Total No. of Questions : 4]

SEAT No. : ____

PA-2205

[Total No. of Pages : 2

[5901]-301
T.Y. B.Sc
MATHEMATICS
MT 351 : Metric Spaces
(2019 Pattern) (Semester - V) (CBCS)

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) Does $d(x, y) = |\text{Sin}(x-y)|$, $\forall$ x, y $\in \mathbb{R}$ define a metric on $\mathbb{R}$? Justify.

b) Find the interior of following subsets of $\mathbb{R}$ with usual metric

i) Q

ii) $(0, 1) \cup (1,2)$

c) Let $A = \left\{ \frac{n}{n+1} / n \in N \right\}$ be a subset of $\mathbb{R}$ with usual metric. Find $\bar{A}$.

d) Let (X, d) be a metric space and A, B $\subset$ X. If A is closed and B is open, then show that A–B is closed.

e) Prove that metric space (X,d), where X = (0,1) and *d* is usual metric on X is not complete.

f) Give an example of closed and bounded subset in Q but not complete.

g) If A and B are any two dense subsets of ametric space X, then show that A$\cup$B is dense.

P.T.O.

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

i) Let (X, d) be a metric space, $x \in X$ and $r > 0$. Prove that the open ball $B(x, r)$ is open in X.

ii) Prove that the limit of a sequence in a metric space (X, d) is unique.

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

i) Let (X, d) be a metric space. Define

$$\delta(x,y) = \frac{d(x,y)}{1+d(x,y)} \quad \forall\ x, y \in X$$ Show that δ is a metric space.

ii) Let (x_n) and (y_n) be sequences in a metric space (X, d) such that $(x_n) \to x$ and $(y_n) \to y$. Then prove that $(d(x_n, y_n)) \to d(x, y)$.

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

i) Prove that identity function on metric space X is continuous.

ii) Let X, Y be metric spaces. Show that a map $f : X \to Y$ is continuous if for every closed set $V \subset Y$, its inverse image $f^{-1}(V)$ is closed in X.

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

i) Show that any two closed and bounded intervals in $\mathbb{R}$ are homeomorphic.

ii) Show that a compact subset of a metric space (X, d) is bounded.

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

i) Prove that any continuous function f from a compact metric space (X, d) to another metric space (Y, d) is bounded.

ii) Prove that a metric space (X, d) is connected if every continuous function $f : X \to \{\pm 1\}$ is a constant function.

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

i) Let A be a connected subset of a metric space (X, d) and $A \subset B \subset \overline{A}$. Then show that B is connected.

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

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Total No. of Questions : 4]

SEAT No. : ____

PA-2206

[Total No. of Pages : 2

[5901]-302
T.Y. B.Sc.
MATHEMATICS
DSE - 1B - MT 352 : Real Analysis - I
(2019 Pattern) (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) Express the following statement using quantifiers $\lim_{x \to a} f_{(x)} = l$.

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

c) Using definition of limit, prove that $\lim_{n \to \infty} \frac{1}{\sqrt{n+1}} = 0$.

d) Define $\lim_{n \to \infty}$ in f S_n.

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

f) Show that the series $\sum_{n=1}^{\infty} \frac{3n}{n+1}$ is divergent.

g) Define absolute convergence of series of real numbers.

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

i) If S is a countable set and R is a subset of S then prove that R is empty or R is finite or R is countable.

ii) Prove that the set of integers $\mathbb{Z}$ is countable.

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

i) Show that the set S of all sequences on $\{0,1\}$ is uncountable.

ii) If $f : A \to B$ and $A_1, A_2 \subseteq A$ then
Prove that $f(A_1 \cup A_2) = f(A_1) \cup f(A_2)$

P.T.O.

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

i) Define bounded sequence of real numbers. Prove that every convergent sequence is bounded.

ii) If $\{S_n\}_{n=1}^{\infty}$ is a sequence of real numbers which converges to L then prove that $\left\{S_n^2\right\}_{n=1}^{\infty}$ converges to L^2.

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

i) Let $S_1 = \sqrt{2}$ and $S_{n+1} = \sqrt{2} \cdot \sqrt{S_n}$ for $n \geq 2$.

Prove that $\{S_n\}_{n=1}^{\infty}$ is convergent.

ii) Suppose $\{S_n\}_{n=1}^{\infty}$ is a sequence of positive real numbers and $0 < x < 1$.

If $S_{n+1} < xS_n$, $n \in \mathbb{N}$ then prove that $\lim_{n\to\infty} S_n = 0$.

Q4) a) Attempt any <u>one</u> of the following : **[5]**

i) If $\sum_{n=1}^{\infty} a_n$ is a convergent series of real numbers then prove that $\lim_{n\to\infty} a_n = 0$.

ii) State and prove Minkowski inequality.

b) Attempt any <u>one</u> of the following : **[5]**

i) Show that the series $\sum_{n=1}^{\infty} \frac{1}{n}$ is divergent.

ii) Test the convergence of the following series

A) $\sum_{n=1}^{\infty} \frac{n^4}{n!}$ B) $\sum_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^{2n}}{e^n}$

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Total No. of Questions : 4]

SEAT No. : ____

PA-2207

[Total No. of Pages : 2

[5901]-303
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) Is $\mathbb{Z}_4$ isomorphic to Klein's 4-group? Justify.

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

c) Find all cosets of $<\overline{2}>$ in $\mathbb{Z}_6$.

d) Find all subgroups of $\mathbb{Z}_8$.

e) Define a maximal normal subgroup of a group.

f) Find the maximum possible order for an element of S_7.

g) Give an example of a simple group which is not cyclic group.

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

i) Let G be a group and let $a \in G$, then prove that $H = \{a^n / n \in \mathbb{Z}\}$ is a subgroup of G.

ii) Show that a non empty subset H of a group G is a subgroup of G if and only if $ab^{-1} \in H$, for all $a, b \in H$.

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

i) Let G be the set of all real numbers except - 1. That is $G = \mathbb{R} - \{-1\}$. Define * on G by a * b = a + b + ab. Show that <G, *> is a group.

ii) Show that $Z = \{a \in G / ax = xa \ \forall \ x \in G\}$ is a subgroup of group G.

P.T.O.

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

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

ii) Let $\phi : G \to G'$ be a group homomorphism. Show that ϕ is one - to - one if and only if $\ker \phi = \{e\}$.

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

i) Let H be a subgroup of $\mathbb{Z}_4 \times \mathbb{Z}_6$ generated by (0,1). List all elements of the factor group $\frac{\mathbb{Z}_4 \times \mathbb{Z}_6}{H}$. Also, find the order of (2,0) + H.

ii) Let $\phi : \mathbb{Z} \to \mathbb{Z}_{10}$ be a group homomorphism such that $\phi(1) = \overline{6}$

A) Find $\phi(18)$.

B) Find Ker ϕ.

C) To which group $\mathbb{Z}/\ker\phi$ is isomorphic.

Q4) a) Attempt any <u>one</u> of the following : **[5]**

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

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

B) $gHg^{-1} = H$ for all $g \in G$

C) $gH = Hg$ for all $g \in G$

ii) Show that M is a maximal normal subgroup of G if and only if G/M is simple.

b) Attempt any <u>one</u> of the following : **[5]**

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

ii) Let $\rho = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 8 & 2 & 6 & 3 & 7 & 4 & 5 & 1 \end{pmatrix} \in \delta_8$. Then

A) Express ρ as product of disjoint cycles.

B) Express ρ as product of transpositions.

C) Determine whether ρ is odd or even permutation.

D) Find inverse of ρ.

E) Find order of ρ.

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Total No. of Questions : 4]

SEAT No. : ____

PA-2208

[Total No. of Pages : 3

[5901]-304
T.Y. B.Sc.
MATHEMATICS
DSE - 2B - 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) Find general solution of $y'' + y = 0$.

b) Find the particular integral of $(D^2 - 2D^2 - 5D + 6)\, y = e^{3x}$.

c) Verify that $y_1 = e^{4x}$ and $y_2 = xe^{4x}$ are solutions of $y'' - 8y' + 16y = 0$.

d) Find singular points of Bessel's equation

$$x^2 y'' + xy' + (x^2 - V^2)\, y = 0$$

e) Find general solution of Euler Equation

$$6x^2 y'' + 5x\, y' - y = 0.$$

f) Rewrite the equation $y^{(4)} + y''' + 2y'' + y' + 2y = 0$ as a 4×4 first order system.

g) State the principle of superposition.

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

i) Prove that $\dfrac{1}{F(D)} xV(x) = x\dfrac{1}{F(D)} V(x) - \dfrac{F'(D)}{(F(D))^2} V(x).$

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) Solve $(D^2 - 4)\, y = x^2 e^{3x}$.

ii) Find a particular solution of

$$y'' - 2y' + y = 5 \cos 2x + 10 \sin 2x.$$

P.T.O.

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

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

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

ii) Show that the coefficients $\{a_n\}$ in any solution $y = \sum_{n=0}^{\infty} a_n (x - x_0)^n$ of $(1 + \alpha (x - x_0)^2)\,y'' + \beta (x - x_0)\,y' + \gamma\, y = 0$

Satisfy the recurrence relation.

$$a_{n+2} = \frac{-P(n)}{(n+2)(n+1)} a_n,\ n \geq 0$$

Where $P(n) = \alpha\, n\,(n-1) + \beta\, n + \gamma$.

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

i) Solve the initial value problem

$$y' = \begin{bmatrix} 2 & 4 \\ 4 & 2 \end{bmatrix} y,\ y(0) = \begin{bmatrix} 5 \\ -1 \end{bmatrix}$$

ii) Suppose $y = \sum_{n=0}^{\infty} a_n (x-1)^n$ on, an open interval I that contains $x_0 = 1$.

Express the function $(1 + x)\,y'' + 2(x-1)^2 y' + 3y$ as a power series in $(x - 1)$ on I.

Q4) a) Attempt any <u>one</u> of the following : **[5]**

i) Suppose n × n constant matrix A has n real eigen values $\lambda_1, \lambda_2, ..., \lambda_n$ with associated linearly independent eigen vectors $X_1, X_2, ..., X_n$. Then show that functions $Y_1 = X_1 e^{\lambda_1 t}$, $Y_2 = X_2 e^{\lambda_2 t}$, $.....Y_n = X_n e^{\lambda_n t}$ forms a fundamental set of solutions of Y' = AY.

ii) Show that the general solution of the Euler equation $ax^2y'' + bxy' + cy = 0$ on $(0, \infty)$ is $y = c_1 x^{r_1} + c_2 x^{r_2}$ where r_1, r_2 are distinct real roots of indicial equation $ar(r-1) + br + c = 0$.

b) Attempt any <u>one</u> of the following : **[5]**

i) Find the general solution of

$$y' = \begin{bmatrix} -3 & 2 & 2 \\ 2 & -3 & 2 \\ 2 & 2 & -3 \end{bmatrix} y .$$

ii) Compute a_0, a_1, a_2, a_3, a_4, a_5 in the series solution $y = \sum_{n-0}^{\infty} a_n x^n$ of the initial value problem.

$(1 + 2x^2)\, y'' + 10xy' + 8y = 0,\ y(0) = 2,\ y'(0) = -3.$

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Total No. of Questions : 4]

SEAT No. : ____

PA-2209

[Total No. of Pages : 4

[5901]-305
T.Y. B.Sc.
MATHEMATICS
DSE - 3A MT 355(A) : Operations Research
(2019 Pattern) (Semester - V) (33115A)

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 <u>five</u> of the following : **[5 × 1 = 5]**

a) Indentify the direction of decrease in z when minimize $z = -3x_1 + x_2$.

b) Define linear programming problem.

c) Write the following LPP in equation form.

Maximize $z = 3x_1 + 2x_2 + 4x_3$

Subject to $2x_1 - 3x_2 \leq 5$

$x_1 + 2x_2 + 3x_3 \leq 4$

$3x_1 + 2x_2 \leq 2$

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

d) Write the dual of following LPP.

Maximize $z = x_1 + x_2 + x_3$

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

$3x_1 + x_2 - x_3 \leq 2$

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

e) Explain, how assignment problem is a special case of transportation problem?

P.T.O.

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

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	1	3	5
O_2	4	2	5	9	5
O_3	3	2	4	7	2
Demand	2	4	3	1	

g) State, why following assignment problem is unbalanced?

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

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

i) A firm manufactures necklaces and bracelets. The combine number of necklaces and bracelets that it can be handling per day is at most 24. the bracelet takes 1 hour to make and necklace takes ½ an hour. The minimum number of hour available per day is 16. If the profit on the bracelet is Rs. 120 and the profit on the necklace is Rs. 150. Formulate this as an LPP.

ii) Solve the following LPP using graphical method.

Maxmize $z = 3x_1 + 5x_2$

subject to $x_1 + 2x_2 \leq 2000$

$x_1 + x_2 \leq 1500$

$x_2 \leq 600$

and $x_1, x_2 \geq 0$.

b) Attempt any <u>one</u> of the following : **[5]**

i) Solve the following LPP using simplex method.

Maximize $z = 5x_1 + 3x_2$

Subject to $3x_1 + 5x_2 \leq 15$

$6x_1 + 2x_2 \leq 24$

and $x_1, x_2 \geq 0$.

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

Wareshouse

		W_1	W_2	W_3	W_4	
	F_1	19	30	50	10	7
Factory	F_2	70	30	40	60	9
	F_3	40	8	70	20	18
Requirement		5	8	7	14	

Q3) a) Attempt any <u>one</u> of the following : **[5]**

i) Explain, how to convert maximization of transportation problem into minimization of trasportation problem with an example.

ii) Show that the following LPP has unbounded solution by simplex method.

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

$$\text{subject to } -3x_1 + 3x_2 \leq 9$$

$$-x_1 + 5x_2 \leq 3$$

$$\text{and } x_1, x_2 \geq 0.$$

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

i) Solve the dual of following problem, then find its optimal solution form the solution of the dual.

$$\text{Minimize } z = x_1 + \frac{1}{2} x_2$$

$$\text{subject to } 6x_1 - 2x_2 \geq 24$$

$$3x_1 + 2x_2 \geq 18$$

$$x_1 + 3x_2 \geq 12$$

$$\text{and } x_1, x_2, \geq 0$$

ii) Solve the following LPP using Big - M method.

Minimize $z = 2x_1 + 3x_2$

subject to $x_1 + x_2 \geq 5$

$x_1 + 2x_2 \geq 6$

and $x_1, x_2, \geq 0.$

Q4) a) Attempt any <u>one</u> of the following : **[5]**

i) Explain, how to solve restricted assignment problems.

ii) Obtain initial basic feasible solution (IBFS) for following transportation problem using matrix - minima method.

	D_1	D_2	D_3	D_4	Availability
O_1	23	27	16	18	30
O_2	12	17	20	51	40
O_3	22	28	12	32	53
Requirement	22	35	25	41	

b) Attempt any <u>one</u> of the following : **[5]**

i) Test the following solution of transportation problem for optionality. If not, find the optional solution.

1	(6) 2	3	4
4	3	(2) 2	(6) 0
(4) 0	(0) 2	(6) 2	1

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

	I	II	III	IV
A	2	10	9	7
B	15	4	14	8
C	13	14	16	11
D	4	15	13	9

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Total No. of Questions : 4]

SEAT No. : ____

PA-2210

[Total No. of Pages : 2

[5901]-306
T.Y. B.Sc.
MATHEMATICS
MT355(B): 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 the Cartesian equation of the curve.
$\gamma(t) = (e^t, t^2)$

b) State Frenet-serret equations.

c) Define curvature of a curve in $\mathbb{R}^3$.

d) Find the equation of the tangent plane of the surface $\sigma(u,v) = (u, v, u^2 - v^2)$ at point (1, 1, 0).

e) Find the first fundamental form of the surface
$\sigma(u,v) = (u, v, u^2 + v^2)$

f) Is $\gamma(t) = (t^2, t^4)$ a parametrisation of the parabola $y = x^2$?

g) Show that an open disc in the *xy*-plane is a surface.

P.T.O.

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

i) Prove that any reparametrisation of a regular curve is regular.

ii) Let γ be a unit speed curve in $\mathbb{R}^3$ with constant curvature and zero torsion then prove that γ is part of a circle.

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

i) Find the parametrisations of the level curve $y^2 - x^2 = 1$

ii) Compute the curvature of the curve

$\gamma(t) = (\cos^3 t, \sin^3 t)$.

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

i) State and prove isoperimetric inequality.

ii) Prove that evey convex simple closed curve in $\mathbb{R}^3$ has at least four vertices.

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

i) Find the equation of the tangent plane of the surface

$\sigma(r, \theta) = (r\cosh\theta, r\sinh\theta, r^2)$ at point (1, 0, 1).

ii) Show that the elipse

$\gamma(t) = (a\cos t, b\sin t)$

where a and b are positive constants, is a simple closed curve and compute the area of its interior.

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

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

ii) Prove that any tangent developable is isometric to part of a plane.

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

i) Show that the quadric

$x^2 + 2y^2 + 6x - 4y + 3z = 7$ is a smooth surface with an atlast consisting of the single surface patch.

ii) Show that every isometry is a conformal map. Give an example of conformal map that is not an isometry.

Total No. of Questions : 4]

SEAT No. : ____

PA-2211

[Total No. of Pages : 2

[5901]-307
T.Y. B.Sc.
MATHEMATICS
MT355(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 × 1 = 5]**

a) Define an identifiers and keywords.

b) Find the value of expression 5% 2 × 3 + 6 –4.

c) Write the syntax of any one loop structure in C-language.

d) What is difference between 'break' and 'continue' statement in C-language?

e) What is use of clrscr ( ) function?

f) Indicate what values are assigned to the individual array elements for char flag [5] = {'T', 'R', 'U', 'E'};

g) Determine which of the following numerical values are valid constants. 0.5, 018CDF.

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

i) Write a short note on types of operators.

ii) Explain do-while statement with an illustration.

P.T.O.

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

i) Write a C-Program to find g.c.d of two numbers.

ii) Write a C-Program to print the transpose of a matrix of order 3×3.

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

i) Explain the syntax and one illustration for each of the following.

1) Scanf

2) Printf

ii) Write a short note on switch statement.

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

i) What is recursion? Write a recursion function to find the value of x^n, where x is real and n is integer.

ii) Write a C-Program to calculate area of circle, when radius is 2.5 cm.

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

i) Write a short note on one dimensional array.

ii) Explain need and advantages of function.

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

i) Write a C-Program to calculate and print the value of $|x|$ without using absolute function.

ii) Write a C-Program to print the value of x for $f(x)$,

where $f(x) = x^3, x < 0$

$= 5, x = 0$

$= e^x, x > 0.$

Total No. of Questions : 4]

SEAT No. : ____

PA-2212

[Total No. of Pages : 2

[5901]-309

T.Y. B.Sc.

