants of personality development. **[6]**

OR

Describe the different types of Written communication.

b) Justify the body language is an important type of non-verbal communication. **[4]**

Q3) a) Explain the various challenges & process of SWOT analysis. **[6]**

OR

Describe the role of team workers for effective work planning.

b) Differentiate between social and official setting etiquettes. **[4]**

P.T.O.

Q4) a) Explain the types and mistakes of interview. **[6]**

OR

Describe the different types of barriers in communication.

b) Explore the characteristics of effective team. **[4]**

Q5) Write short notes on any four of the following. **[10]**

a) Advantages self assessment.

b) Process of communication.

c) Need of goal setting.

d) Telephone etiquettes.

e) Advantages of career planning.

f) e-mail etiquettes.

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Total No. of Questions : 5]

SEAT No. : ____

PC-1401

[Total No. of Pages : 2

[6327] - 211
T.Y. B.Sc. (Regular)
ENVIRONMENTAL SCIENCE
EVS 351: Terrestrial Ecosystem and Management
(2019 Pattern) (Semester - V) (Paper- I) (35241)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions from 2 to 5 carries equal marks.***

Q1) Solve any five of the following : **[5]**

a) Define the term Terrestrial Ecosystem

b) Give an example of Keystone species

c) Enlist any 2 benefits of Terrestrial Ecosystem

d) Define the term Carbon pool

e) What are the effects of forest fires

f) What is meant by point frame method used for vegetation Sampling.

Q2) a) Explain in detail Biogeographic realms of the world **[6]**

b) Explain Reasons and threats to Terrestrial Ecosystem. **[4]**

Q3) a) Write short note on Sustainable Management of Terrestrial Ecosystem **[6]**

b) Explain the importance of people in Terrestrial Ecosystem Management. **[4]**

Q4) a) Write short note on Forest fires Management and control measures **[6]**

b) Explain Carbon Sequestration and its importance. **[4]**

Q5) Write short note on any four of the following **[10]**

a) Biogeographic zones in India

b) Application of Remote Sensing and GIS in Terrestrial Ecosystem Management

c) Traditional methods of Terrestrial Ecosystem and its Management.

d) Benefits of community based Terrestrial Ecosystem Management.

e) Explain reasons, threats of Terrestrial Ecosystem.

f) Parameters of Terrestrial Environment.

Total No. of Questions : 5]

SEAT No. : ____

PC-1402

[Total No. of Pages : 2

[6327] - 212
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
EVS 352: Wildlife Biology and Management
(2019 Pattern) (Semester - V) (Paper - II) (35242)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any five of the following : **[5]**

a) Define wildlife Biology

b) What is Estuaries?

c) What is Insect?

d) What is Artificial stocking in wildlife management techniques?

e) What is Dicot?

f) What is mean by Poaching?

Q2) Answer the following :

a) Explain in detail of urbanization. **[6]**

b) Write in brief about Bryophytes and Amphibians. **[4]**

P.T.O.

Q3) Answer the following :

a) Write note on Appiko movement. **[6]**

b) Explain wildlife management practices with reference to habitat improvement. **[4]**

Q4) Answer the following :

a) Explain Human wildlife conflict. **[6]**

b) Explain direct count method with suitable example. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) What is Reptiles?

b) What is Pugmark?

c) What is HEP?

d) What is GIS? Application of GIS in wildlife management. Explain in short.

e) What is crustaceans?

f) What is visual encounter survey?

Total No. of Questions : 5]

SEAT No. : ____

PC-1403

[Total No. of Pages : 2

[6327] - 213
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
EVS-353, Water and Soil Quality
(2019 Pattern) (Semester - V) (Paper - III) (35243)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Attempt any five of the following : **[5]**

a) Define : Water inventory **[1]**

b) Write any two chemical characteristics of water **[1]**

c) Write the meaning of water stress index **[1]**

d) Name any two tertiary water treatment processes **[1]**

e) Define - Nitrification **[1]**

f) Write any two principles of soil conservation technique. **[1]**

Q2) Answer the following

a) Explain lake water pollution with a case study. **[6]**

b) Describe the factors affecting soil temperature **[4]**

P.T.O.