MATHEMATICS

DSE-3B: MT356(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) Prove that $(n, n + 2) = 1$ or 2, for any integer n.

b) If p is a prime and $a^2 \equiv b^2 (\text{mod} p)$, then show that either $p|(a + b)$ or $p|(a - b)$.

c) Prove that $[x + m] = [x] + m$, if m is any integer, and x is a real number.

d) Let p be an odd prime. Then prove that $\left(\frac{a}{p}\right)\left(\frac{b}{p}\right) = \left(\frac{ab}{p}\right)$.

e) Find $\sigma(12)$.

f) How many solutions are there for $15x \equiv 25 \pmod{35}$?

g) Is 3, 4, 5 a Pythagorean triple? Justify your answer.

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

i) Show that the set of primes is an infinite set.

ii) State and prove Euler's theorem.

P.T.O.

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

i) Prove that n^2-n is divisible by 2, n^3-n is divisible by 3 and that n^5-n is divisible by 30.

ii) Find smallest positive integer except 1, that satisfy simultaneously $x \equiv 1 \pmod 3$, $x \equiv 1 \pmod 5$, $x \equiv 1 \pmod 7$.

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

i) Let x and y be real numbers. Then prove that

1) $[x] + [y] \leq [x + y] \leq [x] + [y] + 1$.

2) $\left[\frac{[x]}{m}\right] = \left[\frac{x}{m}\right]$, if m is a positive integer.

ii) If Q is odd and Q > 0, then prove that $\left(\frac{-1}{Q}\right) = (-1)^{\left(\frac{Q-1}{2}\right)}$.

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

i) Evaluate $\left(\frac{-46}{17}\right)$.

ii) Show that $63! + 1 \equiv 0 \pmod{71}$.

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

i) State and prove Wilson's theorem.

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

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

i) Find all solutions of $10x - 7y = 17$.

ii) Let m be a positive integer. Show that, if $2^m - 1$ is a prime, then m is a prime.

Total No. of Questions : 4]

SEAT No. : ____

PA-2213

[Total No. of Pages : 2

[5901]-310

T.Y. B.Sc.

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 $L^{-1}\left\{\frac{1}{s^2+6s+18}\right\}$.

b) Find $L^{-1}\{\log(s+3)\}$.

c) Evaluate $\int_0^\infty e^{-t}\, t^5 dt$.

d) Find $L[\sin^2 t]$.

e) Evaluate $\int_0^\infty x^6\, e^{-x} dx$.

f) Give an example of unbounded function on $(0, \infty)$.

g) Evaluate $\int_{-\infty}^{\infty} x^3 \cos x\, dx$.

P.T.O.

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

i) Prove that $L[t^n] = \frac{n!}{s^{n+1}}$, where $s > 0$ & $n \in N$.

ii) If $L[F(t)] = F(s)$, then prove that $L[t^n F(t)] = (-1)^n \frac{d^n}{ds^n}(F(s)$, Where $s \in N$.

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

i) Evaluate $\int_0^\infty \frac{\sin t}{t} dt$.

ii) Find $L[e^{-3t}(2 \sin 5t - 3 \cos 5t)]$.

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

i) If $L^{-1}\{F(s)\} = F(t)$, then prove that $L^{-1}\{F(s-a)\} = e^{at} L^{-1}\{F(s)\}$.

ii) State and prove the convolution theorem.

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

i) Find $L^{-1}\left\{\frac{3s^2}{s^3 - 8}\right\}$.

ii) Find $L^{-1}\left\{\frac{1}{s(s-2)^3}\right\}$.

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

i) Obtain the Fourier series for $F(x) = x, -\pi \le x \le \pi$.

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

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

i) Solve $y'' - a^2 y = F(t)$.

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

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Total No. of Questions : 5]

SEAT No. : ____

PA-2214

[Total No. of Pages : 2

[5901]-311

T.Y. B.Sc.

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) ***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) Define orthogonal co-ordinate system.

b) Define proper time.

c) Write the expression of gradient operator in cartesian co-ordinate system.

d) Define regular singular point of ordinary differential equation.

e) What is special function?

f) Define inertial frame of reference.

Q2) Answer the following :

a) Solve Legendre differential equation $(1-x^2)y'' - 2xy' + l(l+1) = 0$, ($l$ = constant) around an ordinary point $x = 0$ using Frobenius method. Solve the differential equation for $k = 0$ and a1 = 0. **[6]**

b) Derive an expression of length contraction using Lorentz transformation equation. **[4]**

P.T.O.

Q3) Answer the following :

a) i) Express the curl operator in spherical polar co-ordinate system. **[6]**

ii) Find the scale factors of cylindrical co-ordinate system.

b) Prove that $(n+1)P_{n+1}(x) = (2n+1)x\ P_n(x) - nP_{n-1}(x)$. **[4]**

Q4) Answer the following :

a) Explain Michelson-Morley experiment with *s*. **[6]**

b) Find first three Hermite polynomials using generating function. **[4]**

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

a) Explain parity function.

b) Find order, degree and check linearity of given dfferential equation

$$\frac{d^2y}{dx^2} + \sqrt{\frac{dy}{dx}} + y = 0.$$

c) Discuss the negative result of Michelson Morley experiment.

d) Explain partial differential equation with examples.

e) Write the transformation equation between cylindrical co-ordinate and cartesian co-ordinate system. Draw the cylindrical co-ordinates XYZ-system.

f) Explain volume element in orthogonal co-ordinate system.

Total No. of Questions : 5]

SEAT No. : ____

PA-2215

[Total No. of Pages : 2

[5901]-312
T.Y. B.Sc.
PHYSICS (Paper - II)
PHY-352 : Electrodynamics
(2019 Pattern) (Semester - V) (35122)

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) ***Figures to the right indicate full marks.***
5) ***Use of log table and calculator is allowed.***

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

a) What is Polar molecule?

b) State Biot - Savart's Law.

c) What is Poynting vector?

d) Write any two Maxwell's equations in differential form in free space.

e) Find the Electric Intensity at a point situated at a distance of 10 cm from point charge $q = 1.6 \times 10^{-12}$C.

f) An electric dipole consisting of two opposite charges +2μc and –2μc are separated by a distance of 2 mm. Calculate the dipole moment.

Q2) Answer the following :

a) Define electric vectors $\vec{D}, \vec{E}$ and $\vec{P}$. Obtain the relation between them. **[6]**

b) State Ampere's circuital law. Obtain the relation. **[4]**

$$\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$$

P.T.O.

Q3) Answer the following :

a) State Faraday's Law of electromagnetic induction and prove that **[6]**

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$

b) Two long parallel conducting wires seperated by distance 20 cm in air carry current of 8A. Find the force on one meter length of wire. **[4]**

Q4) Answer the following :

a) State and prove Poynting's theorem. **[6]**

b) Find the magnitude of polarization $\vec{P}$ in a homogeneous and isotropic dielectric material with K = 3, if D = 3×10^{-7} C/m^2. **[4]**

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

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

b) What are advantages of Gauss's Law over Coulomb's Law?

c) Distinguish between paramagnetic and diamagnetic materials.

d) What do you mean by displacement current?

e) Write a note on Magnetic susceptibility.

f) What do you mean by uniform plane electromagnetic wave?

Total No. of Questions : 5]

SEAT No. : ____

PA-2216

[Total No. of Pages : 2

[5901]-313
T.Y. B.Sc. PHYSICS
PHY-353 Classical Mechanics
(2019 Pattern) (Semester - V) (Paper - III) (35123)

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) ***Que - 2 to Que - 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculators and log table is allowed.***

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

a) State nature of path described by charged particle moving in constant electric Field perpendicular to the direction of motion.

b) State any two examples of central force.

c) What do you mean by Laboratory frame or Lab frame.

d) Give any one advantage of lograngian formulation over newtonian apporach.

e) Calculate force require to produce acceleration of $2m/s^2$ on mass of 2 kg.

f) A charged particle having charge 2×10^{-9} C enters in the magnetic field of induction 4×10^{-4} T with velocity $3\times10^{4} m/s$ an angle of 30^0 with field. Find Force acting on the Particle.

Q2) **Answer the following** :

a) Obtain an expression for the path described by charged particle moving in uniform electric field parallel to direction of electric field. **[6]**

OR

a) Derive differential equation of orbit in central force motion **[6]**

b) State and Prove Kepler's third law of planetory motion **[4]**

P.T.O.

Q3) **Answer the following** :

a) What is meant by holonomic and Non - holonomic constraints. Give two examples of each. **[6]**

OR

a) Show that scattering angles θ and θ' in Lab system and C.M. system is related by equation $\tan\theta = \dfrac{\sin\theta'}{\frac{m1}{m2} + \cos\theta'}$ **[6]**

d) Show that the gravitational force between two masses m_1 and m_2 separated by distance r is a conservative force. **[4]**

Q4) **Answer the following** :

a) Prove that for Artificial satellite square of period of satellite is proportional to the cube of the radius of orbit. **[6]**

OR

a) Explain Advantages of Lagrangian formulation. **[6]**

d) Two bodies of masses 5 gm and 10 gm have position vectors $\vec{2i} + \vec{3j} - \vec{k}$ and $\vec{i} - \vec{j} + \vec{2k}$ respectively. Find the position vector and distance of centre of mass from the origin. **[4]**

Q5) **Write a short note on any Four of the following** : **[4 × 2½ = 10]**

a) Cyclic Co-ordinate

b) Degree of Freedom

c) Elastic Scattering

d) Geosynchronous and Geostationary orbit.

e) Centre of mass.

Total No. of Questions : 5]

SEAT No. : ____

PA-2217

[Total No. of Pages : 2

[5901]-314

T.Y. B.Sc. (Semester - V)

PHYSICS

PHY - 354 : Atomic and Molecular Physics

(2019 Pattern) (CBCS) (Paper - IV) (35124)

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

Instructions to the candidates :

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Que.2 to Que. 5.***
3) ***Que.2 to Que.5 carries equal marks.***
4) ***Figures to right indicate full marks.***
5) ***Use of calculator and logtable is allowed.***

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

a) What is quantum state of an election?

b) Write the spectral series in hydrogen atom.

c) Define Normal Zeeman effect.

d) What is reduced mass of a system?

e) Define Raman effect.

f) What are the possible values of ml for $l = 3$?

Q2) Attempt the following questions.

a) With neat diagram explain four spectral series in Sodium. **[6]**

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

Q3) Attempt the following questions.

a) Explain selection rules in Spectroscopy. **[6]**

b) Find singlet and triplet terms for p-p electron configuration. **[4]**

P.T.O.

Q4) Attempt the following questions.

a) Obtain an expression for rotational energy levels of rigid diatomic molecule. **[6]**

b) Determine the normal Zeeman effect of cadmium red line of 6438 Å, when the atoms are placed in a magnetic field of 0.009 T. **[4]**

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

a) Explain the term multiplicity with examples.

b) Explain Bohr's second postulate in detail.

c) What are Longitudinal and transverse Zeeman effect?

d) Explain the term molecular polarizability & state its SI unit.

e) Explain Frank and Condon principle.

f) What is Molecular Spectra? Write three types of Molecular Spectra.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2218

[Total No. of Pages : 2

[5901]-315
T.Y. B.Sc. (Semester - V)
PHYSICS
PHY - 355 : Computational Physics
(2019 Pattern) (35125)

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 the right indicate full marks.***
5) ***Use of calculator and logtable is allowed.***

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

a) Define array.

b) Write syntax of scant function.

c) Why C language is known as middle level language?

d) State advantages of flowchart.

e) What is the function of closegraph( )?

f) Give the use of return statement.

Q2) Answer the following questions.

a) State the different types of operators used in C language. Explain any two types with the suitable example. **[6]**

b) Explain switch statement. **[4]**

Q3) Answer the following questions.

a) Explain while loop with example. State the difference between while and do while loop. **[6]**

b) Describe how actual arguments pass the information to function. **[4]**

P.T.O.

Q4) Answer the following questions.

a) Find the smallest root of the equation $x^3 - 5x + 3 = 0$ using Newton Raphson method. Using 4 iterations. **[6]**

b) Write a C program to calculate the sum of first 10 digits [1 to 10]. **[4]**

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

a) What will be the output of following C program,

```
# include <stdio'b>
main ( )
   {
      char c;
      printf(" Enter any one character = ");
      c = getchar ( );
      printf("the character you have entered is =");
      putchar C( );
   }
```

b) Write a short note on Keywords.

c) Give syntax of circle, ellipse, are, bar.

d) Explain if - else statement.

e) Evaluate the integral $\int_{4}^{5.2} \ln x \, dx, n = 6$ using Trapezoidal rule.

f) Explain pointers with suitable example.

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Total No. of Questions : 5]

SEAT No. :

PA-2219

[Total No. of Pages : 2

[5901]-316

T.Y.B.Sc. (PHYSICS)

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

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

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 Q.2 to Q.5 carry equal marks (10 each)***
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 transit?

b) A star located at 1 parsec distance shows an apparent brightness of B unit. What will its apparent brightness from 1 light year?

c) What is Gravitational Red shift?

d) What is Interferometry?

e) Write important properties of RR lyrae stass.

f) An escape velocity of a star is u. What will be its new escape velocity if it's radius is doubled?

Q2) Solve the following questions.

a) What is CCD?
Explain it's construction and working (with suitable diagram)
What are advantages and disadvantages of CCD? **[6]**

b) A planet is revolving around a star.
The orbit of revolution is circle of radius R and period T.
What will happen to T if
i) Size of a star is decreased by 50%
ii) R becomes 9R. **[4]**

P.T.O.

Q3) Solve the following questions :

a) Write a note on :-
'Big Bang and its evidences' **[6]**

b) Explain the concepts of Apparent magnitude and absolute magnitude. Show approximate positions of the sun, the moon, venus on scale of apparent magnitude. **[4]**

Q4) Solve the following questions :

a) What is degeneracy pressure? How it decides the end of star? **[6]**

b) Describe construction and working of radio telescopes. **[4]**

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

a) Short Note : Dark matter.

b) Short Note : Celestial Hemisphere.

c) Spectral classification of stars. (Short note)

d) Milky way Galaxy. (Short note)

e) Pulsars. (Short note)

f) Short note : Transits and occultations.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2220

[Total No. of Pages :2

[5901]-317
T.Y. B.Sc.
PHYSICS
PHY - 356 (B) : ELEMENT OF MATERIAL SCIENCE
(2019 Pattern) (Semester - V) (Paper - VI) (35126B)

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-tables is allowed.***

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

a) What is solid solution?

b) Give any two properties of single phase alloy.

c) What are hard ferrite?

d) State lever rule.

e) What is elastic strain in material rod if it is stressed at 60 Mpa and modulus of elasticity is 10×10^5 Mpa?

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 questions. **[6]**

i) Write short note on smart material. **[3]**

ii) Explain with diagram Lens type Cu - Ni phase diagram. **[3]**

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

b) What is the rules for interstial solid solution. **[4]**

P.T.O.

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

i) Explain any three thermal properties of materials. **[3]**

ii) Explain semi conducting properties of ceramics. **[3]**

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

b) Calculate thermal stress for polymer change the dimension due to change in temperature 400 K, Young's modulus is 2.3×10^{-12} N/m^2, and linear coefficient of thermal expansion for polymer is $120 \times 10^{-6}\,{}^{o}C^{-1}$. **[4]**

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

i) Draw and explain in brief the phase diagram of NaCl and water. **[3]**

ii) What is Ax- type ceramic crystal structure. **[3]**

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

b) Find out critical resolved shear stress for crystal slips on the plane (111) and in the direction (110) with 500 psi. Stress is applied in the direction (1 –11) plane. **[4]**

Q5) Attempt any <u>four</u> of the following: **[10]**

a) State different types of smart material.

b) Define phase and explain phase equilibrium.

c) What are ceramic phases?

d) What are the influencing factor in polycrystalline material?

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

f) Define the term creep and fatigue.

Total No. of Questions : 5]

SEAT No. :

PA-2221

[Total No. of Pages : 2

[5901]-318

T.Y. B.Sc. (Physics)

PHY-356(C) : Biophysics

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

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

Instructions to the candidates:

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

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

a) Define Resting potential.

b) State the principle of colorimeter.

c) Define viscosity.

d) Define cardiac output of an ECG.

e) State the principle of SEM.

f) Define Diffusion.

Q2) Answer the following :

a) Describe in detail the construction and working of Nuclear magnetic Resonance. **[6]**

b) Describe in detail the construction and working of spectrophotometer. **[4]**

Q3) Answer the following :

a) Describe in detail ECG with suitable block diagram. **[6]**

b) Describe in detail primary structure of protein with suitable example. **[4]**

P.T.O.

Q4) Answer the following :

a) What do you mean by Genetic code symmetry. Describe in detail DNA structure with suitable examples. **[6]**

b) The distance between two consecutive R waves is 30 mm and the paper speed is 50 mm/sec. What is the heart rate? **[4]**

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

a) What do you mean by radioimmunoassays?

b) What is mitochondria?

c) What is Resting potential?

d) What do you mean by half cell potential?

e) What do you mean by Gibb's free energy?

f) What is polarizable electrodes?

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Total No. of Questions : 5]

SEAT No. :

PA-2222

[Total No. of Pages : 2

[5901]-319

T.Y. B.Sc.

PHYSICS

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

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

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Que. 2 to Que. 5.***
3) ***Que. 2 to Que. 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 are conventional energy sources?

b) What is the principle of solar dryer?

c) State different type of solar cells.

d) What is solar module?

e) What are the importance of energy storage?

f) Give limitations of concentrating collectors.

Q2) Answer the following questions :

a) Describe the construction and working of liquid Flat Plate Collector (FPC). **[6]**

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

P.T.O.

Q3) Answer the following questions :

a) Explain the photovoltanic principle. Describe a basic photovoltanic system for power generation. **[6]**

b) Explain how energy is stored in Battery. **[4]**

Q4) Answer the following questions :

a) Discuss environmental degradation due to use of conventional energy. **[6]**

b) Explain various applications of solar cells. **[4]**

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

a) Super capacitors.

b) P-i-n-solar cell.

c) Selective coating.

d) Heat Insolation.

e) Tidal energy.

f) Solar pond.

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Total No. of Questions : 5]

SEAT No. :

PA-2223

[Total No. of Pages : 2

[5901]-320

T.Y. B.Sc. (Physics)

PHY-356(E) : Applied optics

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

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three from Q. 2 to 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 any five of the following : **[5]**

a) Define Malus law.

b) What is numerical aperture?

c) Define cardinal points of system of co-axial lens.

d) Define translation matrix of optical system.

e) Define quarter wave 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) Calculate the acceptance angle for an optical fibre whose core refractive index is 1.48 and cladding refractive index is 1.39. **[4]**

P.T.O.

Q3) Answer the following questions :

a) Explain What is step index, graded index, single mode and multimode fibre in fibre optics. **[6]**

b) Calculate the specific rotation which rotates plane of polarization 15.2º in 20% sugar solution of 25 cm length. **[4]**

Q4) Answer the following questions :

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

b) Describe fraunhofer diffraction by narrow slit illuminated by parallel beam of light. **[4]**

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

a) Define and explain total internal reflection.

b) Explain the diffraction term in detail with diagram.

c) Explain angle of minimum deviation and angle of incidance relation.

d) What is power of a lens? Obtain it for mirror, convex lens and concave lens.

e) What are sign convensions followed for lens system?

f) Define and explain Dispersive power and it's unit.

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Total No. of Questions : 5]

SEAT No. :

PA-2224

[Total No. of Pages : 2

[5901]-321

T.Y. B.Sc.

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 Que. 2 to Que. 5.***
3) ***Que. 2 to Que. 5 carry equal marks.***

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

a) Explain in short NET CLRJIT performance counters.

b) What is an object in C #?

c) What is Boxing and Unboxing in C #?

d) What is the difference between interface and Abstract class in C #?

e) When C Integer ( ) function can be used?

f) What is the size of a decimal?

Q2) Answer the following :

a) What is Dot Net frame work? **[6]**

b) What is CLR? **[4]**

Q3) Answer the following :

a) What is SQL? **[6]**

b) What is Name space? **[4]**

P.T.O.

Q4) Answer the following :

a) What are the different types of polymorphism? **[6]**

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

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

a) What is the output of printf("%d")?

b) What do you mean by keyword?

c) Define structure of program in C #.

d) Specify different operators used in C #.

e) What is ADO.NET.

f) What RDBMS?

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Total No. of Questions : 5]

SEAT No. : ____

PA-2225

[Total No. of Pages : 2

[5901]-322
T.Y. B.Sc.
PHYSICS
PHY - 356(G) : ACOUSTICS - I
(2019 Pattern) (Semester - V) (Paper - VI) (35126G)

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-tables is allowed.***

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

a) Define intensity level and sound pressure level.

b) What do you mean by free field?

c) What is meant by dead room?

d) Find T_{60} for an office which has a volume of 1800 m^3 and a total sound absorption of 150 metric sabine.

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

f) Define reverberation time.

g) Define quality factor in case of Helmholtz Resonator.

Q2) Answer the following questions :

a) Discuss the effect of density, thickness and airspace on sound absorption using corresponding curves. **[6]**

b) Write a note on acoustic standards and reference conditions. **[4]**

P.T.O.

Q3) Answer the following questions :

a) Give expression for T.L. (Transmission Loss) in case of expansion chamber muffler. Give significance of each of the quantities in the expression. **[6]**

b) Write a note on Musical Instruments Digital Interface (MIDI). **[4]**

Q4) Answer the following questions :

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

b) The interior surfaces of an auditorium 200 × 50 × 30 ft have an average sound absorption coefficient of 0.25. What is the reverberation time of the auditorium? **[4]**

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

a) Audiometry.

b) Pros and Cons of headphones.

c) Pitch and timbre.

d) Mechanism of hearing

e) Decibel scales.

f) Anechoic chamber.

Total No. of Questions : 5]

SEAT No. : ____

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[Total No. of Pages : 2

[5901]-323

T.Y. B.Sc.

PHYSICS

PHY-3510 (H) : Python Programming

(2019 Pattern) (Semester - V) (351210H)

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

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any three questions from Que.2 to Que.5.***
3) ***Que.2 to Que. 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 are the features of python?

b) Which are data types in python?

c) Which are the different conditional statements?

d) What is string slice?

e) What are the different types of function?

f) Define seaborn.

Q2) Answer the following questions:

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

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

Q3) Answer the following questions:

a) Explain determine module with an example. **[6]**

b) What are the advantages of using Matplotlib library? **[4]**

P.T.O.

Q4) Answer the following questions:

a) Write python program to find the sum of first 100 natural 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) Program structure of python programming.

b) Basic tuple operations.

c) Features of Pandas in python.

d) Sys module.

e) Numpy

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

Total No. of Questions : 5]

SEAT No. : ____

PA-2227

[Total No. of Pages : 2

[5901]-324
T.Y. B.Sc.
PHYSICS
PHY-3510 (I) : ENERGY STUDIES (Skill Enhancement Course)
(2019 Pattern) (Semester - V) (351210 I)

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) ***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 fuel cell?

b) Write principle of solar dryer?

c) Write any two limitations to photovoltaic efficiency.

d) What is wind energy?

e) What is biomass?

f) Calculate energy of photon if wavelength of photon is 1000nm.

Q2) Solve the following questions.

a) Explain principle and working of biogas plant with suitable diagram. **[6]**

b) Calculate the Input power of solar cell using following data: **[4]**
I_{SC} = 600mA, Voc = 4V, Fill factor = 0.5 and efficiency of solar cell η = 15%

Q3) Solve the following questions.

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

i) Draw schematic diagram and explain electrical vehicles.

ii) Discuss advantages and disadvantages of solar photovoltaic system.

b) What is energy audit? Explain it. **[4]**

P.T.O.

Q4) Solve the following questions.

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

i) Explain energy storage device : Supercapacitor.

ii) Explain construction and working of liquid flat plate collector with suitable diagram.

b) Explain basic photovoltaic system for power generation with suitable diagram. **[4]**

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

a) Sun is a Giant nuclear reactor. Comment on it.

b) Discuss different sources of energy which are helpful in protecting the environment.

c) Explain inverter.

d) What are the methods for obtaining energy from biomass?

e) Write applications of solar photovoltaic system.

f) Explain vertical axis wind machine.

Total No. of Questions : 5]

SEAT No. : ____

PA-2228

[Total No. of Pages : 2

[5901]-325

T.Y. B.Sc.

PHYSICS

PHY 3510 (J) : INTRODUCTION TO ARDUINO

(2019 Pattern) (Semester - V) (351210J)

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

Instructions to the candidates:

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

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

a) What is Arduino?

b) What language is the Arduino IDE built on?

c) What is Microcontroller used in Arduino UNO?

d) What is stable version of Arduino software?

e) Who is developer of Arduino?

f) Which functions are contained in Arduino IDE?

Q2) Answer the following.

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

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

Q3) Answer the following.

a) What is difference between microcontroller and microprocessor? **[6]**

b) What is function of SPI? **[4]**

P.T.O.

Q4) Answer the following.

a) What is difference between analog and digital pins of Arduino? **[6]**

OR

What is structure of Arduino program?

b) Explain arithmatic, logical and relational; modulo and assignment operators? **[4]**

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

a) Describe void, int, char.

b) Explain digital write () function.

c) Explain pin mode () function.

d) Write a program to blink LED on Arduino.

e) Explain serial communication using Arduino.

f) What is function? Write advantages of functions.

Total No. of Questions : 5]

SEAT No. : ____

PA-2229

[Total No. of Pages : 2

[5901]-326
T.Y. B.Sc.
PHYSICS
PHY-3510 (K) : Sensors and Transdusors
(Skill Enhancement Course-I)
(2019 Pattern) (Semester - V) (351210K)

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

Instructions to the candidates:

1) ***Que. 1 is compulsory.***
2) ***Solve any three questions from Que.2 to Que.5.***
3) ***Que.2 to Que.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 strain gauge?

b) What is mean by gauge factor?

c) Why are capacitive sensors important?

d) What is the principle of capacitive transducer?

e) State the principle of liquid-in-glass thermometer (LIG)?

f) State any two applications of bimetallic thermometers.

Q2) Answer the following questions:

a) Describe strain gauge transducer. **[6]**

b) State advantages and disadvantages of variable capacitance devices. **[4]**

Q3) Answer the following questions.

a) Explain Helix strip bimetallic thermometer. **[6]**

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

P.T.O.

Q4) Answer the following questions:

a) What type of capacitive sensors are used in pressure transmitters? Explain it's operation with appropriate diagram. **[6]**

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

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

a) LVDT

b) Material expansion type sensors.

c) Applications of capacitive sensors.

d) RTD material.

e) Working principle of variable capacitance transducer.

Total No. Of Questions : 5]

SEAT No. : ____

PA-2230

[Total No. Of Pages : 2

[5901]-327
T.Y.B.Sc. (Physics)
PHY-3511(L) : PHYSICS WORKSHOP SKILL
(2019 Pattern) (Semester-V) (Skill Enhancement Course-II)
(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) ***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 <u>any Five</u> of the following** : **[5]**

a) Define loading effect.

b) Write advantages of digital meter over analog meter.

c) A voltage has a true value of 1.50 V. An analog indicating instrument with scale range of 0-2.50 V shows a voltage of 1.46v. What is the value of absolute error?

d) What is peak voltage of 230 volts RMS mains A.C. voltage in CRO?

e) What is signal generator? Write different types of signal generator.

f) Write significance of electronic voltmeter.

Q2) **Answer the following questions:**

a) Discuss construction and working of cathode ray tube with labeled diagram. **[6]**

b) Write a principle and construction of voltmeter. **[4]**

P.T.O.

Q3) **Answer the following questions:**

a) A sinusoidal input signal that occupies 8 vertical division and 5 horizontal division on CRO screen to complete one cycle. If controls on the CRO are set at 0.5 V/div and 2 ms/div. Find the RMS Voltage, time period and freqency of the input signal. **[6]**

b) Explain any two different types of errors in measurement. **[4]**

Q4) **Answer the following questions:**

a) With help of neat labeled block diagram discuss principle and working of digital oscilloscope. **[6]**

b) Write principles of measurement of DC voltage and DC current, AC voltage and AC current. **[4]**

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

a) Digital meter

b) Function generator

c) Q - meter

d) AC millivoltmeter.

e) Dual trace oscilloscope.

Total No. Of Questions : 5]

SEAT No. :

PA-2231

[Total No. Of Pages : 2

[5901]-328

T.Y.B.Sc. (Physics)

PHY-3511(M) : BIOMEDICAL INSTRUMENTATION

(2019 Pattern) (CBCS) (Semester-V) (Skill Enhancement Course II)

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 of calculators and log-table is allowed.***

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

a) What are the different types of Bioelectric signals.

b) What is pulse oximetry?

c) What is Transducer?

d) Define artifacts.

e) What are the different types of electrodes used for ECG recording?

f) What is diastolic pressure?

Q2) **Answer the following:**

a) Describe in detail the block diagram of an ECG with suitable examples. **[6]**

b) Describe in detail the direct blood pressure measurements with suitable examples. **[4]**

P.T.O.

Q3) **Answer the following :**

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

b) Describe pressure transducer for blood pressure measurement. **[4]**

Q4) **Answer the following :**

a) State resting potential. Describe in detail resting potential with suitable diagram. **[6]**

b) The distance between two consecutive R wave is 30 mm and the paper speed is 50 mm/sec. What is the heart rate? **[4]**

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

a) How to interprete the electrocardiogram.

b) What do you mean by phonocardiography.

c) What do you mean by Biosensors.

d) What are the different types of ECG leads.

e) Write a short note on "ECG Recorders"

f) Write a short note on " Action Potential".

Total No. Of Questions : 5]

SEAT No. : ____

PA-2232

[Total No. Of Pages : 2

[5901]-329
T.Y.B.Sc.
PHYSICS
PHY-3511(N) : Non-destructive Testing Techniques
(2019 Pattern) (Semester-V) (351211N)
(Skill enhancement Course II)

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 of calculators and log-table is allowed.***

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

a) What are it's objectives of NDT?

b) Give any two applications of visual inspection method.

c) What are the limitations of water suspendable developer?

d) Give the principle of liquid penetrant method.

e) State the principle of magnetic resonance imaging.

f) What are the stages of eddy current testing technique?

Q2) **Attempt the following questions:**

a) State the principle of acoustic emission testing technique. Explain the various stages in acoustic emission testing method. **[6]**

b) Explain in brief Helium leak testing method. **[4]**

P.T.O.

Q3) **Answer the following questions:**

a) Explain method of NDT with Portable Electromagnetic Yokes. **[6]**

b) Explain How X-ray is useful for non-destructive testing in the field of medicine. **[4]**

Q4) **Answer the following questions:**

a) Explain How MRI is useful in the field medicine. **[6]**

b) Explain with diagram the proceduce of magnetic particle testing method. **[4]**

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

a) List the instruments or equipment used in visual testing method.

b) Limitations of thermography testing method.

c) Advantages of water - soluble developer.

d) Distinguish between active and passtre approach of thermography testing method.

e) Advantages of echo-method of cultrasonic testing technique.

f) Limitation of visual inspection method.

Total No. of Questions : 5]

SEAT No. : ____

PA-2233

[Total No. of Pages : 3

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T.Y. B.Sc.

PHYSICS

PHY-3511 (O) : Acoustics Applications

(Skill Enhancement Course - II)

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

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 trauma?

b) What is the difference between a tweeter and a woofer?

c) State four names of percussion instruments.

d) State Sabine Equation.

e) What are ultrasonic transducers?

f) Define transmission loss.

P.T.O.

Q2) Answer the following :

a) Give the construction and working of a condensor microphone. Draw its equivalent circuit and give the expression for its sensitivity. **[6]**

OR

With the help of a neat diagram, give the construction and working of a folded horn.

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

Q3) Answer the following :

a) Define the following terms : **[6]**

i) Pitch.

ii) Loudness.

iii) Consonance.

iv) Dissonance.

v) Harmonics.

vi) Overtones.

b) The frequency of mechanical resonance of a cone speaker is 60 Hz. The stiffness of a cone system is 1.85×10^3 N/m. Determine the radiation resistance in SI units, if the total mass of the diaphragm and voice coil is 11 gm. **[4]**

Q4) Answer the following :

a) i) Write a note on Musical Instruments Digital Interface (MIDI). **[3]**

ii) A condensor micro phone has sensitivity 0.1 SI unit. What will be its sensitivity in dB. **[3]**

b) Write a note on Non Destructive Testing (NDT). **[4]**

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

a) C - Weighted sound level.

b) Loud speaker - Bass Reflex Cabinet.

c) MP3 audio file format.

d) Sound absorption materials.

e) Ultrasonography.

f) Graphic Equalizers.

Total No. of Questions : 5]

SEAT No. : ____

PA-2234

[Total No. of Pages : 2

[5901]-331
T.Y. B.Sc. (Chemistry)
CH-501 PHYSICAL CHEMISTRY -I
(2019 Pattern) (Semester - V) (35131) (CBCS)

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 indicates full marks.***
5) ***Draw neat and labelled diagram whenever necessary.***
6) ***Use of logarithm tables and calculator is allowed.***

Q1) **Solve <u>any Five</u> of the following** : **[5 × 1 = 5]**

a) Distinguish between polar and non-polar molecules.

b) Define the term Zero point energy.

c) State Grotthus - Draper law.

d) What is wave particle duality?

e) What are stokes and antistokes lines?

f) In photochemical reaction the number of moles reacted is 1.03×10^{-4} and the number of einstein absorbed is 7.787×10^{-6}. Calculate quantum yield.

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

i) Define the term degeneracy. What is the degeneracy corresponding to $E=\frac{14h^2}{8ma^2}$ for particle in three dimensional box?

ii) Discuss the use of dipole moment in the determination of % ionic character of molecule.

iii) Explain the term photosynthesis with suitable example.

P.T.O.

B) i) The group moment of chlorine in aromatic compound is 1.5D. Find out the dipole moment of para dichlorobenzene. **[2]**

ii) Calculate the reduced mass of $N^{14}O^{16}$ molecule $(given\ N = 6'023\times10^{23})$ **[2]**

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

i) Explain pure Rotational spectra of linear diatomic molecule.

ii) State and explain Heisenberg uncertainty principle.

iii) Give the difference between thermal and photochemical reaction.

B) i) Calculate frequency of U.V. radiation of wavelength 4500Aº. **[2]**

ii) Calculate de Broglie wavelength of a body of mass 0.575 kg moving with a velocity of 4500 m/s $(h = 6.625\times10^{-34})$ **[2]**

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

i) Define the following terms.
   a) Photolysis
   b) Quantum yield
   c) Chemiluminescence

ii) State the conditions for well - behaved function.

iii) Explain stretching and bending vibrations with the help of diagrams.

B) A diatomic molecule has reduced mass 1.14×10^{-23} gm and force constant 18.5×10^{5} dynes/cm. Calculate the vibrational frequency of the molecule. **[4]**

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

a) Relative Intensities of spectral lines.
b) Reasons for low and high quantum yield.
c) Fluorescence.
d) Vibrational Spectra
e) Significance of ψ and ψ^2
f) Application of Raman spectra.

Total No. of Questions : 5]

SEAT No. :

PA-2235

[Total No. of Pages : 3

[5901]-332
T.Y. B.Sc.
CHEMISTRY
CH - 502 : Analytical Chemistry - I
(2019 Pattern) (CBCS) (Semester - V) (35132)

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 diagram wherever necessary.***
6) ***Use of log-table and calculators are allowed.***

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

a) Define the term qualitative analysis.

b) What is cation?

c) Write long form of DTA?

d) Explain the term analyte?

e) Calculate absorbance of absorbing solution if transmittance is 0.45?

f) Calculate molar extraction coefficient of solution having concentration 0.005m when placed in 4cm path length cell shows absorbance of 0.25.

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

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

ii) What is common ion effect? How it is used in dissociation of H_2S in presence of HCl.

iii) What is TGA? Describe decomposition of hydrated calcium oxalate by TGA curve?

b) What is developing a procedure in analysis? What are parameters needed

P.T.O.

for it? **[4]**

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

i) Explain the term precipitation from homogeneous solution? Give any one suitable example.

ii) What are interfering radicals in detection of cation? Discuss removal of phosphate ion using ferric chloride method?

iii) What is principle of D.T.A? Draw neat and labelled diagram of D.T.A. curve?

b) A solution of absorbing material having concentration 1×10^{-5}m. Shows absorbance of 1.2, calculate concentration of unknown solution of same species which shows absorbance of 0.80 in the same cuvette? **[4]**

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

i) Write conditions for good precipitation?

ii) Write short note on photovoltaic cell.

iii) Differentiate between colorimeter and spectrophotometer.

b) The solubility product of AgCl is 1.3×10^{-10} calculate solubility of AgCl in water? **[4]**

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

a) Explain role of organic precipitating reagent in gravimetric analysis? Write any two structure of organic precipitating reagent?

b) Calculate gravimetric factor for the following stoichiometric conversing.