Q3) Answer the following

a) Enumerate in detail the sources of ganga river pollution. **[6]**

b) Write the functions and deficiency syndromes of micronutrients. **[4]**

Q4) Answer the following

a) Discuss the functions of central board in water act. **[6]**

b) Explain the effects of soil sickness on soil health and plant growth. **[4]**

Q5) Write the short note on any four of the following :

a) Effects of sewage water on aquatic life **[2½]**

b) Control measures for water borne diseases **[2½]**

c) Biological methods for soil conservation **[2½]**

d) Soil profile (horizons) with diagram **[2½]**

e) Acid-Base reactions in soil **[2½]**

f) Sources and control measures for water pollution. **[2½]**

Total No. of Questions : 5]

SEAT No. : ____

PC1404

[Total No. of Pages : 2

[6327]-214

T.Y.B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

EVS 354 : Atmospheric and Global Climate Change

(2019 Pattern) (Semester - V) (35244)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Question No. 2 to 5 carry equal marks.***

Q1) Attempt any five of the following.

a) What are the four types of fronts? **[1]**

b) What are the 4 types of air masses. **[1]**

c) Give an example of albedo. **[1]**

d) Define La-Nina effect.

e) What is temperature inversion. **[1]**

f) Give the four examples of green house gases. **[1]**

Q2) Answer the following.

a) Briefly explain the importance of Indian monsoon and agriculture. **[6]**

b) What are the salient features of kyoto protocol 1997. **[4]**

Q3) Answer the following.

a) What are the atmospheric factors responsible for plume behaviour. **[6]**

b) Briefly explain the Earth radiation budget. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain the importance and factors affecting atmospheric stability and mixing height. **[6]**

b) Explain the role of IPCC in climate change. **[4]**

Q5) Write a short note on any four of the following. **[10]**

a) Atmospheric structure

b) EL-Nino

c) Clean development mechanism.

d) Temperature inversion.

e) Asian Brown cloud

f) Carbon sequestration.

Total No. of Questions : 5]

SEAT No. : ____

PC1405

[Total No. of Pages : 2

[6327]-215

T.Y. B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

EVS - 355 : Environmental Legislation and Policy

(2019 Pattern) (Semester - V) (35245)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any Three questions from Question No. 2 to Question No.5.***
3) ***Question No. 2 to Question No.5 carry equal marks.***

Q1) Attempt any FIVE of the following.

a) Write the short Title of water Act. **[1]**

b) Which Article states to protect the environment by Protecting wildlife. **[1]**

c) State any 2 role of CPCB in a country. **[1]**

d) What is the main aim of Stockholm Conference. **[1]**

e) What is the name of 4 zones according to Noise Pollution Rules 2000. **[1]**

f) In which year Environment Protection Act has enacted. **[1]**

Q2) Answer the following.

a) Write short Note on Kyoto Protocol, 1997. **[6]**

b) Explain the concept of Environmental Ethics. **[4]**

Q3) Answer the following.

a) Write short Note on Public liability Insurance Act, 1991. **[6]**

b) Write Down the penalties for section 25 & 26 under water (Prevention & control) Act, 1974. **[4]**

Q4) Answer the following.

a) Explain the Functions of Pollution control Boards under Air Act, 1981. **[6]**

b) What are the Role of National Green Tribunal Act. **[4]**

P.T.O.

Q5) Write a short note on Any Four of the following. **[10]**

a) Environmental Governance. **[2½]**

b) RAMSAR Convention. **[2½]**

c) Montreal Protocol. **[2½]**

d) Agenda 21 **[2½]**

e) Role of SPCB. **[2½]**

f) Fundamental Rights. **[2½]**

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Total No. of Questions : 5]

SEAT No. :

PC1406

[Total No. of Pages :2

[6327]-216

T.Y.B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

EVS - 356 : Environmental Biotechnology - I

(2019 Pattern) (Semester- V) (35246)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any 3 questions from question 2 to question 5.***
3) ***Question 2 to question 5 carry equal marks.***

Q1) Attempt any Five of the following:

a) What are the challenges of environmental biotechnology? **[1]**

b) What is the scope of environmental biotechnology? **[1]**

c) What can be composted? **[1]**

d) What is the rarest worm? **[1]**

e) Enlist the name of three harmful microbes. **[1]**

f) What is the purpose of diluting? **[1]**

Q2) Answer the following:

a) Which are the basic parameters to evaluate the quality of the compost? **[6]**

b) What are the seven classes of microbes? **[4]**

Q3) Answer the following:

a) What is the purpose of microbial enumeration? **[6]**

b) Which is the best method of vermicompost? **[4]**

P.T.O.