Analyte Molar Mass	Precipitate Molar Mass
P = 30.97	Ag_3PO_4 = 418.58

c) Explain the term scale of operation in analysis. Classify sample based

on their size.

d) What is group reagent? Explain the role of KOH in separation of Gr-II cations?

e) Calculate the % loss for the following reaction

$$CaCO_{3(s)} \xrightarrow{D} CaO_{(s)} + CO_2 \uparrow$$

(At. wt. of Ca = 40, C = 12, O = 16)

f) Draw schematic representation of single Beam photoelectric colorimeter?

□□□

Total No. of Questions : 5]

SEAT No. :

PA-2236

[Total No. of Pages : 2

[5901]-333
T.Y. B.Sc.
CHEMISTRY - I
CH - 504 : Inorganic Chemistry
(2019 Pattern) (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 logarithms table and calculator is allowed.***

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

a) What type of π-bond present in (Mi $(pph_3)_4$)?

b) What do you mean by inert complex?

c) Calculate the magnetic moment for Co^{2+} ion by using spin only formula (Co. at. no. 27).

d) Define over all formation constant.

e) Which d-orbitals are involved in π-bonding according to MOT?

f) Define : insulator.

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

i) Discuss multiple bonding in complexes.

ii) Explain the factors affecting Liability of metal complexes.

iii) Why d-block element forms complexes?

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

i) Why $KMnO_4$ is coloured?

ii) What is trans effect? Explain with suitable example.

P.T.O.

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

i) Explain classification of inorganic reactions.

ii) What is lanthanide contraction? Why $La(OH)_3$ is more basic than $Lu(OH)_3$?

iii) Distinguish between intrinsic and extrinsic semiconductors.

b) What is Misch metal? Explain preparation and uses of Misch metal. **[4]**

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

i) Explain the synthesis of transuranic element by heavy ion bombardment method.

ii) Why the elements Cd, Zn, Hg have lower melting points as compared to other d-block elements?

iii) Discuss the structure of superconducting oxide $YBa_2Cu_3O_{7-\delta}$.

b) Explain effect of π-bonding on 10 Dq 0.00 of complexes. **[4]**

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

a) Assumptions of MOT.

b) Catalytic activity of d-block elements.

c) Solvent extraction method for Lanthanide separation.

d) P-type semiconductor.

e) N(E) curve for divalent metals.

f) Nephelauxetic effect and series.

□□□

Total No. of Questions : 5]

SEAT No. : ____

PA-2237

[Total No. of Pages : 2

[5901]-334
T.Y. B.Sc.
CHEMISTRY
CH - 505 : Industrial Chemistry - I (Paper - V)
(2019 Pattern) (CBCS) (Semester - V) (35135)

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 Unit Process.

b) Define the term 'Yield:

c) Write any two uses of Ammonia.

d) What is fermentation?

e) What are soaps?

f) Explain the term chromophore.

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

i) Explain the physicochemical principle involved in the manufacture of ammonia.

ii) Give applications of bagasse.

iii) What are the characteristics of a good dye?

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

i) Batch process

ii) Cleaning Action of Soap

P.T.O.

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

i) Explain the concentration of Juice by multiple effect evaporator.

ii) What are the advantages of detergents?

iii) Write the synthesis and uses of Fluorescein.

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

i) Write note on trade marks.

ii) Explain the term Hydrophobic and Hydrophilic.

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

i) Distinguish between platinum catalyst and vanadium catalyst.

ii) Give the synthesis and uses of crystal violet.

iii) Give the synthesis and uses of Alizarin.

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

i) Define the term process control.

ii) Explain the importance of sefty in chemical industry.

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

a) Physicochemical principal involved in the manufacture of nitric acid.

b) Write note on sulphuric acid fog.

c) Importance of fermentation industry.

d) Write short note on Coffey still.

e) Discuss raw material required for manufacture of soap.

f) Distinguish between soap and detergent.

□□□

Total No. of Questions : 5]

SEAT No. :

PA-2238

[Total No. of Pages : 3

[5901]-335
T.Y. B.Sc.
CHEMISTRY
CH - 507 : Organic Chemistry - I
(2019 Pattern) (CBCS) (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) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***

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

a) Why pyridine is more basic than pyrrole?

b) Give any two examples of active methylene compounds.

c) Write any two examples of Heterocyclic Aromatic Compounds.

d) Name any two Rearrangement reactions which involves Isocyanate Intermediate.

e) State Saytzeff Rule.

f) Allylic ethers of enols undergo which type of Rearrangement reaction?

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

i) Comment on Aromaticity of Furan, Pyrrole and Pyridine.

ii) Describe the reaction of Isocyanate intermediate with H_2O, ROH and RNH_2.

iii) Describe Factors affecting the Reactivity in Elimination Reaction.

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

i) 1-Iodopropane undergoes E_2 elimination Faster than 1-Chloropropane Explain?

ii) Explain Cope Rearrangement.

P.T.O.

Q3) a) Attempt the following (any Two) : **[6]**

i) Naphthalene undergoes electrophillic substitution mainly at position 2 and not 1. Explain.

ii) Explain the reaction and mechanism of Curtius Rearrangement with suitable example.

iii) Explain Orientation and Reactivity in E_1 Elimination Reaction.

b) Predict the product and Justify answer. **[4]**

i) 

ii) $H_3C–CH_2–CH_2–\underset{\oplus N(CH_3)_3\overset{\ominus}{O}H}{CH}–CH_3 \xrightarrow[base]{\Delta} \underset{(Majon)}{A} + \underset{(Minor)}{B}$

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

i) Explain. Why cross products are not obtained in pinacol-pinacolone rearrangement?

ii) What is the reaction of following reagents with Thiophene?

a) SO_3/Pyridine

b) $(CH_3CO)_2O/H_2PO_4$

c) Phenyl diazonium salt

iii) What do you mean by reactive methylene group? How will you prepare carbanion in reactive methylene compounds?

b) Identify the products 'A' and 'B' in the following reactions. **[4]**

i) $Eto–\overset{O}{\overset{\|}{C}}–CH_2–\overset{O}{\overset{\|}{C}}–OEt \xrightarrow[ii)\,CH_3Br]{i)\,NaOEt} 'A' \xrightarrow[ii)\,-CO_2]{i)\,H_2o|Ht} 'B'$

ii) 

Q5) Write Short Note on any four : **[10]**

a) Lossen Rearrangement

b) Hofmann Elimination

c) Pall-Knorr Synthesis

d) Baeyer-Villiger Oxidation

e) Synthesis of Pyridine

f) Evidence for E_2 mechanism

□□□

Total No. of Questions : 5]

SEAT No. : ____

PA-2239

[Total No. of Pages : 3

[5901]-336
T.Y. B.Sc.
CHEMISTRY
CH - 508 : Chemistry of Biomolecules
(2019 Pattern) (CBCS) (Semester - V) (35138)

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) ***Figures to the right indicate full marks.***
4) ***Questions 2 to 5 carry equal marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of logarithm tables and calculator is allowed.***

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

a) Name any two thyroid hormones.

b) What is enzyme inhibitor?

c) Define peptide bond.

d) What is rancidity?

e) Draw structure of α-D-Glycopyranose.

f) Define Biomolecule.

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

i) What are monosaccharides? Explain the reaction of following with D-Glycose.

a) dil HNO_3

b) H_2/pt

ii) What are proteins? Discuss α-helical structure with neat labelled diagram.

iii) Describe the classification of hormones.

P.T.O.

b) i) What are Lipoproteins? Write its type. **[4]**

ii) Discuss the effect of substrate concentration on rate of enzyme catalysed reaction.

Q3) a) Attempt any Two : **[6]**

i) What are α-amino acids? What is the action of following on amino acids.

a) Sanger's reagent

b) Dansyl chloride

ii) What is Saponification number? Write its significance.

iii) Write the Industrial applications of enzymes.

b) i) What are the functions of Hormones?

ii) What is Epimers & anomers?

[4]

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

i) Give any three cell organelles and their function in detail.

ii) Discuss the classification of α-amino acids, giving one example of each class.

iii) What are polysaccharides? Give a brief account of amylose.

b) i) What is mean by prosthetic group? Write in details.

ii) What are the types of rancidity? Explain with detail?

[4]

Q5) Write short notes on any four of the following : **[4 × 2½ = 10]**

a) Explain Group I & Group II hormones with suitable example.

b) Explain the different types of specificity of enzymes.

c) Write the biological significance of lipids.

d) Explain the reaction of following with D-Glycose

i) Br_2/water

ii) Tollen's reagent

e) Explain the following terms :

i) Zwitter ion

ii) Isoelectronic point

f) Give details about any two bonds present in biomolecules.

□□□

Total No. of Questions : 5]

SEAT No. : ____

PA-2240

[Total No. of Pages :2

[5901]-337
T.Y. B.Sc.
CHEMISTRY
CH - 510(A) : INTRODUCTION TO MEDICINAL CHEMISTRY
(2019 Pattern) (CBCS) (Semester - V) (351310A)

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 logarithm tables and calculator is allowed.***

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

a) What is receptor?

b) What is the meaning of bioisoster.

c) Name any two antibacterial agents.

d) Draw the structure of Paracetamol.

e) Define Antimetabolites.

f) What is superficial fungal infection?

Q2) a) Attempt any 2: **[6]**

i) Define Inflammation. What are anti inflammatory agents? How are they classified?

ii) What is vaccine? Name different methods of vaccine preparation. Give one example of booster vaccine.

iii) Discuss the term 'Pharmacophore' with an example.

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

i) Explain SAR of penicillins.

ii) What are macrolides? Give their applications.

P.T.O.

Q3) a) Attempt any 2: **[6]**

i) What is drug? Discuss the need of new drugs.

ii) What are sedatives? Give characteristics of ideal sedatives.

iii) Write structure and explain mode of action of salvarson.

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

i) What are sulphonamides? Draw the general structure of sulphonamides.

ii) Write classification of antifungal agents with one example each.

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

i) Discuss any three terms used in drug development.

ii) Explain Lipinski Rule of 5.

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

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

i) Name the steps involved in viral life cycle.

ii) Give mechanism of action of acyclovir.

Q5) Write short note on any 4: **[10]**

a) Types of antimicrobial agents.

b) SAR & applications of tetracyclins.

c) β - lactam antibiotics.

d) Pharmacokinetics.

e) Physico - chemical properties of drugs.

f) Characteristics non infections diseases.

Total No. of Questions : 5]

SEAT No. : ____

PA-2241

[Total No. of Pages :2

[5901]-338
T.Y. B.Sc.
CHEMISTRY
CH - 510(B) : Polymer Chemistry
(2019 Pattern) (Semester - V) (CBCS) (351310B)

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 logarithm tables and calculator is allowed.***

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

a) Define the term co-polymer.

b) The process of vulcanisation was invented by _____.

c) Which polymerisation technique involves formation of spherical beads or pearls?

d) What is meant by condensation polymerisation?

e) The acronym PAN stands for _____.

f) Calculate the degree of polymerisation of polyvinyl alcohol having average molecular weight 11,000.

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

i) Discuss in brief the bimetallic mechanism of co-ordination polymerisation by using Ziegler Natta catalysts.

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

iii) Describe the Interfacial polycondensation. Give its merits.

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

i) Homochain and heterochain polymer.

ii) Plastic and elastomer.

P.T.O.

Q3) a) Attempt the following (any two) : **[6]**

i) Explain the factors affecting glass transition temperature of polymers.

ii) Explain the viscometric method for determination of intrinsic viscosity.

iii) What is polyisoprene? Give its applications. Draw the structure of natural rubber.

b) What is ionic polymerisation? Explain three main steps in cationic polymerisation. **[4]**

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

i) Give full account of bulk polymerisation.

ii) Write the synthesis, properties and uses of poly tetrafluro ethylene.

iii) Explain in detail polyethylene.

b) Equal volumes of polymer solution and pure solvent are allowed to flow down the fixed distance marked on the viscometer. The flow time is 41.2 sec and 35.0 sec for the polymer solution and pure solvent respectively. Calculate the reduced and inherent viscosity. **[4]**

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

a) Conducting polymers.

b) Relation between degree of polymerisation and melt viscosity.

c) Cross - linked polymers.

d) Inhibitors in free - radical polymerisation.

e) Micelles.

f) Polyvinyl chloride.

Total No. of Questions : 5]

SEAT No. : ____

PA-2242

[Total No. of Pages :2

[5901]-339
T.Y. B.Sc.
CHEMISTRY
CH - 511(A) : ENVIRONMENTAL CHEMISTRY
(2019 Pattern) (Semester - V) (CBCS)

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 logarithm tables and calculator is allowed.***

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

a) Define Chemical Oxygen Demand (C.O.D)

b) Define Pollutant.

c) What is Hardness of Water?

d) What is mean by TOC.

e) What is speciation?

f) Name of the sources of radioactive pollutant.

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

i) Explain Environmental chemistry.

ii) Differentiate between BOD and COD.

iii) What is meant by primary treatment of waste water.

b) Explain segments of Environment. **[4]**

P.T.O.

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

i) Give the relation between PPM and PPb.

ii) What are Humic substances? Explain their role in Nature.

iii) Explain electrodialysis method for purification of waste water.

b) How can we determine D.O.? Describe Winkler method. **[4]**

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

i) What is eutrophication? How is it controlled.

ii) Write a note on Industrial sewage treatment.

iii) Name of the few chelating agents found in natural water. Describe their chelating behaviour.

b) Write a note on speciation of Hg in air. **[4]**

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

a) Write a note on Biosphere.

b) Explain Nitrogen fixation by bacteria.

c) Classified the water pollutants.

d) Explain Reverse Osmosis.

e) What is the role of Chlorine in drinking water treatment?

f) Describe methods for the estimation of COD in water sample.

Total No. of Questions : 5]

SEAT No. : ____

PA-2243

[Total No. of Pages : 2

[5901]-340
T.Y. B.Sc.
CHEMISTRY
CH - 511(B) : Cheminformatics
(2019 Pattern) (Semester - V) (CBCS) (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) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of logarithm tables and calculator is allowed.***

Q1) Answer any FIVE of following : **[5]**

a) What is Lead compound?

b) What is drug discovery?

c) What is toxicity?

d) What is SMILE notation?

e) What is Marvinsketch?

f) What is algorithms?

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

i) Explain Pharmacophore modeling with suitable examples.

ii) Write note on online available toolkits for cheminformatics.

iii) What is QSAR?

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

i) Give the application of GOLD software.

ii) What is graph theory?

P.T.O.

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

i) Write a comparative note on similarity and diversity search.

ii) Write a note on computer aided drug design.

iii) What is linear free energy relationship? How it can be studied using cheminformatics.

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

i) Explain any one predictive method for organic spectral data analysis.

ii) What is difference between full and sub structure search.

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

i) How does virtual screening help in drug design.

ii) What is protein Ligand interaction analysis? Give its applications.

iii) Describe application of Pubchem.

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

i) Write WLN notation for alanine and catechol.

ii) What is matrix representation?

Q5) Attempt <u>any four</u> of following: **[10]**

a) Give the historical progression of cheminformatics.

b) Write a note on machine learning method in cheminformatics.

c) Explain the short coming of Lipinski's rule.

d) Write SMILE notation for benzene and napthalene.

e) What are different electronic effects in chemical structure?

f) What is target indentification and validation?

Total No. of Questions : 5]

SEAT No. : ____

PA-2244

[Total No. of Pages : 2

[5901]-341
T.Y. B.Sc.
BOTANY (Paper - I)
BO-351 : Cryptogamic Botany (Algae & Fungi)
(CBCS) (2019 Pattern) (Semester - V) (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) ***Question 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 Cryptogams

b) Write the habit of Nostoc?

c) Enlist the types of asexual reproduction in Nostoc.

d) Write occurrence of Mucor.

e) Define Fungi.

f) What are Mycorrhiza?

Q2) a) Explain thallus structure in Nostoc. **[6]**

b) Describe vegetative reproduction in Chara. **[4]**

Q3) a) Describe vegetative reproduction in Saccharomyces. **[6]**

b) Write in short about asexual reproduction in Penicillium. **[4]**

Q4) a) Discuss in detail life - cycle of Cercospora. **[6]**

b) Comment on types of Mycorrhiza. **[4]**

P.T.O.

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

a) Components of Lichens

b) Symptoms of Cercospora

c) Teleutospores in Puccinia

d) Thallus structure in Saccharamyces (Yeast)

e) Trichogyne in Batrachospermum

f) Glomerule

Total No. of Questions : 5]

SEAT No. : ____

PA-2245

[Total No. of Pages : 2

[5901]-342
T.Y. B.Sc.
BOTANY
BO - 352 : Archegoniate
(35142) (2019 Pattern) (Semester - V) (CBCS)

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) ***Figures to the right indicate full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

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

a) What is Antheridium?

b) Give the functions of sporophyte in bryophyte.

c) What is mean by Archegoniophore?

d) Define Apospory.

e) Which generation is dominant in life cycle of pteridophytes

f) What is protostele?

Q2) a) Describe structure of sporophyte in Anthoceros. **[6]**

b) Write general characters of class sphenopsida. **[4]**

Q3) a) Explain external morphology of Selaginella sporophyte. **[6]**

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

Q4) a) Describe external morphology of Funaria gametophyte. **[6]**

b) Explain Regressive Evolution Theory of bryophytes. **[4]**

P.T.O.

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

a) Life cycle of heterosporous pteridophyte.

b) General characters of class Anthocerotae.

c) Alternation of generations in Anthoceros.

d) Strobilus theory of evolution of pteridophytes.

e) Synangium of Psilotum.

f) Strobilus of Selaginella.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2246

[Total No. of Pages : 2

[5901]-343

T.Y. B.Sc.

BOTANY (Paper - III)

BO-353: Spermatophyta and Paleo Botany

(2019 Pattern) (Semester - V) (35143)

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) ***Draw neat labelled diagrams wherever necessary.***

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

a) Mention any one example of family Amaranthaceae.

b) Define Spermatophytes.

c) Write any two characters of Gymnosperms.

d) Define Herbarium.

e) Give an example of any one endemic plant.

f) What is impression?

Q2) a) Give the outline and merits of Aurthor Cronquist system of classification. **[6]**

b) Explain biological species concept. **[4]**

P.T.O.

Q3) a) Describe mole cone of Pinus. **[6]**

b) Give systematic position and one example of family Oleaceae. **[4]**

Q4) a) Describe T.S. of stem of Gnetum. **[6]**

b) Explain functions of Botanical Gardens. **[4]**

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

a) Transitional Combinational Theory.

b) Petrification.

c) Holo endemism.

d) Distinguishing characters of Cannaceae.

e) Economic importance of Gymnosperms.

f) Pollen grain Pinus.

Total No. of Questions : 5]

SEAT No. : ____

PA-2247

[Total No. of Pages : 2

[5901]-344
T.Y. B.Sc. (Semester - V)
BOTANY
BO - 354 : Plant Ecology
(2019 Pattern) (CBCS) (Paper - IV)

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 2 to 5 carry equal marks.***
4) ***Figures to right indicates full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

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

a) Define ecosystem.

b) Define 'Niche'.

c) What is community ecology?

d) What is long form of EIA?

e) What is remote sensing?

f) Define Audit.

Q2) a) Describe need and objectives of environmental audit. **[6]**

b) Describe applications of remote sensing. **[4]**

Q3) a) Describe Raunkiaer's life form of classification. **[6]**

b) Enlist goals of sustainable development. **[4]**

Q4) a) Write notes on Nitrogen Cycle. **[6]**

b) Write notes on GPS. **[4]**

P.T.O.

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

a) Biotic components.

b) Phenology.

c) Pyramid of Biomass.

d) Edge effect.

e) Population density.

f) Stages in Ecological Impact Assessment Process.

▽▽▽▽

Total No. of Questions : 5]

SEAT No. :

PA-2248

[Total No. of Pages : 2

[5901]-345

T.Y. B.Sc.

BOTANY

BO-355 : Cell and Molecular Biology

(2019 Pattern) (CBCS) (Semester - V) (Paper - 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 chloroplasts.

b) Define codon.

c) State function of topoisomerase.

d) What is acrocentric chromosome?

e) Enlist types of DNA polymerases in prokaryotes.

f) Define endocrine signalling.

Q2) a) What is a vacuole? Explain its structure and functions. **[6]**

b) Describe Avery, McLeod experiment. **[4]**

Q3) a) Describe types of eukaryotic promoters. **[6]**

b) Give a brief account of calcium signalling pathway in plants. **[4]**

P.T.O.

Q4) a) Discuss structure of trp operon. **[6]**

b) Give a brief account of transport of molecules across the nucleus. **[4]**

Q5) Write short notes on any four of the following : **[4 × 2½ = 10]**

a) Lampbrush chromosomes

b) Cell wall

c) Karyotype and ideogram

d) mRNA

e) Termination of transcription in prokaryotes.

f) Elongation of replication in prokaryotes.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2249

[Total No. of Pages : 2

[5901]-346

T.Y. B.Sc.

BOTANY

BO 356 - Genetics

(2019 Pattern) (Semester - V) (Paper-VI) (CBCS) (35146)

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 Question 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

Q1) Attempt any Five: **[5]**

a) What is Heredity?

b) Mention any two branches of genetics.

c) What is Mutation?

d) What is heteromorphic self-Incompatibility?

e) Define Aneuploidy?

f) $2n + 2$ denotes which type of Aneuploidy?

Q2) a) What is crossing over? Explain its types in details. **[6]**

b) Comment on Inhibitory Gene action (13.3) **[4]**

Q3) a) Explain in detail the cytoplasmic Inheritance. Give its characteristics. **[6]**

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

P.T.O.

Q4) a) Describe in detail on Inheritance of y-linked (Holandric) genes. **[6]**

b) Describe in detail dihybrid cross with suitable example. **[4]**

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

a) Concept of Multiple Allelism.

b) Law of segregation.

c) Spontaneous mutation.

d) Applications of polyploidy.

e) Two point test cross.

f) Variegation in four 'o' clock plants.

Total No. of Questions : 5]

SEAT No. :

PA-2250

[Total No. of Pages : 2

[5901]-347
T.Y. B.Sc. (Botany)
BO-3510 : MEDICINAL BOTANY
(CBCS) (2019 Pattern) (Semester - V) (Paper - X) (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) ***Questions 2 to 5 carry equal marks.***
4) ***Figures to right indicate full marks.***
5) ***Draw neat and labelled diagrams wherever necessary.***

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

a) Define medicinal botany.

b) What is Indigenous system of medicine?

c) Define Ethnobotany.

d) Where did the unani system of medicine originated?

e) What is Tridosha?

f) Define In-Situ conservation.

Q2) a) Mention the scope and importance of medicinal Botany. **[6]**

b) Enlist the IUCN categories for conservation of Rare and Endangered medicinal plants. **[4]**

P.T.O.

Q3) a) What is Ethnobotany? Add a note on ethnic communities of India. **[6]**

b) Explain the role of Botanic gardens in Ex - Situ conservation. **[4]**

Q4) a) What is Nursery? Describe various types of Nursery. **[6]**

b) Mention the applications of Natural Products to cure skin diseases. **[4]**

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

a) Palaeo - ethnobotany.

b) Panchamahabhutas.

c) Amchi system of medicine.

d) Air Layering

e) Sacred groves.

f) Folk medicines and Ethnobotany.

Total No. of Questions : 5]

SEAT No. : ____

PA-2251

[Total No. of Pages : 2

[5901]-348
T.Y. B.Sc.
BOTANY
BO 3511 : Plant Diversity and Human Health
(2019 Pattern) (CBCS) (Semester - V) (351411)

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

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Attempt any three from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Draw neat labelled diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***

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

a) Define hot-spot.

b) What is inbreeding depression?

c) Define in-situ conservation.

d) Give names of any two ornamental plants.

e) Write any two functions of forests.

f) Write asthetic value of Agro-biodiversity.

Q2) a) Describe biodiversity conservation. **[6]**

b) Write a note on National Parks in India. **[4]**

Q3) a) Write a note on Megadiverse countries. **[6]**

b) Comment on wild taxa and explain its significance. **[4]**

Q4) a) Write note on UNESCO. **[6]**

b) Enlist objectives of Biodiversity conservation. **[4]**

P.T.O.

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

a) Alcoholic beverages through ages.

b) Conservation of genetic diversity.

c) UNEP (United Nations Environmental Programme).

d) Pomology

e) Uses of microbes

f) Change in Productivity method.

□□□

Total No. of Questions : 5]

SEAT No. :

PA-2252

[Total No. of Pages : 2

[5901]-349
T.Y. B.Sc.
ZOOLOGY
ZO-351 : Pest Management (Paper - I)
(2019 Pattern) (CBCS) (Semester - V) (35151)

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.***

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

a) Regular pest

b) Pesticide

c) Crop free period

d) Bio control agent

e) Define systematic insecticide

f) Enlist transgenic plants

Q2) a) Describe the regulatory control of pest management with reference to Eradication and control districts. **[6]**

OR

Describe the principles and advantages of I.P.M.

b) Describe different group of pest and compare with plant pathogens. **[4]**

Q3) a) Explain what is meant by prevention, suppression and eradication of pests. **[6]**

OR

Distinguish positive and negative impacts of pesticide use.

b) Biological control of insect describe with suitable example. **[4]**

P.T.O.

Q4) a) Describe "thresholds" and why they are an important consideration in developing a pest control strategy. **[6]**

OR

Describe use of Fungi and Viruses in pest management.

b) Describe the types of damages caused by the pest. **[4]**

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

a) Maximum permissible limits

b) Safe handling of insecticides

c) Predators as Biocontrol

d) Enlist Genetic modified plants

e) Biological control of plant disease

f) Quarantine as a pest control

Total No. of Questions : 5]

SEAT No. :

PA-2253

[Total No. of Pages : 2

[5901]-350
T.Y. B.Sc.
ZOOLOGY
ZO - 352 : Histology (Paper - II)
(2019 Pattern) (Semester - V) (35152) (CBCS)

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 tissue.

b) What is stratified squamous epithelium?

c) What is taste bud?

d) Explain exocrine glands?

e) What is enamel?

f) Explain the term heterodont.

Q2) a) Describe the histological structure of tooth, with the help of neat labelled diagram. **[6]**

OR

With neat labelled diagram, describe T.S. of duodenum.

b) Write short note on smooth muscle. **[4]**

Q3) a) Describe the histological structure of trachea, with the help of neat labelled diagram. **[6]**

OR

With the help of neat labelled diagram, describe the structure of testis.

b) Write note on Juxta Glomerular Complex. **[4]**

P.T.O.

Q4) a) Explain the structure and role of pituitory gland. **[6]**

OR

Describe the structure and functions of Islet of Langerhans

b) Explain structure, location and functions of gastric glands. **[4]**

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

a) Sertoli cells.

b) Brunner's gland

c) Rugae

d) Lung alveolus

e) Sweat gland

f) Pacinian Corpuscles.

❄ ❄ ❄

Total No. of Questions : 5]

SEAT No. : ____

PA-2254

[Total No. of Pages : 2

[5901]-351
T.Y.B.Sc.
ZOOLOGY
ZO-353 : Biological Chemistry
(CBCS 2019 Pattern) (Semester - V) (Paper - III) (35153)

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

Instructions to the candidates:

1) ***Q 1 is compulosry.***
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 Monosaccharides.

b) What are conjugated acid?

c) List out bonds present in tertiary structure of proteins.

d) What are co-factors?

e) Define km.

f) What is PKU?

Q2) a) What are the three buffering system in our body? **[6]**

OR

Discuss isomerism in carbohydrates giving examples.

b) Explain the types of amino-acids on the basis of their polarity. **[4]**

Q3) a) Discuss in brief types of enzymes on the basis of the reactions they catalyze. **[6]**

OR

Explain the effect of pH and substrate concentration on enzyme activity.

b) What are saturated and unsaturated fatty acids? **[4]**

P.T.O.

Q4) a) Explain and classify homopolysaccharides in detail. **[6]**

OR

Write in brief what are isoenzymes.

b) Explain quaternary structure of proteins with suitable example. **[4]**

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

a) Importance of Biochemistry.

b) Biological significance of carbohydrates.

c) Hyperglycemia.

d) AKU

e) pH scale

f) Atherosclerosis

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. : ____

PA-2255

[Total No. of Pages : 2

[5901]-352
T.Y.B.Sc.
ZOOLOGY
ZO-354 : Genetics
(CBCS 2019 Pattern) (Semester - V) (Paper - IV) (35154)

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 cistron.

b) What is transversion mutation?

c) Explain dihybrid cross.

d) Define haplodiploidy.

e) What is hypertrichosis.

f) Define Lethal allele.

Q2) a) Describe principle, characteristics and significance of Hardy-Weinberg law. **[6]**

OR

Describe the concept and characteristics of multiple alleles with suitable example.

b) Write defination and classification of parthenogenesis. **[4]**

Q3) a) Explain the different types of point mutation. **[6]**

OR

Explain XX-XO and ZZ-ZW type of sex determination methods.

b) Turner syndrome. **[4]**

P.T.O.

Q4) a) Discuss colorblindness with suitable example. **[6]**

OR

What is mutagenic agent. Enlist different types of mutagenic agent.

b) Discuss the concept of population genetics. **[4]**

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

a) Importance of multiple alleles

b) Classical concept of gene

c) Incomplete dominance

d) Two applications of genetics

e) Types of Gynandromorphism

f) Panmictic mating

Total No. of Questions : 5]

SEAT No. : ____

PA-2256

[Total No. of Pages : 2

[5901]-353
T.Y.B.Sc.
ZOOLOGY
ZO-355 : Developmental Biology
(CBCS 2019 Pattern) (Semester - V) (Paper - V) (35155)

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

Instructions to the candidates:

1) ***Q. 1 is compulosry.***
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) What is differentiation?

b) Give Scope of developmental biology.

c) Explain cell determination.

d) What are somites?

e) What is regeneration?

f) Define spermiogensis.

Q2) a) What is gametogenesis? Describe in detail the process of oogenesis. **[6]**

OR

Describe in detail the different egg membranes.

b) Explain activation of ovum. **[4]**

Q3) a) Describe the development of chick embryo up to primitive streak formation. **[6]**

OR

Describe the concept of organizer in development.

b) Explain Pangenesis theory of embryonic development. **[4]**

P.T.O.

Q4) a) Define cleavage. Explain different types of cleavage. **[6]**

OR

What is fertilization? Explain the types of fertilization with example.

b) Describe structure of typical sperm. **[4]**

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

a) Explain dedifferentiation.

b) Germplasm theory

c) Significance of blastula

d) Epiboly

e) Significance of fertilization

f) Meridional plane cleavage

Total No. of Questions : 5]

SEAT No. : ____

PA-2257

[Total No. of Pages : 2

[5901]-354
T.Y.B.Sc.
ZOOLOGY
ZO-356 : Parasitology
(CBCS 2019 Pattern) (Semester - V) (Paper - VI)

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

Instructions to the candidates:

1) ***Question 1 is compulosry.***
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) What is Parasitism?

b) What is Ectoparasite?

c) What is Ecological specificity?

d) Define Reservoir Host.

e) Name the causative organism of malaria.

f) What is pediculosis.

Q2) a) Describe Life cycle of P.Vivax in man. **[6]**

OR

Describe Epidemiology. Pathogenecity and prophylexis of E. histolytica.

b) Describe life cycle of Head Louse. **[4]**

Q3) a) Describe life cycle of A.Lumbricoides. **[6]**

OR

What is Host specificity? Describe physiological host specificity.

b) Define Endoparasite and its subtypes. **[4]**

P.T.O.

Q4) a) What is a Host and describe their types. **[6]**

OR

Describe effect of parasite on Hosts.

b) Describe external morphology of T. Solium. **[4]**

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

a) Enlist branches of parasitology.

b) Control measures of bed bug.

c) Effects of Ticks on Hosts.

d) Structural specificity.

e) Treatment of E. histolytica.

f) Pathogenecity of Rat flea.

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. :

PA-2258

[Total No. of Pages : 2

[5901]-355
T.Y.B.Sc.
ZOOLOGY
ZO-3510 : Aquarium Management
(CBCS 2019 Pattern) (Semester - V) (Paper - VII) (351510)

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 5 carry equal marks.***

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

a) Aquarium

b) Natural fish breeding

c) Nutritional value of fish

d) Economic importance of aquarium

e) Types of fish feeds

f) Fish farm

Q2) a) Describe endemic species of aquarium fishes. **[6]**

OR

Describe live fish feed organisms.

b) What is budget for setting up an aquirum? **[4]**

Q3) a) Describe any two chemical parameters of water for fish culture. **[6]**

OR

Describe fish preservation.

b) Describe induced breeding. **[4]**

P.T.O.

Q4) a) Describe exotic species of fishes for aquarium. **[6]**

OR

Describe general aquarium maintainance.

b) Describe causes of mortality in transport. **[4]**

Q5) Write notes on any four. **[10]**

a) Scope of aquarium

b) Guppy fish

c) Sexual dimorphism in guppy fish and mollyfish

d) Aquarium as cottage industry

e) Fighter fish

f) Common diseases of aquarium fish

Total No. of Questions : 5]

SEAT No. : ____

PA-2259

[Total No. of Pages : 2

[5901]-356
T.Y.B.Sc.
ZOOLOGY
ZO-3511 : Poultry Management
(CBCS 2019 Pattern) (Semester - V) (Regular) (Paper - VIII) (351511)

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

Instructions to the candidates:

1) ***Q 1 is compulosry.***
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) What is paultry

b) Define fertility of birds

c) Explain Biosecurity programme

d) Explain Artificial incubation

e) Define Induced breeding

f) Explain AGMARK standerd of eggs.

Q2) a) Describe the digestive system of chicken. **[6]**

OR

Explain any two types of poultry forms.

b) Explain various breeds and strains of broilers chicken. **[4]**

Q3) a) Explain various aspects for the establishment of poultry. **[6]**

OR

Explain Ranikhet and Marek poultry disease.

b) Explain the process of preservation and storage of eggs. **[4]**

P.T.O.

Q4) a) Explain general aspects of breeding for layers chicken. **[6]**

OR

Describe slaughtering and processing of chicken.

b) Describe backyard poultry farming. **[4]**

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

a) Indigenous birds.

b) Artificial inseminations

c) Gumboro disease

d) Feed ingredients

e) Lighting Schedule for poultry

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. : ____

PA-2260

[Total No. of Pages : 2

[5901]-357
T.Y.B.Sc.
GEOLOGY
GL-311 : Geology of India - I
(2019 Pattern) (Semester - V) (35161) (Paper - I) (Revised)

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

Instructions to the candidates:

1) ***Q 1 is compulosry.***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions No.s 2 to 5 carry equal marks.***

Q1) Answer the following questions in 2-3 lines (any 5). **[5]**

a) What is the trend of rocks belonging to Dharwar Supergroup?

b) Give economic importance of Singhbhum Craton.

c) What is charnokite?

d) What are Gondites?

e) Give equivalents of kurnool group.

f) Give physiographic division of India.

Q2) Write short notes on

a) Bundelkhand craton. **[6]**

b) Malani Volcanics. **[4]**

Q3) Write short notes on

a) Stratigraphy of Sauser Group. **[6]**

b) Eastern Ghat Mobile belt. **[4]**

P.T.O.

Q4) Answer the following.

a) Give geographical distribution, classification, succession and lithology of CUDDAPAH SUPERGROUP. **[6]**

b) SAKOLI Group. **[4]**

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

a) Economic importance of Sargur Group.

b) Subdivisions of Mesozoic Era.

c) Short note on Peninsular Gneissic Complex.

d) Economic importance of Singhbhum Craton.

e) What are Kodurites?

f) What is Eparchean Unconformity?

Total No. of Questions : 5]

SEAT No. :

PA-2261

[Total No. of Pages : 2

[5901]-358
T.Y.B.Sc.
GEOLOGY
GL-312 : Mineral Resources
(2019 Pattern) (Semester - V) (35162)

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

Instructions to the candidates:

1) ***Q 1 is compulosry.***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions Nos. 2 to 5 carry equal marks.***

Q1) Answer the following questions in 2-3 lines (any 5). **[5]**

a) Define epigenetic deposits.

b) What are limonites?

c) Define alluvial placer deposits.

d) Define Vug.

e) Zone of oxidation.

f) Beach placer deposits.

Q2) Explain the following.

a) Beach and aeolin deposits. **[6]**

b) Wall rock alteration. **[4]**

Q3) Explain the following.

a) Residual liquid segregation. **[6]**

b) Breccia filling deposits. **[4]**

P.T.O.

Q4) Explain the following.

a) Saddle reef and ladder veins. **[6]**

b) Immiscible liquid segregation. **[4]**

Q5) Write short notes. (Any five) **[10]**

a) State criterias of metasomatic replacement (any four).

b) Residual concentration.

c) Non-metalliferous deposits.

d) Hypothermal deposits.

e) Name the manganese bearing minerals.

f) Give geological and geographical distribution of Uranium deposits of India.

Total No. of Questions : 5]

SEAT No. : ____

PA-2262

[Total No. of Pages : 2

[5901]-359
T.Y.B.Sc.
GEOLOGY
GL-313 : Marine Geology
(2019 Pattern) (Semester - V) (Paper - III) (Revised) (35163)

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 5 carry equal marks.***

Q1) Answer Any Five of the following question in 2-3 lines: **[5]**

a) Draw a neat labeled diagram showing all physiographic divisions of Oceans.

b) How Indian Ocean is different from Atlantic and Pacific Oceans.

c) Define Stromatolites.

d) Define Minamata disease.

e) Define Explosion Seismology.

f) Give the existing EEZ area of India.