Q4) Answer the following:

a) What are some ethical issues in agricultural biotechnology? **[6]**

b) What are the major groups of microbes? **[4]**

Q5) Write a short notes on any four of the following. **[10]**

a) Phases of composting.

b) Coimbatore method of composting.

c) Micropropogation.

d) Importance of Xenobiotic.

e) Micro-organism growth conditions.

f) Principles of GMO's.

Total No. of Questions : 5]

SEAT No. : ____

PC1407

[Total No. of Pages : 2

[6327]-217
T.Y. B.Sc. (Regular)
ENVIRONMENTAL SCIENCE
SEC-EVS-3511: Remote Sensing, GIS and Modeling
(2019 Pattern) (Semester - V) (352410)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three question from Question No.2 to Question No.5.***
3) ***Questions No. 2 to Questions No. 5 carry equal marks.***

Q1) Attempt any Five of the following.

a) What are satellites? **[1]**

b) What is GIS? **[1]**

c) Define the term Remote Sensing. **[1]**

d) Write the full form of EMR. **[1]**

e) Mention two types of statistical Distributions. **[1]**

f) What does Kurtosis Mean in statistics? **[1]**

Q2) Answer the following. **[6]**

a) What are the applications of Remote sensing in Land use planning, forest resources & Agriculture?

b) Enlist principles of Remote Sensing. **[4]**

Q3) Answer the following.

a) Discuss the Role & importance of GIS in Environmental studies. **[6]**

b) Explain Energy Response Mechanism with respected to Reflection & Absorption. **[4]**

P.T.O.

Q4) Answer the following.

a) "GIS, RS and Aerial photography are the integrated tools". Discuss in brief. **[6]**

b) Discuss about any two softwares related to GIS. **[4]**

Q5) Write a short notes on any Four of the following.

a) GPS survey in GIS **[2½]**

b) Aerial photography **[2½]**

c) Satellites & sensors **[2½]**

d) Disadvantages of Remote sensing **[2½]**

e) Applications of GIS in Geosciences. **[2½]**

f) Advantages of GIS **[2½]**

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Total No. of Questions : 5]

SEAT No. :

PC1408

[Total No. of Pages : 2

[6327]-218

T.Y. B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

SEC - EVS - 3512 : Soil Health Management

(2019 Pattern) (Semester - V) (352411)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q. No. 2. to Q. No. 5.***
3) ***Question No. 2 to Question No. 5 carry equal marks.***

Q1) Attempt any Five of the following : **[5]**

a) How nutrients affects plant growth?

b) What is purpose of vagitative barriers?

c) What is full form of IPNM?

d) Enlist important micro nutrient used to prepare soil Health card.

e) What cause leaf rust in plants.

f) What is purpose of water conservation Scheme.

Q2) Answer the following.

a) Why rain water harvesting is important in conservation of water? What are two types of Rain water Harvesting? Explain any one. **[6]**

b) What is pest? Give classification of plant Disease. **[4]**

P.T.O.

Q3) Answer the following.

a) What is Agroforestry? Why agroforestry is important in Environmental conservation? **[6]**

b) Give details about Integrated pest Managements. **[4]**

Q4) Answer the following.

a) Explain in detail mechanical measure used in conservation of soil. **[6]**

b) Why irrigation scheduling is important for water conservation? **[4]**

Q5) Write a short notes on any Four of the following. **[10]**

a) Calculation of Recommended dose of fertilizer.

b) Energy crop.

c) Perculation pond.

d) Importance of contour Trench.

e) Bio pesticides.

f) Essential plant Nutrients.

Total No. of Questions : 4]

SEAT No. : ____

PC-1409

[Total No. of Pages : 2

[6327]-219

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 501 : Study of Disaster

(2019 Pattern) (Semester - V) (35231)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) Define the following questions. **[5]**

a) Write the full form of NIDM.

b) Define Management.

c) What is a natural disaster?

d) What is a man-made disaster?

e) What is an easy definition of a tsunami?

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

a) Disaster

b) Recovery

c) Earthquake

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

a) What are the concepts of disaster?

b) State the role of National Institute of Disaster Management (NIDM).

c) What is the disaster management cycle?

P.T.O.

Q4) Answer in details (any one): **[10]**

a) What is the importance of an early warning system in the disaster management cycle?

b) Describe in detail The case study report on Kashmir Floods 2014.