Q2) Answer the following.

a) Explain the Ocean floor rocks. **[6]**

b) Why are sediments interesting to Oceanographers? **[4]**

Q3) Answer the following :

a) Define Lithogenous sediments. Give its origin and composition in detail. **[6]**

b) Explain the structure of Indian Ocean. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain marine environmental problems associated with petroleum pollution. Give its any one case study. **[6]**

b) Explain the disputes of EEZ. **[4]**

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

a) Other types of chemical pollutants.

b) Importance of EEZ.

c) Distribution of Biogenous Sediments.

d) Atoll Formation.

e) Origin of Indian Ocean.

f) Seismic Profiling.

Total No. of Questions : 5]

SEAT No. :

PA-2263

[Total No. of Pages : 2

[5901]-360
T.Y.B.Sc.
GEOLOGY
GL-314 : Engineering Geology
(2019 Pattern) (Semester - V) (Paper - I) (35164)

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

Instructions to the candidates:

1) ***Question no. 1 is compulosry.***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions Nos. 2 to 5 carry equal marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer Any Five of the following in 2-3 lines: **[5]**

a) Name qualities of a good facing stone.

b) What are different engineering properties of a rock?

c) Define Tunnel

d) What are the quolities of foundation rock?

e) What are the requirements of a good aggregate?

f) What is a foundation rock?

Q2) Answer the following.

a) Write a note on physical and engineering properties of aggregates. **[6]**

b) Importance of weathering in site selection. **[4]**

Q3) Answer the following :

a) Write a note on types of bridges and site selection for bridge construction. **[6]**

b) Write a note on types of tunnels. **[4]**

P.T.O.

Q4) Answer the following.

a) What are the forces acts on a dom? **[6]**

b) Which factors influences engineering usefullness of rocks? **[4]**

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

a) Significance of geology in engineering projects.

b) Define compressive strength of a rock.

c) Transverse strength of a rock.

d) Gravity dam

e) Silting in reservoirs

f) Mumbai sea - Link

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. : ____

PA-2264

[Total No. of Pages : 2

[5901]-361
T.Y. B. Sc.
GEOLOGY
GL-315 : Hydrogeology
(2019 Pattern) (Semester - V) (Paper - V) (Revised) (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) ***Question No. 2 to 5 carry equal marks.***

Q1) Answer Any Five of the following question in 2-3 lines: **[5]**

a) Define transmissivity.

b) What is Lamellar flow.

c) Define Hydrogeology.

d) Enlist major cations in groundwater.

e) What is piezometric surface.

f) What is permeameter.

Q2) Answer the following.

a) What is well inventory? Explain the procedure. **[6]**

b) Explain W.H.O. Standards of drinking water. **[4]**

Q3) Answer the following :

a) Explain vertical distribution of groundwater. **[6]**

b) Explain groundwater contamination. **[4]**

P.T.O.

Q4) Answer the following.

a) What is Darcy's law? Explain it's validity. **[6]**

b) Explain saline water intrusion in coastal aquifers. **[4]**

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

a) Soil Moisture Zone

b) Aquifer

c) Confined aquifer

d) APT

e) Perched watertable

f) Tracers in groundwater flow studies.

Total No. of Questions : 5]

SEAT No. : ____

PA-2265

[Total No. of Pages : 2

[5901]-362
T.Y.B.Sc.
GEOLOGY
GL-316 : Applied Geophysics
(2019 Pattern) (Semester - V) (Paper - VI) (Revised) (35166)

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

Instructions to the candidates:

1) ***Question no. 1 is compulosry.***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Question Nos. 2 to 5 carry equal marks.***

Q1) Answer Any Five of the following in 2-3 lines: **[5]**

a) Enlist the types of magnetometer.

b) Define Snell's law of refraction.

c) What are surface waves and give its types.

d) Define resistivity.

e) Define wenner array.

f) Enlist the instruments used in electromagnetic method.

Q2) Answer the following:

a) What is seismic survey method? Explain its principle and field procedures. **[6]**

b) What is induced polarization method? Give tis applications. **[4]**

Q3) Answer the following:

a) Explain resistivity method and give its principle and field procedure. **[6]**

b) Describe electromagnetic method and give its principle. **[4]**

P.T.O.

Q4) Answer the following:

a) Explain processing and interpretation in Magnetic method. **[6]**

b) Describe granimeter and its types. **[4]**

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

a) Magnetometer

b) Bouguer anomaly

c) Air borne survey

d) Self potential method

e) Instruments in electromagnetic method.

f) Schlumberger array

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. : ____

PA-2266

[Total No. of Pages : 2

[5901]-363
T.Y.B.Sc.
GEOLOGY
SEC - I : Geotechnology
(2021 Pattern) (Semester - V) (Paper - VII) (Revised) (351610)

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

Instructions to the candidates:

1) ***Question no. 1 is compulosry.***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions Nos. 2 to 5 carry equal marks.***

Q1) Answer Any Five of the following questions in 2-3 lines: **[5]**

a) Enlist the rotary drilling equipments.

b) Define the liquid limit of soil.

c) Enlist the any two uses of levelling.

d) Define Horizontal plane.

e) Give the uses of oren.

f) Enlist the shallow foundations.

Q2) Answer the following.

a) Define drilling in geotechnicals, types of drilling and functions. **[6]**

b) Define core Recovery and Rock Quality designation with formula. **[4]**

Q3) Answer the following :

a) Give the classification of surveying in brief. **[6]**

b) Give the principle of surveying. **[4]**

P.T.O.

Q4) Answer the following.

a) Define the Bench marks and types of Bench marks in detail. **[6]**

b) Describe the collimation system of calculating reduced level. **[4]**

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

a) Draw a neat figure of pycnometer with labells.

b) Enlist the any two parameters considered for calculating RMR.

c) Define levelling staff and types of levelling staff.

d) Define plastic limit of soil.

e) Define safe bearing capacity of soil.

f) Explain the plain surveying.

Total No. of Questions : 5]

SEAT No. : ____

PA-2267

[Total No. of Pages : 2

[5901]-364

T.Y.B.Sc.

GEOLOGY

SEC - II : Gemology and Gem Testing

(2019 Pattern) (Semester - V) (Revised) (351611)

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

Instructions to the candidates:

1) ***Question no. 1 is compulosry.***
2) ***Solve any three questions from Q.2 to Q.5***
3) ***Questions Nos. 2 to 5 carry equal marks.***

Q1) Answer Any Five of the following question in 2-3 lines: **[5]**

a) Name the primary gem varieties of corundum.

b) Name the luster shown by diamond.

c) Define refractive index.

d) Define specific gravity.

e) Name any two instruments used for gem identification.

f) What is R.T. of Canada balsam?

Q2) Answer the following.

a) Explain various gemstones based on pleochroic colors. **[6]**

b) Write a note on rare gemstones. **[4]**

P.T.O.

Q3) Answer the following :

a) How to distinguish between synthetic and natural gemstones. **[6]**

b) Explain Dichroscope with neat labeled diagram. **[4]**

Q4) Answer the following.

a) Explain various organic gemstones. **[6]**

b) Write a note on Double refraction. **[4]**

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

a) Varities of silica

b) Gem synthesis

c) Diamond

d) Polariscope

e) Fluorescent effect

f) Birefringence

Total No. of Questions : 4]

SEAT No. : ____

PA-2268

[Total No. of Pages : 3

[5901]-365
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 table 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:

a) Le $X \sim C(\mu = 3, \lambda = 5)$ then distribution of $Y = 2X - 4$ is:

i) $\beta_1(3, 5)$ ii) $C(\mu = 10, \lambda = 4)$

iii) $C(\mu = 2, \lambda = 10)$ iv) $\beta_2(5, 5)$

b) Let $X \sim \beta_1(3, 12)$ and let $Y = \frac{x}{1-x}$ then the distribution of Y is _____

i) $\beta_1(3, 12)$ ii) $\beta_2(12, 3)$

iii) $\beta_2(3, 12)$ iv) $\beta_1\left(\frac{1}{3}, \frac{1}{12}\right)$

c) A sequence of random variables $X_1, X_2, ..., X_n$ is said to converge in probability to α if for any $\varepsilon > 0$, the $\lim_{n\to\infty} P\left(|X_n - \alpha| < \varepsilon\right)$ = _____

i) 1 ii) 0

iii) $\frac{1}{2}$ iv) 2/3

P.T.O.

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) The Weak Law of Large Numbers states that as the sample size becomes large, the sampling distribution of sample mean approaches normality.

b) The distribution of first order statistics $X_{(1)}$ based on the random sample of size '*n*' from G(θ, 1) is exponential with parameter (nθ).

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) Let $X \rightarrow C(0,1)$. Derive the distribution of $Y = X^2$.

c) A random sample of size 5 such as X_1, X_2,....., X_5 is drawn from U(0, θ). Derive the distribution of sample median of the sample.

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.m.f. $f(x) = \begin{cases} \frac{1}{6}, x = 1,2,...,6 \\ 0, \ otherswise \end{cases}$

Using central limit theorem, compute $P\left(\sum_{i=1}^{40} Xi \geq 160\right)$

c) If $X \rightarrow \beta_2(m, n)$ then derive the expression for mode of X.

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 $V = \frac{X}{X+Y}$ are indepedently distributed and identify their distributions. **[7]**

ii) Le $X \rightarrow C(0,1)$ the find $P(|X| > 1)$. **[3]**

b) i) Let X be a r.v. and $g(x)$ be any non-negative function of X with $E[g(x)] < \infty$ If 'k' is any positive real number then show that:

$$P[g(x) \geq k] \leq \frac{E[g(x)]}{k}$$ **[6]**

ii) Let $X_1, X_2, ..., X_n$ are independently and identically distributed exponential random variates with parameter λ. Show that min $(X_1, X_2, ...X_n)$ follows exponential distribution with parameter $(n\lambda)$. **[4]**

Total No. of Questions : 4] **SEAT No. :**

PA-2269 **[Total No. of Pages : 3**

[5901]-366
T.Y.B.Sc.
STATISTICS (Principal)
ST - 352 : Theory of Estimation
(CBCS 2019 Pattern) (Semester - V) (Paper - II) (35172)

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. **[1 each]**

A) Choose the correct alternative for each of the following:

a) Let $X_1, X_2, ...X_n$ is a random sample from U(0, θ), the bias in estimation of θ by the estimator $T = \bar{X}$ is

i) $\frac{\theta}{2}$ ii) $-\frac{\theta}{2}$

iii) 2θ iv) 0

b) Let $X_1, X_2, ...X_n$ be a random sample from Normal (μ, σ^2). The maximum likelihood estimator of μ. when σ^2 is know is

i) $\bar{X}$ ii) $X_{(n)}$

iii) $X_{(1)}$ iv) $2\bar{X}$

c) Suppose that $X_1, X_2, ...X_n$ is a random sample from Bernoulli (θ) distribution, which among the following is not sufficient statistic for θ

i) $\sum_{i=1}^{n} X_i$ ii) $\frac{\sum_{i=1}^{n} X_i}{2n}$

iii) $\bar{X}^2$ iv) $\bar{X}$

P.T.O.

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) A statistic T is sufficient for parameter θ if conditional distribution of random sample $X_1, X_2, ...X_n$ given T depends on θ.

b) If T_1 and T_2 are unbiased estimators of θ then there exist infinitely many unbiased estimators of θ.

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

a) Let $X_1, X_2, ...X_n$ is a random sample from a distribution with p.d.f given by $f(x) = \theta x^{\theta-1} \quad 0 \le x \le 1$ $= 0 \quad o.w.$ find maximum likelihood estimator of θ.

b) Show that if T is an unbiased estimator of θ, then $\phi(T)$ is unbiased estimator of $\phi(\theta)$ provided $\phi(\theta)$ is a linear function.

c) Let T_n is a sequence of estimators such that $\forall \theta \in \Theta, \text{Bias} = E(T_n) - \theta \to 0$, and $V(T_n) \to 0$ as $n \to \infty$. Then show that T_n is consistent estimator for θ.

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

a) Describe method of moments to estimate parameters. Find moment estimator of parameter *p* of Bernoulli distribution.

b) Let $X_1, X_2, ... X_n$ be a random sample from $N(\mu, \sigma^2)$, $S^2 = \frac{\sum_1^n (X_i - \bar{X})^2}{n}$.

Check whether S^2 is unbiased for σ^2 ?

c) State and prove Neyman Factorization theorem.

Q4) Attempt any one of the following.

a) i) Suppose $X_1, X_2, \ldots, X_5$ be a random sample from $N(\mu, \sigma^2)$ Consider the following estimators of λ.

$$T_1 = \frac{X_1 + X_2 + \ldots + X_5}{5}$$

$$T_2 = \frac{2X_1 + X_3 + 3X_5}{6}$$

Check whether T_1 and T_2 are unbiased for μ. Also decide which among them is more efficient. **[5]**

ii) Let $X \rightarrow$ Poisson(λ). Check whether $\sum X_i$ is sufficient for λ. **[5]**

b) i) Let $X_1, X_2, \ldots, X_n$ be a random sample from $N(\mu, 4)$. Find Fisher information function $I(\mu)$. Check whether $\bar{X}$ is minimum variance bound unbiased estimator (MVBUE) of μ. **[6]**

ii) If MVBUE exists for θ then MVBUE exists for $\phi(\theta)$where ϕ is a linear function. **[4]**

♦ ♦ ♦

Total No. of Questions : 4] **SEAT No. :**

PA-2270 **[Total No. of Pages : 2**

[5901]-367
T.Y.B.Sc.
STATISTICS (Principal)
ST - 353 : Design and analysis of Experiments
(2019 CBCS Pattern) (Semester - V) (Paper - III) (35173)

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 table and calculator is allowed.***

Q1) Attempt each of the following. **[1 each]**

A) In each of the following cases, choose the correct alternative:

a) In a Randomized Block Design (RBD) with 5 blocks and 4 treatments, the number of experimental units required are:

i) 16 ii) 9

iii) 20 iv) 25

b) Degrees of freedom for error in Latin square design (LSD) with m treatments are

i) $m - 1$ ii) $m - 2$

iii) $(m - 1)^2$ iv) $(m - 1)(m - 2)$

c) The main purpose of carrying out confounding in factorial experiments is to reduce the size of the

i) Blocks ii) Replicate

iii) Treatments iv) Experimental units

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) All the main effects in 2^3 factorial experiments are non-linear orthogonal contrasts.

b) The efficiency of randomized block design (RBD) relative to completely randomized design (CRD) is always greater than 1.

P.T.O.

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

a) State the model for latin square design (LSD) with assumptions. Obtain the least squares estimators of parameters involved in this model.

b) Explain terms total and partial confounding in factorial experiments.

c) Compute the efficiency of latin square design (LSD) with respect to randomized block design (RBD) by using.

i) Row as blocks

ii) Column as blocks

Based on the following information:

Treatment Sum of Squares = 183.5, Row Sum of Squares = 149.3,

Column Sum of Squares = 172.8, Total Sum of Squares = 568.2,

Number of Rows = 4

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

a) Show that mean sum of squares due to error is unbiased estimator of error variance σ^2 in completely randomised design (CRD).

b) Explain the main effect and Interaction effect in factorial experiments.

c) Obtain the formula for efficiency of randomized block design (RBD) over CRD.

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

a) i) Explain Yate's procedure to obtain factorial effect totals in 2^3 factorial experiment.

ii) Explain the procedure for testing for equality of two specified treatment effects using critical difference method in case of CRD.

b) i) Explain the procedure for analysis of non-normal data using Square root transformation for counts data.

ii) Explain with illustration which principles of design of experiments are used in completely randomized design?

Total No. of Questions : 4] **SEAT No. :**

PA-2271 **[Total No. of Pages : 3**

[5901]-368
T.Y.B.Sc.
STATISTICS
ST - 354 : Statistical Process and Product Control
(2019 Pattern) (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. **[1 each]**

A) In each of the following cases, choose the correct alternative:

a) Given that k samples each of size n have been drawn from a continuous production process, the probability distribution of $\bar{X}$ is considered to be normal with parameters:

i) $\hat{\mu} = \bar{\bar{X}}, \hat{\sigma} = \frac{\bar{R}}{d_2}$ ii) $\hat{\mu} = \bar{\bar{X}}, \hat{\sigma} = \frac{\bar{R}}{d_2\sqrt{k}}$

iii) $\hat{\mu} = \bar{\bar{X}}, \hat{\sigma} = \frac{\bar{R}}{D_2}$ iv) $\hat{\mu} = \bar{\bar{X}}, \hat{\sigma} = \frac{\bar{R}}{d_2\sqrt{n}}$

b) Which of the following is **NOT** one of the eight dimensions of quality?

i) Performance ii) Value

iii) Aesthetics iv) Durability

c) When both upper and lower specification limits are given, the proportion of non-conformities is:

i) P[X < USL] + P[X > LSL]

ii) P[X < USL] – P[X > LSL]

iii) P[X < LSL] + P[X > USL]

iv) P[X < UCL] + P[X > LCL]

P.T.O.

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) $C_{pk} = 0$ indicates that the process mean is equal to either lower or upper sepcification limit.

b) The point on the OC curve which corresponds to acceptance probability of zero is called point of indifference.

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

a) For 25 samples each of size 4, it is given that $\overline{R} = 0.01, \overline{\overline{X}} = 0.43.$ Obtain the 3σ control limits. IF the process average shifts to 0.435, calculate the probability of detecting this shift on the first sample after the shift.

b) Explain Acceptance Rectification Sampling. Also explain Average Outgoing Quality (AOQ) with reference to Acceptance Rectification Sampling.

c) Explain the construction and working of p - chart for process fraction defective not specified and unequal subgroup sizes. How do you interpret low spots in a p-chart?

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

a) Explain the working of a Single Sampling Plan. Also explain what is producer's risk and how it can be located graphically.

b) Explain the meaning and purpose of Statistical Quality Control. Also explain how Design of Experiments is considered as a process control (PC) tool.

c) The following information is given for a continuous production process: $\sum_{i=i}^{25} R_i = 0.0153, \sum_{i=1}^{25} \overline{X}_i = 0.9315, n = 5, k = 25.$ Assuming the quality characteristic to be normally distributed and the process to be under Statistical control, verify whether the process meets specifications if sepcification limits are taken same as the control limits. Justify your answer.