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Total No. of Questions : 4]

SEAT No. :

PC-1410

[Total No. of Pages : 2

[6327]-220

T.Y. B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS - 502 : United Nations Organization Part - I

(2019 Pattern) (Semester - V) (35232)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) Define the following questions. **[5]**

a) Where is the headquarters of UNO?

b) What is the meaning of the General Assembly?

c) On which date the UN charter was signed?

d) International court of justice.

e) Who is the Secretary-General of the UN.

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

a) UN Chronicle

b) UN Charter

c) UDHR

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

a) Write about UN General Assembly (UNGA).

b) What is the role of the General Assembly?

c) State the role of the Security council.

P.T.O.

Q4) Answer in details (any one): **[10]**

a) Explain the Aims and Objectives of the General Assembly.

b) How does a new State or Government obtain recognition by the United Nations?

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Total No. of Questions : 4]

SEAT No. :

PC-1411

[Total No. of Pages : 2

[6327]-221
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS - 503 : International Relation Part - I
(2019 Pattern) (Semester - V) (35233)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates :

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

Q1) Define the following questions. **[5]**

a) What is bipolar two?

b) Write the types of realism in international relations.

c) Define Idealism.

d) What is radicalism in international relations?

e) What is International Relations?

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

a) Vietnam War

b) Multipolar

c) Unipolar

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

a) What is the significance of international relations?

b) What is the most important theory in international relations?

c) What is hegemony in international relations?

P.T.O.

Q4) Answer in details (any one): **[10]**

a) How many types of game theories are there? Explain in detail.

b) What is political theory in international studies?

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Total No. of Questions : 4]

SEAT No. :

PC1412

[Total No. of Pages :1

[6327]-222
T.Y.B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS-504 : Terrorism
(2019 Pattern) (Semester-V) (35234)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) Define Terrorism.

b) What are the types of terrorism?

c) What is National Security?

d) What are the solutions to terrorism?

e) What are the Problems of Naxalism-Maoism?

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

a) Religious Extremist Terrorism

b) Liberty and security of the person.

c) Terrorism as a threat to National Security

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

a) State the Economical Impact of Terrorism on National Development.

b) Explain the'Terrorism and other aspects of international law.

c) State the implications of terrorism to national development.

Q4) Answer in details (any one) **[10]**

a) Explain the right to life.

b) State the Impact of Terrorism on National Development.

Total No. of Questions : 4]

SEAT No. : [ ]

PC1413

[Total No. of Pages : 1

[6327]-223

T.Y. B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS - 505 : Research Methodology

(2019 Pattern) (Semester - V) (35235)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is methodology in a research?

b) What is research formulation?

c) Define Research problems.

d) Define Social research.

e) What is Scientific research?

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

a) Social research

b) Research Hypothesis

c) Research

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

a) Explain the Meaning and Concept of Research.

b) Write the five objectives of research?

c) State the Process of Problem Formulation.

Q4) Answer in details (any one) **[10]**

a) Describe in detail significance and characteristics of research.

b) Describe in detail variables in research?

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Total No. of Questions : 4]

SEAT No. :

PC1414

[Total No. of Pages : 2

[6327]-224

T.Y.B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS 506 (A) : Major Global Conflict - I

(2019 Pattern) (Semester - V) (35236 A)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) Who won World War I?

b) What was the main cause of the Afghanistan issue?

c) What is the question of Palestine?

d) What is the matter between Israel and Palestine?

e) Which countries fought in World War II?

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

a) The main cause of World War I.

b) Historical Background Israel Palestine.

c) Afghanistan Issue.

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

a) What are the major causes of global conflict?

b) State the Afghanistan Issue Brief historical account of wars.

c) What is the meaning of religious conflict?

Q4) Answer in details (any one) **[10]**

a) Describe the Kashmir Issue and write the Present Status of Issue.

b) Explain in detail Why is it important to avoid conflict?

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P.T.O.

Total No. of Questions : 4]

PC1414

[6327]-224

T.Y.B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS 506 (B) : Regional Security System - I

(2019 Pattern) (Semester - V) (35236 B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) Which country SAARC has the highest population?

b) Where is the headquarters of NATO situated?

c) What is the main purpose of NATO?

d) Why did Pakistan join CENTO?

e) When was ASEAN established?

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

a) WARSAW

b) SAARC

c) ASEAN

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

a) What is the role of the world Trade organization?

b) State the Structure of ASEAN.

c) Explain the Origin and Development.

Q4) Answer in details (any one) **[10]**

a) Is the WTO a success or failure?

b) Explain the Origin and Development of ASEAN.

Total No. of Questions : 4]

SEAT No. :

PC1415

[Total No. of Pages : 2

[6327]-225
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS-507 (A) : India's Maritime Security - I
(2019 Pattern) (Semester - V) (35237 A)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) Who protects the Indian Ocean?

b) What is the coast guard?

c) What are maritime boundaries?

d) Define an exclusive economic zone?

e) What is the maritime security code?

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

a) Indian Coast Guard

b) Coastal Boundaries

c) SEZ

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

a) What are the aims of maritime security?

b) Explain an introduction to the Naval Bases and Naval Commands.

c) State the strategic importance of India's Maritime Boundaries.

Q4) Answer in details (any one) **[10]**

a) Why is water security is a major issue in India?

b) Explain the maritime Threats to India's Security through External powers.

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P.T.O.

Total No. of Questions : 4]

PC1415

[6327]-225
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS-507 (B) : Peace and Conflict Studies - I
(2019 Pattern) (Semester - V) (35237 B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is the main aim of regionalism?

b) What is the Cold War?

c) Define Track I Diplomacy.

d) What is the real meaning of peace?

e) Define Conflict.

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

a) Post Cold War.

b) Nature and Forms of conflict

c) Regionalism

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

a) What do you mean by peace movement?

b) State the Confidence Building Measures.

c) What is the cold war in international relations?

Q4) Answer in details (any one) **[10]**

a) Describe the success of Disarmament and Arms Control in today's War Scenario.

b) What is the relationship between peace and conflicts?

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Total No. of Questions : 4]

SEAT No. : ____

PC1416

[Total No. of Pages : 2

[6327]-226
T.Y.B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS 508(A): Chhatrapati Shivaji Maharaj Military System
(2019 Pattern) (Semester - V) (35238A)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is Swarajya?

b) Who provided military training to Shivaji?

c) Who is the founder of Maratha Empire?

d) What is Hindvi swarajya?

e) Write the meaning of chhatrapati.

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

a) Dadoji Kondev

b) Chhatrapati Shivaji Maharaj

c) Adil Shahi

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

a) What was the military system of Shivaji?

b) Explain the Battle of Pratapgad.

c) Explain the Battle of Kolhapur.

Q4) Answer in detail. (any one) **[10]**

a) Explain in detail the Campaign of Mirza Raje Jay Singh and Treaty of Purandar.

b) Explain in detail the Political and Cultural State of Maharashtra during Chhatrapati Shivaji Maharaj' s time.

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P.T.O.

Total No. of Questions : 4]

PC1416

[6327]-226
T.Y.B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS 508(B): Chhatrapati Shivaji Maharaj As Strategic Thinker
(2019 Pattern) (Semester - V) (35238B)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is Forts?

b) Define Ship building.

c) Define Guerilla Leader.

d) What is foresight?

e) Define Organization.

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

a) Chatrapati Shivaji Maharaj

b) Strategic Thinker

c) Guerilla Leader

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

a) State the Structure of Maratha Army.

b) Explain the Ch. Shivaji as a Military Leader.

c) Explain the Leader of Guerrilla Warfare.

Q4) Answer in detail (any one) **[10]**

a) Explain in detail the Principles and Characteristics of Guerrilla Warfare.

b) Explain in detail about Ch. Shivaji the Father of the Indian Navy.

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Total No. of Questions : 4]

SEAT No. :

PC1417

[Total No. of Pages : 2

[6327]-227

T.Y.B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

35239A DS 509(A) : World Military History (1900 - 1945)

(2019 Pattern) (Semester-V)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is Peace?

b) Define World War.

c) Define Balkan War.

d) What is Conflict?

e) What is Aftermath of World War II.

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

a) Treaty of Versailles

b) World War II

c) The Rise of Hitler

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

a) Explain the Effect of World War I.

b) Explain the Effect of World War II.

c) Explain the Effect of the Cold war.

Q4) Answer in details (any one) **[10]**

a) Explain in detail the Short History of World War-II

b) Explain in detail theTechnology used in World War I.

P.T.O.

Total No. of Questions : 4]

PC1417

[6327]-227
T.Y.B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
35239B DS509(B) : India's Foreign Policy
(2019 Pattern) (Semester-V)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is Policy?
b) Define Foreign Policy.
c) Define India's Foreign Policy.
d) Define Neighborhood.
e) What is Diplomacy?