Q4) Attempt any one of the following.

a) i) A Double Sampling Plan operates with parameters N = 40000, $n_1 = 50$, $c_1 = 1$, $n_2 = 50$, $c_2 = 2$. If the process fraction defective is 0.05, find the probability that the lot will get accepted. **[4]**

ii) Explain the basis of control charts, Also justify the use of 3σ control limits for non-normal populations by means of Chebychev's inequality. **[6]**

b) i) Define Capability Performance Index (C_{pk}) and state its interpretations. What can be said about C_{pk} if process mean is centered at the norm? **[3]**

ii) Following data relate to number of weaving defects per rim of cloth as noted for 6 samples. Draw the appropriate control chart and state whether the process is under Statistical control. **[7]**

Rim no.	1	2	3	4	5	6
No. of defects	14	19	28	4	16	8

Total No. of Questions : 4] **SEAT No. :**

PA-2272 **[Total No. of Pages : 4**

[5901]-369
T.Y.B.Sc.
STATISTICS (Principal)
ST - 355 : Operations Research - I
(2019 CBCS Pattern) (Semester - V) (Paper - 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 table 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:

a) To convert a Linear Programming Problem (L.P.P) into the standard form for solving it by simplex method, all the constraints must be of:

i) '=' type ii) '>' type

iii) '≥' type iv) '<' type

b) In PERT, if T denotes the total project duration, then the variance of T is calculated taking into consideration:

i) All the activities of the project

ii) Only that activity which has the minimum duration

iii) Only the activities having zero float

iv) Any randomly chosen activities

c) If an Assignment Problem (A.P) is unbalanced, then which out of the following statements is always true:

i) It cannot be solved

ii) It has multiple optimal solutions

iii) It needs to be solved only for maximization type

iv) It needs to be balanced first and then solved

P.T.O.

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) In Critical Path Method (CPM), a dummy activity is defined as any task that utilizes time and resources of the project.

b) If a decision variable in the primal LPP is unrestricted in sign, then the corresponding constraint in the dual is of the '=' type.

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

a) Solve the following Linear Programming Problem (LPP) using the Simplex Method:

Maximize $Z = 2x_1 + 4x_2$

Subject to $x_1 - x_2 \leq 10$

$2x_1 - x_2 \leq 40$

$x_1 \geq 0, x_2 \geq 0$

b) Explain how an Assignment Problem (A.P.) may be considered as a special case of a Transportation Problem. (T.P.). When can it be said that an optimal solution to A.P. has been reached?

c) Explain the following terms with respect to Critical Path Method:

i) Event

ii) Earlist State Time

iii) Latest Finish Time

iv) Total float of an activity

v) Free float of an activity

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

a) Obtain the dual of the following LPP:

Minimize $Z = 7x_1 + 13x_2$

Subject to $x_1 + 3x_2 \leq 24$

$10x_1 + 17x_2 = 120$

$2x_1 - 14x_2 \geq 33$

$x_1 \geq 0$, x_2 unrestricted

b) A city has three water reservoirs that supply water to four localities A, B, C and D. The following table gives the water availability at each reservoir and requirement at each locality (both in million litres) and the pumping costs (in Rs per million litre):

Reservoir	Towns				Supply
	A	B	C	D	
I	2	3	4	5	15
II	3	2	5	2	20
III	4	1	2	3	25
Demand	8	10	15	12	

i) Obtain the Initial Basic Feasible Solution (IBFS) of the above T.P by Vogel's Approximation Method (V.A.M).

ii) Is the obtained solution degenerate? Justify your anwswer.

c) State the characteristics/ requirements of:

i) Standard form of L.P.P.

ii) Canonical form of L.P.P.

Q4) Attempt any one of the following.

a) i) In L.P.P., define the terms 'feasible solution' and 'optimal solution'. In context of the Simplex Method of solving L.P.P., state the criteria for identifying that the problem has: **[5]**

a) Unbounded solution

b) Infeasible solution

c) More than one possible optima solutions.

ii) A project consists of nine activities with the following relevant information.

Activity	Immediate Predecessor	Time Duration
A	---	3
B	---	5
C	A	4
D	B	3
E	C,D	6
F	E	1
G	E	3
H	F	2
I	G	4

Using the information given, Construct the project network diagram and find the critical path. **[5]**

b) i) A farmer owns 100 hectares of land for cultivation. He grows potatoes and tomatoes. He is expected to earn a profit of Rs. 5000 per hectare for potatoes and Rs. 6000 per hectare for tomatoes. He needs 100 kg fertilizer per hectare for potatoes and 300 kg fertilizer per hectare for tomatoes. The cost of the fertilized is Rs. 10 per kg and he can spend a maximum of Rs. 15,000 on fertilizer. The labur required per hectare for sowing, cultivation and harvesting for potatoes and tomatoes is 3 man-days and 1 man-day respectively, and the total man days of labour available is 150. Formulate the problem as a linear programming problem to maximize profit. **[5]**

ii) A Taxi Company has six cabs at different locations and five customers who have called for service. The mileage from each cab's present locations to each customer is shown in the following table. **[5]**

Cab	Customer				
	1	2	3	4	5
A	7	2	4	10	7
B	5	1	5	6	6
C	8	7	6	5	5
D	2	5	2	4	5
E	3	3	5	8	4
F	6	2	4	3	4

Determine the optimal assignment that will minimize the total mileage travelled. Also state which cab will not be assigned to any customer

♦ ♦ ♦

Total No. of Questions : 4] **SEAT No. :**

PA-2273 **[Total No. of Pages : 2**

[5901]-370
T.Y.B.Sc.
STATISTICS (Principal)
ST - 356 : Regression Analysis
(2019 CBCS Pattern) (Semester - V) (Paper - VI) (35176)

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. **[1 each]**

A) In each of the following cases, choose the correct alternative:

a) In the linear regression analysis, the independent variable is also known as

i) predictor variable ii) regressor variable

iii) explanatory variable iv) all of these

b) In simple linear regression model $\hat{\beta}_1$ is a

i) non-linear function of observation y_i

ii) linear function of observation x_i

iii) linear function of observation y_i

iv) non-linear function of observation x_i

c) Under null hypothesis of regression, the distribution of ratio of regression mean squares and residual mean squares is

i) F distribution ii) t distribution

iii) Normal distribution iv) None of these

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) For the multiple linear regression model $y = X\beta + \varepsilon$, then least squares estimator of β is given by $(X' X)^{-1}Xy'$

b) If $\beta_0 = \beta_1 = 0$ in the univariate logistic regression model, then the expected value of the response variable y is 0.5.

P.T.O.

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

a) Consider the simple linear regression model, $Y = \beta_0 + \beta_1 x + \varepsilon$ with $E(\varepsilon) = 0$, Var $(\varepsilon) = \sigma^2$ and ε_i, $i = 1,2,....,$ n uncorrelated. Show that

$$\text{Cov}\left(\hat{\beta}_0, \hat{\beta}_1\right) = \frac{-\overline{x}\sigma^2}{\sum_{i=1}^{n}(x_i - \overline{x})^2}.$$

b) Explain the procedure to fit the multiple regression model.

c) In logistic regression discuss in brief model deviance.

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

a) Explain in brief detection and treatment of outliers.

b) With usual notations prove that, $E(MS_{res}) = \sigma^2$.

c) State logistic regression model with single regressor. Discuss logit transformation.

Q4) Attempt any one of the following.

a) i) Given that, $S_{xx} = 1160.75$, $S_{xy} = -4512.78$, $\overline{x} = 15.89$ and $\overline{y} = 80.15$. Fit a simple linear regression model for the given data. Also, find the expected value of response variable for $x = 20$. **[5]**

ii) Write a note on corrective measures for variance stabilizing transformation. **[5]**

b) i) Show that, the sum of residuals weighted by corresponding fitted values is always zero. **[5]**

ii) For a multiple linear regression model, $Y = X\beta + \varepsilon$ construct 100 $(1 - \alpha)$% confidence interval for the regression coefficient β_j, $j = 0, 1, 2, ..., k$. **[5]**

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. :

PA-2274

[Total No. of Pages : 2

[5901]-371

T.Y. B.Sc.

GEOGRAPHY

GG-351 : Regional Geography of India-I

(CBCS 2019 Pattern) (Semester-V) (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) ***Question 2 to Q.5 carry equal marks.***

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

a) State the name of neighboring countries of India.

b) Which is the highest peak of the Himalaya?

c) Give name of source region of the Narmada river.

d) Red soil is mainly found in which region?

e) Define Monsoon.

f) What is Frontier?

Q2) a) Describe the significance of Indian peninsular plateau. **[6]**

OR

Discuss about east flowing river.

b) Explain in detail administrative divisions of India. **[4]**

Q3) a) Explain the historical background of India. **[6]**

OR

Describe thermal concept of monsoon.

b) Explain the river system of peninsular India. **[4]**

P.T.O.

Q4) a) Discuss the Soil Distribution of India. **[6]**

OR

Describe the location and extent of India.

b) Write causes of Soil erosion. **[4]**

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

a) Andaman & Nicobar Islands.

b) India's land frontier.

c) Tapi River.

d) Characteristics of winter season.

e) Purvanchal.

f) Black Cotton Soil.

Total No. of Questions : 5]

SEAT No. :

PA-2275

[Total No. of Pages : 2

[5901]-372

T.Y. B.Sc.

GEOGRAPHY

GG-352 : Geography of Economic Activities-I

(CBCS 2019 Pattern) (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) Give two example of secondary economic activitites.

b) What is renewable resources?

c) What is resource?

d) Give two examples of non-renewable resources.

e) Which are the types of human resources.

f) Write any two examples fo quinary economic activities.

Q2) a) Describe the characteristics of Primary economic activities. **[6]**

OR

Describe the water resource planning policy of Government of India.

b) Explain the global energy crisis. **[4]**

Q3) a) Explain the chistaller's central place theory. **[6]**

OR

Explain the Weber's model of industrial location.

b) Discuss the indices network analysis. **[4]**

P.T.O.

Q4) a) Discuss the climatological and economic factor affecting economic activities. **[6]**

OR

Discuss the classification of economic activities.

b) Explain the role of capital in economic activities. **[4]**

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

a) Transport principle (K-4).

b) Central place.

c) Man made resources.

d) Energy resources.

e) Secondary activities.

f) Network analysis.

Total No. of Questions : 5]

SEAT No. :

PA-2276

[Total No. of Pages : 2

[5901]-373

T.Y. B.Sc.

GEOGRAPHY

GG-353 : Fundamentals of Tourism

(CBCS 2019 Pattern) (Semester-V) (35183)

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 2 to Q.5 carry equal marks.***

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

a) State the difference between travel & tourism.

b) What is ITDC.

c) Mention any two purposes of tourism.

d) State any two impacts of soil on tourism.

e) What is heritage tourism?

f) Name any two UNESCO heritage sites in Maharashtra.

Q2) a) Explain the role of Geography in tourism. **[6]**

OR

Explain tourism as an economic activities.

b) Describe the Nature of tourism Geography. **[4]**

Q3) a) Explain the concept of cultural tourism & its significance in India. **[6]**

OR

Describe the concept of sustainable tourism.

b) Describe the concept of recreation & leisure. **[4]**

P.T.O.

Q4) a) Explain the Positive & Negative impact of Economy on tourism. **[6]**

OR

Explain the role of MICE in tourism.

b) Describe the cultural diversity of India. **[4]**

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

a) Tourism.

b) Agro-tourism.

c) National parks in India.

d) Geo-tourism.

e) Adventure tourism.

f) Eco-tourism.

Total No. of Questions : 5]

SEAT No. :

PA-2277

[Total No. of Pages : 2

[5901]-374
T.Y. B.Sc.
GEOGRAPHY
GG-354 : Geography of Soil - I
(CBCS 2019 Pattern) (Semesters-V) (35184)

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

Instructions to the candidates:

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

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

a) Define Soil.

b) Define weathering.

c) What is soil profile?

d) What do you understand by Soil density.

e) State any two processes of human formation.

f) Mention any two features of soil moisture.

Q2) a) Describe the scope of soil geography. **[6]**

OR

Discuss the nature of soil geography.

b) State the ion exchange in soil. **[4]**

Q3) a) Explain the soil pH and NPK. **[6]**

OR

Explain the phisical properties of the soil.

b) Write the importance of soil studies in geography. **[4]**

P.T.O.

Q4) a) Discuss the factors responsible for soil formation. **[6]**

OR

Discuss the various types of physical weathering.

b) Write the biological properties of the soil. **[4]**

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

a) Soil geography approaches.

b) Soil water relationship.

c) Carbonation process of soil formation.

d) Field capacity.

e) Soil organic matter.

f) 'O' Horizon of soil profile.

Total No. of Questions : 5]

SEAT No. :

PA-2278

[Total No. of Pages : 2

[5901]-375

T.Y. B.Sc.

GEOGRAPHY

GG-355 : Management of Natural Disaster

(CBCS 2019 Pattern) (Semesters-V) (35185)

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 Q.5 carry equal marks.***

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

a) Define the term Vulnerability.

b) What do you understand by the term disaster?

c) Write any two causes of Tsunami?

d) What is cyclone?

e) List any two impact of flood.

f) Define the term mitigation.

Q2) a) Discuss the application of remote sensing in disaster planning. **[6]**

OR

Write the role of government organisations in mitigation to disasters.

b) Write in brief about disaster management cycle. **[4]**

Q3) a) Write in brief about disaster mapping in India. **[6]**

OR

Describe in detail the causes and impact of drought in India.

b) Explain the concept of community based disaster management. **[4]**

P.T.O.

Q4) a) Describe in detail the concept of respone and mitigation to disaster. **[6]**

OR

Write in detail about distribution of atmospheric disaster in India.

b) Explain in brief the causes and impact of earthquakes. **[4]**

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

a) Classification of disasters.

b) Landslides.

c) Disaster risk reduction.

d) Geo- physical disaster.

e) Do's during post disaster.

f) Tsunami.

Total No. of Questions : 5]

SEAT No. :

PA-2279

[Total No. of Pages : 2

[5901]-376
T.Y. B.Sc.
GEOGRAPHY
GG-356 : Geoinformatics-I
(2019 Pattern) (CBCS) (Semester-V) (Regular) (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) ***Questions Q.2 to Q.5 carry equal marks.***

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

a) What do you understand by the term manipulation?

b) Name any two components of GIS.

c) List any two data sources used in GIS.

d) Define the term Raster in GIS.

e) What is attribute data?

f) What do you mean by dissolve in GIS?

Q2) a) Write in detail about scope of Geoinformatics. **[6]**

OR

Describe in detail the historical development of GIS.

b) Write in brief about spatial data types in GIS. **[4]**

Q3) a) Describe about the vector data and give its characteristics. **[6]**

OR

Discuss in detail the various data sources of GIS.

b) What is GIS data editing? Explain with example. **[4]**

P.T.O.

Q4) a) Explain in detail the concept of topology building. **[6]**

OR

Describe the relationship between entities and attribute data linking.

b) Write in brief about Non-spatial data analysis. **[4]**

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

a) Overlay analysis.

b) DEM.

c) Multicriteria analysis.

d) Topological errors.

e) Satellite data.

f) Aerial photographs.

Total No. of Questions : 5]

SEAT No. :

PA-2280

[Total No. of Pages : 2

[5901]-377

T.Y. B.Sc.

GEOGRAPHY

GG-3510 : Research Methodology-I

(CBCS 2019 Pattern) (Semester-V) (351810)

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 Q.5 carry equal marks.***

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

a) Define the concept of research.

b) Write any two objectives of research.

c) What is research design?

d) Why research design is essential?

e) Define research problem.

f) Write need for defining a research problem.

Q2) a) Describe the types of research. **[6]**

OR

Describe various steps in research process.

b) Write in brief on research design. **[4]**

Q3) a) Describe the purpose of research design. **[6]**

OR

Describe characteristics of good research.

b) Write a short note on purpose of research. **[4]**

P.T.O.

Q4) a) Explain the steps of identification of research problem. **[6]**

OR

Describe technique involved in defining a research problem.

b) Which are the aspects of delimiting a research problem. **[4]**

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

a) Meaning of research.

b) Research methodology.

c) Descriptive research.

d) Hypothesis formulation.

e) Sources of the problem.

f) Objectives of assumptions about the research problem.

Total No. of Questions : 5]

SEAT No. :

PA-2281

[Total No. of Pages : 2

[5901]-378

T.Y. B.Sc. (Regular)

GEOGRAPHY

GG-3511 : Elementary Surveying (SEC)

(CBCS 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) ***Question 2 to 5 carry equal marks.***

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

a) What is contour?

b) Mention the methods of total station surveying.

c) State any two advantages of DGPS surveying.

d) Mention methods of dumpy level.

e) What is radial method of surveying.

f) Define geodetic surveying.

Q2) a) Describe the functions and methods of theodolite surveying. **[6]**

OR

Describe the function and methods of prismatic surveying.

b) Write the methods of surveying. **[4]**

Q3) a) Explain the applications of surveying. **[6]**

OR

Explain the advantages of drone surveying.

b) Write the parts of dumpy level. **[4]**

P.T.O.

Q4) a) Explain the characteristics of total station. **[6]**

OR

Discuss the demerrits of total station.

b) Write the functions of total station. **[4]**

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

a) Drone surveying.

b) Dumpy level.

c) Intersection method of plane table surveying.

d) Features of total station.

e) Demerrits of place table surveying.

f) Setting up of prismatic compass.

Total No. of Questions : 5]

SEAT No. :

PA-2282

[Total No. of Pages : 2

[5901]-379

T.Y. B.Sc.

MICROBIOLOGY

MB-352 : Medical Microbiology - I

(CBCS 2019 Pattern) (Semesters-V) (35191)

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

Instructions to the candidates:

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

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

a) Give any two biochemical characters of *Streptococcus pneumoniae.*

b) Write the selective media used for growth of *Neisseria meningitidis.*

c) Write any two toxins produced by *clostridium tetani.*

d) True or False: middle ear infection is called as otitis media

e) What is the causative agent for scrub typhus.

f) Define Epidemiology.

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

i) Case control studies.

ii) Source of Infection.

iii) Antigenic structure of *streptococcus pyogenes.*

b) Describe upper respiratory system with neat labelled diagram. **[4]**

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

i) Laboratory diagnosis of *Mycobacterium tuberculosis.*

ii) Symptoms of diseases caused by *pseudomonas aeruginosa.*

iii) Bacterial diseases and symptoms of the gastrointestinal system.

b) Explain design of concurrent parallel trials. **[4]**

P.T.O.

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

i) Various measures for the provention and control of diseases.

ii) Principles of clinical trials of drugs.

iii) Bacterial diseases of female urogenital system with causative agents.

b) With neat labelled diagram represent liver. **[4]**

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

a) Pathogenicity of *Neisseria meningitidis.*

b) Laboratory diagnosis of *clostridium tetani.*

c) Mode of transmission of infection.

d) Spotted fevers.

e) Central nervous system.

f) Vaccine preventable bacterial diseases.