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

a) Foreign Policy
b) India's Foreign Policy
c) Look East Policy

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

a) Explain the Elements of Foreign Policy.
b) State the Meaning and Concept Foreign Policy.
c) What are the principles of foreign policy?

Q4) Answer in details (any one) **[10]**

a) Explain in detail the India's Neighborhood First Policy.
b) What are the main elements and approaches to the study of foreign policy?

Total No. of Questions : 4]

SEAT No. : ____

PC-1418

[Total No. of Pages : 2

[6327]-228
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS 510: Introduction to Human Rights and Duties
(2019 Pattern) (Semester - V) (352310)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) **Define the following questions:** **[5]**

a) Who is a hero for human rights?

b) Defme Values.

c) What is Justice?

d) Define Dignity.

e) What is Liberty?

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

a) Universal Declaration of Human Rights

b) Minorities

c) Women rights

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

a) What are human rights and duties?

b) State the Significance of Human Values.

c) Explain the Human Rights and Gender Issues.

P.T.O.

Q4) **Answer in details (any one):** **[10]**

a) What are some quotes about rights and freedom?

b) Explain in detail the Human Rights and Child Labour.

Total No. of Questions : 4]

SEAT No. : ____

PC-1419

[Total No. of Pages : 1

[6327]-229
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS : S 11 : Human Rights and UN
(2019 Pattern) (Semester - V) (352311)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

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

Q1) **Define the following questions.** **[5]**

a) What is Human Rights?

b) Do human rights cover all human needs?

c) Define preamble.

d) Define mission.

e) What is liberty?

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

a) Human Rights.

b) UN.

c) Liberty.

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

a) Who is responsible for protecting human rights?

b) Does human rights law apply to convicted terrorists?

c) Explain the Importance of the Universal Declaration of Human Rights.

Q4) **Answer in details (Any One):** **[10]**

a) Explain in detail the Freedom and equal dignity and rights of Human Rights.

b) Are civil rights and human rights the same?

Total No. of Questions : 5]

SEAT No. :

PC-1420

[Total No. of Pages : 2

[6327] - 230

T.Y. B.Sc (Vocational) (Biotechnology)

VBT-311: Animal & Plant Tissue Culture

(2019 Pattern) (Semester - V) (CBCS) (35571) (Paper - V)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Questions 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) Define animal Tissue culture.

b) Name one media commonly used in ATC.

c) Which indicator is used in Tissue culture media

d) Give role of cytokinins in plant Tissue culture.

e) Give full form of MCF-7 cell line.

f) How much % of CO_2 is required for cell growth.

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

i) Draw and explain various growth stages of cells in animal Tissue culture.

ii) Distinguish between Direct and indirect organogenesis.

iii) Comment on basic lab design required for ATC laboratory.

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

i) Explain in detail the process of Invitro fertilization.

ii) What are somaclonal variations. Give its applications.

P.T.O.

Q3) a) Solve any two of the following : **[6]**

i) Write a note on artificial seed production. Give its significance.

ii) Discuss any two physical methods of gene transfer

iii) Explain in detail Hairy root culture.

Q3) b) Answer any one of the following : **[4]**

i) What are common tissue culture contaminants How they are eradicated from culture.

ii) Comment on 'Evolution of cell line"

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

i) What is induction of somatic embryos. Give its significance.

ii) What are monoclonal antibodies. Give diagrammatic view for monoclonal antibody production.

iii) Comment on 'secondary metabolites'

Q4) b) Answer any one of the following : **[4]**

i) Discuss in detail how cell lines are characterized.

ii) Explain primary and secondary cultures with example

Q5) Write short notes on (any four) **[10]**

a) Hormones used in plant tissue culture

b) Rhizogenesis

c) Somaclonal variations

d) Organogenesis

e) Insulin production

Total No. of Questions : 5]

SEAT No. : ____

PC-1421

[Total No. of Pages : 2

[6327]-231
T.Y. B.Sc. (Vocational)
BIOTECHNOLOGY
VBt-312: Industrial Biotechnology(Paper - VI)
(CBCS) (2019 Pattern) (Semester - V) (35572)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Q2 to Q5 carry equal marks.***

Q1) **Solve any Five of the following:** **[5]**

a) What is White biotechnology?

b) Why is agitation necessary in a fermenter?

c) Define fermentation media.

d) In which phase of growth are secondary metabolites produced?

e) Name any one method used for measuring dissolved oxygen during fermentation process.

f) Give any one application of citric acid.

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

i) Define the terms-fermentation and industrial biotechnology. Give any two examples of bio-based products produced through industrial biotechnology.

ii) Distinguish between crude media and synthetic media.

iii) Describe primary metabolites with the help of suitable examples.

b) Give a generalized schematic presentation of a typical fermentation process. Add a note on the component parts of a fermentation process.**[4]**

OR

With the help of a well labelled diagram explain the working of air lift fermenter.

P.T.O.

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

i) Give the objectives of strain improvement.

ii) Write a short note on "sporulation an solid media" method of inoculum development of fungi.

iii) Enlist the examples of antifoaming agents. Add a note an important properties of antifoaming agents.

b) What is downstream processing? Explain any one step involved in downstream processing. **[4]**

OR

Describe secondary screening in detail.

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

i) Describe the process of production of vitamin B_{12} in detail.

ii) With the help of well labelled diagram, explain the parts of a typical fermenter.

b) Explain the working of galvanic electrode. Add a note on its advantages and disadvantages. **[4]**

OR

Give the applications of industrial biotechnology.

Q5) **Write short notes on any <u>Four</u> of the following:** **[10]**

a) Types of air-lift fermenters.

b) Flocculation step of downstream processing.

c) Role of chelators in fermentation media.

d) Types of beer.

e) Control of pH during fermentation process.

f) Objectives of inoculum development.

Total No. of Questions : 5]

SEAT No. :

PC-1422

[Total No. of Pages : 2

[6327] - 232

T.Y. B.Sc. (Vocational) (Seed Technology)

S.T. 3.1: Seed Pathology and Entomology

(2019 Pattern) (Semester - V) (CBCS) (35891) (Paper- V) (2 Credit)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Q. 1 is compulsory***
2) ***Solve any three questions from Q. 2 to Q. 5.***
3) ***Question 2 to 5 carry equal marks.***

Q1) Solve any five of the following : **[5]**

a) What are seed borne fungi?

b) Define Entomology

c) Give any two names of storage pests.

d) What is seedling symptom testing

e) Define seed health.

f) What is plant quarantine.

Q2) a) Explain the seed transmitted pathogens influence on seed production **[6]**

b) Comment on blotter paper technique with respect to seed health testing.**[4]**

Q3) a) Explain the mechanism of seed transmission. **[6]**

b) Give the importance of Seed testing? **[4]**

P.T.O.

Q4) a) Give difference between seed borne and storage fungi. **[6]**

b) What are seed borne pathogens **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Seed pathology

b) Structure of Seed storage

c) Characters of order Lepidoptera

d) Seed treatment

e) Common insect pest in cereals.

f) Incubation method.

Total No. of Questions : 5]

SEAT No. : ____

PC-1423

[Total No. of Pages : 2

[6327]-233
T.Y. B.Sc.
SEED TECHNOLOGY
ST 3.2: Entrepreneurship Development
(CBCS) (2019 Pattern) (Semester - V) (2 Credits) (35892)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Q2 to Q5 carry equal marks.***

Q1) **Solve any Five of the following:** **[5]**

a) Write full form of MIDC.

b) What is market segmentation.

c) Write types of loans.

d) Enlist sources of finance.

e) What is service Tax.

f) Write full form of SIDBI.

Q2) a) What is entrepreneurship development? Write ideas to start new business. **[6]**

b) What is marketing mix write its effects. **[4]**

Q3) a) Comment on Role of various funding agencies. **[6]**

b) Explain tools of Digital Marketing. **[4]**

Q4) a) Explain in detail different modes of employment. **[6]**

b) Write different opportunities for entrepreneurship. **[4]**

P.T.O.

Q5) **Write short notes on any Four of the following:** **[10]**

a) Scope in modern industry.

b) TDS act.

c) Commercial and Co-operative Bank.

d) Patent Rules.

e) Role of consultancy organization.

f) Factory Act.

Total No. of Questions : 5]

SEAT No. : ____

PC-1424

[Total No. of Pages : 2

[6327]-234
T.Y. B.Sc.(Vocational)
INDUSTRIAL MICROBIOLOGY
IMB-355: Applications of Microbial Systems
(CBCS) (2019 Pattern) (Semester - V) (35825)(Paper - V)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Q2 to Q5 carry equal marks.***

Q1) **Attempt any Five:** **[5]**

a) Name any two fermented milk products.

b) Define functional products of dairy.

c) Mention any one therapeutic application of dairy products.

d) What is health benefit of dairy product?

e) Give significance of cheese.

f) What is importance of whey?

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

i) Write a note on waste water characteristics.

ii) Describe physical methods of waste water treatment.

iii) Enlist chemical methods of waste water treatment.

b) Write note on Biological treatment of waste water. **[4]**

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

i) Describe tertiary waste water treatment methods.

ii) Write note on removal of ROC.

iii) Describe EIA.

b) Write note on ETP. **[4]**

P.T.O.

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

i) What are starter cultures.

ii) Give therapeutic importance of dairy products.

iii) Write note on nutritional aspects of dairy products.

b) Compare the terms probiotics and prebiotics. **[4]**

Q5) **Describe in short any <u>Four</u> of following.** **[10]**

a) Microbes in soil.

b) Nutritional recycling by microbes.

c) Agro-wastes.

d) Sustainble agriculture.

e) Biofertilizers.

f) Biofuels.

Total No. of Questions : 5]

SEAT No. :

PC-1425

[Total No. of Pages : 2

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T.Y. B.Sc.
IMB-356: Industrial Microbiology
CELL CULTURE TECHNOLOGY(Paper - VI)
(2019 Pattern) (CBCS) (Semester - V) (35826)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Q2 to Q5 questions carry equal marks.***

Q1) **Solve any Five :** **[5]**

a) What is Pronuclear microinjection?

b) State contribution of Alexis Carrel in ATC.

c) What is the role of CO_2 in ATC media?

d) What is ATCC?

e) State example of finite cell line.

f) Why is Glutamate added separately in ATC media?

Q2) **Solve any Two :** **[6]**

a) i) Enlist applications of stem cell technology.

ii) Give a brief account on Hollow Fibre reactor.

iii) What is Preimplantation Genetic diagnosis?

b) Describe different methods for disarggregation of animal cells from tissue. **[4]**

Q3) **Solve any Two :**

a) i) Write a short note on viral vaccine production. **[6]**

ii) What are adherent and suspension cell lines. Give examples.

iii) Write a short note on Febroblast cell line.

b) Give a brief account on characterization of cell lines. **[4]**

P.T.O.

Q4) **Solve any <u>Two</u> :**

a) i) Explain plasma clot technique for organ culture. **[6]**

ii) Give a brief account on 'HAT' medium used for mAb production.

iii) Differenciate between normal & transformed cell lines.

b) Explain the process of setting a primary culture form an organ explant.**[4]**

Q5) **Solve (Any Five):** **[2 × 5 = 10]**

a) Aseptic techniques followed in ATC laboratory.

b) Adult stem cells.

c) Nunc cell factory.

d) Extracellular matrix.

e) 'Venting' in ATC culture flask.

f) Bioartificial organs.

Total No. of Questions : 5]

SEAT No. : ____

PC1426

[Total No. of Pages : 2

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T.Y.B.Sc. (Regular)

INDUSTRIAL MICROBIOLOGY

IMB 3510 : Plant Tissue Culture

(2019 Pattern) (Semester - V) (Vocational Paper-V) (358210)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from question No. 2 to question No. 5.***
3) ***Question No. 2 to question No. 5 carry equal marks.***

Q1) Solve any five **[5]**

a) What are somatic embryo's?

b) What is importance of transgenic plants?

c) Who is considered father of PTC?

d) Draw the Ti plasmid

e) What are synseeds?

f) Which medium is used for PTC?

Q2) a) Solve any two **[6]**

i) What are edible vaccines? Explain with example.

ii) What is 'Hardening'? Justify it's importance.

iii) Write in brief - constituents of PTC media.

b) Write detailed protocol for setting - up a suspension cell culture. **[4]**

P.T.O.

Q3) a) Solve any two **[6]**

i) What are meristmatic cells? State importance.

ii) What are advantages of PTC Over conventional farming?

iii) Explain types of callus.

b) Explain the process of Agrobacterium tumifaciens mediated transformation. **[4]**

Q4) a) Solve any two **[6]**

i) Explain biolistic method for transformation of plant cells.

ii) Explain the concept behind Golden - rice.

iii) Enlist four limitations of PTC.

b) Give a detailed account on Haploid plants and their advantages. **[4]**

Q5) Solve any four **[10]**

a) Somatic embryo's

b) Plantibodies

c) Auxin and cytokinins in PTC media

d) Herbicide - resistant crops.

e) Aseptic techniques followed during setting up PTC.

f) Virus - free plants.

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