Total No. of Questions : 5]

SEAT No. :

PA-2283

[Total No. of Pages : 2

[5901]-380
T.Y. B.Sc.
MICROBIOLOGY
MB-352 : Immunology-I
(CBCS) (2019 Pattern) (Semesters-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 Q.5 carry equal marks.***

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

a) Write any two important functions of lymphatic system in immune response.

b) Define PAMP with one example.

c) What is antibody cross reactivity? Write anyone example.

d) Define autograft with one example.

e) Write any two therapeutic applications of monoclonal antibodies.

f) Write class of antibody activating complement pathway and class of antibody predominant along mucus membrane.

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

i) Describe the structure of lymph node with the help of diagram.

ii) What is adjuvant? Write names of any two adjuvants and their applications.

iii) Explain precipitation reaction in gel. Writes its applications.

b) Diagrammatically explain the mechanism of alternate pathway. **[4]**

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

i) Explain the role of MALT.

ii) Describe antigenic nature of immunoglobulin molecule.

iii) What is agglutination inhibition reaction? Write its applications.

b) Write any two functions of each macrophage and dendritic cell in immune response. **[4]**

P.T.O.

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

i) Diagrammatically explain micro cytotoxicity reaction.

ii) Draw neat labelled diagram of direct immunofluorescence technique. Write its applications.

iii) Diagrammatically represent the kappa-chain DNA rearrangement.

b) With neat labelled diagram, explain FACS technique. Write its applications. **[4]**

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

a) Acute phase reactants.

b) Autoantigen and isoantigen.

c) Lattice hypothesis and two stage theory.

d) Effector phase of allograft rejection.

e) Mixed lymphocyte reaction.

f) Preparation & propogation of hybridomas.

Total No. of Questions : 5]

SEAT No. :

PA-2284

[Total No. of Pages : 2

[5901]-381
T.Y. B.Sc.
MICROBIOLOGY
MB-353 : Enzymology
(CBCS 2019 Pattern) (Semester-V) (35193)

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 Q.5 carry equal marks.***

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

a) Thiamine pyrophosphate contains _____ring.

b) Define unit of an enzyme.

c) State true of false: Allosteric enzymes. Obeys M.M.eq^{n}.

d) Enlist any two isotopes used for enzyme assays.

e) "V_{max} is independent of substrate concentration" State true or false.

Q2) a) Describe the following (any three). **[6]**

i) Isoelectric focusing.

ii) Covalent modification of enzyme in enzyme regulation.

iii) State L.B. equation & give its graphical representation.

iv) Solvent precipitation in enzyme purification.

b) Enlist methods of enzyme purification, based on molecular size. Describe molecular exclusion chromatography with neat labelled diagram. **[4]**

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

i) Biochemical function of vitamin D.

ii) X-ray crystallography.

iii) Construction of purification chart in enzyme purification.

iv) Specific activity of enzyme & its significance.

b) What are zymogens? How they are activated. **[4]**

P.T.O.

Q4) a) Describe any three of the following. **[6]**

i) Applications of immobilized enzymes.

ii) Role of TPP in metabolism.

iii) Radio isotope assays.

iv) Methods of cell fractionation

b) Derive Michaelis-Menton equation for determination of initial velocity of an enzyme. **[4]**

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

a) Properties of Allosteric enzymes.

b) KM.

c) Use of pseudo-substrate in mapping of active site.

d) Brigg – Haldane's modification of Michaelis-Menten equation.

e) Enzyme compartmentation in enzyme activity regulation.

f) Comparison between feed back inhibition and feed back repression.

Total No. of Questions : 5]

SEAT No. : ____

PA-2285

[Total No. of Pages : 2

[5901]-382

T.Y. B.Sc.

MICROBIOLOGY

MB-354 : Genetics

(CBCS 2019 Pattern) (Semester-V) (Paper-IV) (35194)

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 Q.5 carry equal marks.***

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

a) Which enzyme has 5' to 3' as well as 3' to 5' exonuclease activity?

b) State two types of terminators of transcription in prokaryotes.

c) What type of gene is lacIgene in lac operon?

d) State any two termination codons in translation process.

e) State the properties of 'r' & 's' strains of *S.pneumoniae* used by F.Griffith.

f) What does Hfr stand for?

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

i) State the role of DNA polymerase I and DNA polymerase III in DNA replication.

ii) What is the role of sigma (σ) factor in initiation of prokaryotic transcription?

iii) State the function of tRNA in transcription.

iv) What is homolgous recombination?

b) With suitable diagram explain initiation of transcription in eukaryotes. **[4]**

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

i) Why tRNA is described as an adapter molecule in translation process.

ii) What is the role of positive regulator in lac operon?

iii) What is spliceosome?

iv) What is the role of Tus proteins in termination of DNA replication.

b) Explain gene mapping in bacteria using co-transformation. **[4]**

P.T.O.

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

i) Describe various mating types of *E.Coli*.

ii) Explain semi conservative DNA replication.

iii) State termination codons with their role in termination of translation.

iv) Name the specific sites on bacterial and phage DNA involved in specialised transduction.

b) With suitable diagram explain transformation in pneumococci. **[4]**

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

a) Merozygote.

b) Recombination frequency and gene mapping.

c) Role of helperphage in specialised transduction.

d) Formation of F' Strain.

e) LA2 and LA22 strains of *S. typhimurium* in transduction.

f) Structure of prokaryotic RNA polymerase.

Total No. of Questions : 5]

SEAT No. :

PA-2286

[Total No. of Pages : 2

[5901]-383

T.Y. B.Sc.

MICROBIOLOGY

BSEC-MB-355 : Fermentation Technology-I

(2019 Pattern) (CBCS) (Semesters-V) (35195)

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

Instructions to the candidates:

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

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

a) State any 2 objectives of strain improvement.

b) State any 2 methods for media optimization.

c) What is RSM?

d) Write the formula for Del factor.

e) Enlist levels of scale-up.

f) What is validation.

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

i) Filter sterilization of media.

ii) Ames test.

iii) Auxotrophic mutants.

b) Explain liquid-liquid extraction. **[4]**

Q3) a) Explain the following (any two). **[6]**

i) Rotary vacuum filtration process.

ii) Scale-up for sterilization.

iii) Analogue resistant mutants.

b) Explain pyrogen testing by animal inoculation test. **[4]**

P.T.O.

Q4) a) Describe the following (any two). **[6]**

i) LAL test.

ii) Distillation.

iii) Types of IPR.

b) Explain cell disruption methods. **[4]**

Q5) Write short notes on (any four): **[10]**

a) Non-recurring expenditure.

b) Bioburden test.

c) Drying.

d) Cell-Permeability mutants.

e) Sterility testing.

f) Scale-down.

Total No. of Questions : 5]

SEAT No. :

PA-2287

[Total No. of Pages : 2

[5901]-384
T.Y. B.Sc.
MICROBIOLOGY
DSEC-MB-356 : Agricultural Microbiology
(2019 Pattern) (Semesters-V) (CBCS) (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) ***Question 2 to Q.5 carry equal marks.***

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

a) Define infection.

b) What is the causative agent of 'mosaic' disease?

c) What are transgenic crops?

d) Define microbiome.

e) Write any two examples of shuttle vectors.

f) What is diazotrophy?

Q2) a) Describe the following Any three. **[6]**

i) Perannation.

ii) Canker symptoms.

iii) Monocyclic disease.

iv) Applications of plant biofilms.

b) Describe plant disease triangle. **[4]**

Q3) a) Explain the following Any three. **[6]**

i) Dissemination.

ii) Edible vaccines.

iii) Biological control of plant diseases.

iv) Phosphate solubilizers.

b) Write a note on RNAi technology. **[4]**

P.T.O.

Q4) a) Discuss the following Any three. **[6]**

i) Herbicide resistance.

ii) Forecasting of plant diseases.

iii) Role of microorganisms in soil health.

iv) Antisense RNA technology applications.

b) Schematically represent the technology of development of BT crops.**[4]**

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

a) Plant disease control by eradication.

b) Role of genetic engineering in plant disease resistance.

c) Methods of plant invasion.

d) Methods of plant growth improvement.

e) Mechanism of Potassium mobilization.

f) Integrated pest Management.

Total No. of Questions : 5]

SEAT No. :

PA-2288

[Total No. of Pages : 2

[5901]-385

T.Y. B.Sc.

MICROBIOLOGY

MB-3510 : Marine Microbiology

(CBCS) (2019 Pattern) (Semester-V) (351910) (Regular)

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 Q.5 carry equal marks.***

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

a) What are 'VBNC'?

b) Mention any two examples of thermophilic bacteria.

c) Write any two examples of marine habitats.

d) Define 'Marine Snow'.

e) Enlist the types of extremophiles.

f) Define bioremediation.

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

i) Estuarine marine habitat.

ii) Salt marshes.

iii) Culturing of VBNC.

b) Explain the role of marine microorganisms in biogeochemical cycles. **[4]**

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

i) Role of thermophiles in bioremediation.

ii) Microbial mats in marine habitats.

iii) Any one method of sediment sampling.

b) Explain the applications of extremophiles in marine habitats. **[4]**

P.T.O.

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

i) Methods used to study & culture 'biofilms'

ii) 'Arachaea' in bioremediation.

iii) Formation of coral reefs.

b) Explain the role of extremophiles in degradation of hydrocarbon pollutants. **[4]**

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

a) Marine loops.

b) Coastal ecosystems.

c) Polar habitat.

d) Halophiles.

e) Gravity corer.

f) Stress response in archaebacteria.

Total No. of Questions : 5]

SEAT No. :

PA-2289

[Total No. of Pages : 2

[5901]-386
T.Y. B.Sc.
MICROBIOLOGY
MB-3511 : Dairy Microbiology
(2019 Pattern) (CBCS) (Semester-V) (Regular) (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) ***Questions 2 to Q.5 carry equal marks.***

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

a) Define colostrum.

b) Define bacto fugation.

c) Pasteurization is a process of sterilization of milk. State True or False.

d) Enlist physical & chemical agents used for preservation of dairy products.

e) Define skimmed milk.

f) Enlist organisms responsible for sweet curdling.

Q2) a) Solve any three of the following. **[6]**

i) Enlist milk borne diseases.

ii) What is thermisation & give its applications.

iii) Enlist any two flavor defects in milk.

iv) Enlist any four GMP in quality assurance of milk products.

b) Describe ropiness of milk with oragnisms involved in it. **[4]**

Q3) a) Solve any three of the following. **[6]**

i) Compare whole, toned & double toned milk.

ii) Describe thermisation as a processingtech. in dairy product processing.

iii) Enlist examples of food grade preservatives.

iv) What do you mean by HACCP.

b) What do you mean by successsion of microorganisms in milk leading to spoilage. **[4]**

P.T.O.

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

i) Enlist various methods used to control biofilm on equipments for safety concer of milk.

ii) Enlist various color changes in milk ट organisms responsible for it.

iii) Enlist physico chemical properties of milking animals.

iv) What is stormy fermentation of milk?

b) Enlist application of HACCP programs in dairy industry. **[4]**

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

a) Difference between ropiness & sweet curdling.

b) Good manufacturing practices in quality assuarance of milk.

c) Micro flora of milk.

d) Standard operating procedures in dairy industry.

e) Effeciency of Pasteurization.

f) Quality assuarance of milk products..

Total No. of Questions : 5]

SEAT No. :

PA-2290

[Total No. of Pages : 2

[5901]-387
T.Y.B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
N.S. 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 neta and Labelled diagram wherever necessary.***
5) ***Figures to right indicate full marks.***

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

a) Define Latex stage mixing.

b) Define polymer nanoscience.

c) Define Exfoliation method.

d) Give the benefits of Nanocomposites.

e) Define composite material. Give example.

f) Writ two applications of composites.

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

i) Explain reinforced rubber.

ii) Differentiate between the thermoplastic and thermo setting polymer.

b) Explain preparation of nanodiamondy by detonation method. **[4]**

P.T.O.

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

i) Write in detail application of layered and non-layered nano and micro particles.

ii) Explain in detail nucleating effect.

b) Explain in detail diamond synthesis route. **[4]**

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

i) Explain the terms - dispersion

ii) Explain the term - reinforced rubber.

b) Explain in detail application of Nanocomposites. **[4]**

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

a) Melt - mixing.

b) Loser ablation method.

c) Composite material rheology.

d) Graphite.

e) Supercapacitor.

f) MWCNT'S (multi - walled carbon nano tubes)

x x x

Total No. of Questions : 5] **SEAT No. :**

PA-2291 **[Total No. of Pages : 2**

[5901]-388
T.Y.B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
N.S. 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) ***Questions 2 to 5 carry equal marks.***
4) ***Draw the neat and Labelled diagram wherever necessary.***
5) ***Figures to the right indicate full marks.***

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

a) Define quantum well.

b) Write the properties of nanocluster.

c) Draw diagram of X-ray absorption tine structure.

d) Define microcononical ensemble.

e) Write application of X-ray absorption tine structure.

f) Define quantum dots.

Q2) a) Write down any one of the following : **[6]**

i) Explain Lioville's theorem.

ii) Explain quantum size effect.

b) Explain insulator and semiconductor. **[4]**

P.T.O.

Q3) a) Write down any one of the following : **[6]**

i) Explain working principle and Experimental set up of X-ray photo-electron spectroscopy.

ii) Explain instrumentation of ESR spectroscopy.

b) Explain NMR spectroscopy with working principle and experimental set up. **[4]**

Q4) a) Write down any one of the following : **[6]**

i) Explain working principles and Experimental set up of EMR.

ii) Explain dynamic light.

b) Explain poisson's distribution. **[4]**

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

a) Write uses of nanocluster.

b) Draw block diagram of ESR spectroscopy.

c) Explain the Fermi – Dirac statistics.

d) Explain quantum distribution function.

e) Draw the diagram of quantum well.

f) Draw the diagram of quantum dots.

Total No. of Questions : 5]

SEAT No. :

PA-2292

[Total No. of Pages : 2

[5901]-389
T.Y.B.Sc. (Nanoscience and Nanotechnology)
NS - 353 : NANOBIOTECHNOLOGY
(2019 Pattern) (Semester - V) (Paper - III) (35263)

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 neta and Labelled diagram wherever necessary.***
5) ***Figures to right indicate full marks.***

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

a) What is RNA?

b) What is Plasmid?

c) Define the term cilia.

d) Define the Flagella.

e) Define the term Cosmid.

f) What is vector?

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

i) How carbohydrates are classify.

ii) What are DNA? Explain the types of A, B and Z DNA. **[6]**

b) With the help of example explain the mode of action of Restriction enzymes. **[4]**

P.T.O.

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

i) With the help of diagram explain fibrous and globular protein.

ii) Write a short note on amino acids with its properties.

b) Draw diagram tRNA and examples. **[4]**

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

i) What are biological motors? Explain Alps.

ii) Define the term lipids? Write short note on phospholipids.

b) Write a short amount on ferritin. **[4]**

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

a) Function of carbohydrates.

b) Classification of polysaccharides.

c) Functions of proteins.

d) Significances of lipids in the body.

e) Haemoglobin function.

f) Nisaubrides.

Total No. of Questions : 5]

SEAT No. :

PA-2293

[Total No. of Pages : 2

[5901]-390
T.Y.B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
NS 354 : Corbon Based Nanomaterials
(2019 Pattern) (Semester - V) (Paper - IV) (35264)

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 neta and Labelled diagram wherever necessary.***
5) ***Figures to right indicate full marks.***

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

a) Define the term catalysis.

b) Define Allotropes of carbon.

c) Give the names of mechanical properties of carbon nanotubes.

d) Give the names of two forms of Graphite.

e) What is pyrrolytic technique?

f) Which acids are used to remove impurities from carbon nanotubes materials?

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

i) Explain catalytic applications of nanoforms of carbon.

ii) Give Introduction of carbon.

b) Explain the term super capacitor. **[4]**

P.T.O.

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

i) Explain in detail loser abiation method.

ii) Explain the term water purification from CNT's.

b) Explain Biological applications of carbon based Nanomaterials. **[4]**

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

i) Give in detail mechanical properties of fullerence.

ii) Explain in detail structure and bonding in Graphite.

b) Explain in detail production of carbon Nanotubes. **[4]**

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

a) Laser abiation method.

b) Graphite.

c) Biosensors.

d) CNT's

e) Chemical vapour deposition method.

f) Electric orc - discharge.

x x x

Total No. of Questions : 5]

SEAT No. : ____

PA-2294

[Total No. of Pages : 2

[5901]-391
T.Y.B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
NS-355 : Energy Conversion Devices and Applications
(2019 Pattern) (Semester - V) (Paper - V) (35265)

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 neta and Labelled diagram wherever necessary.***
5) ***Figures to right indicate full marks.***

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

a) What is dye-sensitized solar cell?

b) What is perovskite solar cell?

c) Write equation of fill factor?

d) Define photovoltaic solar cell?

e) Draw the diagram of plastic solar cell.

f) What is energy of light with a wavelength of 662 nm?

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

i) Explain introduction and construction of dye-sensitized solar cell.

ii) Explain properties of working photoelectrode.

b) Explain and design thin film solar cell. **[4]**

P.T.O.

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

i) Explain photophysics of various pervoskite material.

ii) Explain mechanism of photon absorption and power generation.

b) Explain the mechanism of Excitons in polymer. **[4]**

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

i) Explain the minority carrier lifetime and diffusion length measurement.

ii) Explain the mechanism of DSSCs.

b) Explain the greenhouse effect. **[4]**

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

a) Write properties of dyes?

b) Explain History of perovskite solarcell.

c) Write properties of sunlight?

d) Explain planer heterojunction solar cell.

e) Draw the labelled diagram for donor and acceptor polymer?

f) What is wavelength of light with energy 3×10^{-19}J?

Total No. of Questions : 5]

SEAT No. :

PA-2295

[Total No. of Pages : 2

[5901]-392
T.Y.B.Sc. (Regular)
NANOSCIENCE AND NANOTECHNOLOGY
NS 356 : Environmental Nanotechnology and Applications
(2019 Pattern) (Semester - V) (Paper - VI) (35266) (Elective - I)

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 right indicate full marks.***

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

a) List the physiochemical properties of waste water.

b) Define Engineered nanomaterials.

c) Define ultrafine dust/particle.

d) Give sources of Air pollution.

e) Give example of catalyst.

f) What is seive effect?

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

i) Give the detail properties of sensors.

ii) Give the uses of graphen based sensors.

b) Explain mesoporus silica and its applications to the absorption of toxic onion. **[4]**

P.T.O.

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

i) Explain synthesis and characterisation of Tin oxide.

ii) State and explain, The Air (presentation and control of pollution) act - 1981.

b) Explain toxicity due to air born nanomaterials. **[4]**

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

i) Explain pollution in the atmosphere.

ii) Explain wast water treatment for sugar Industry.

b) Explain elimination of dust deposited in the lungs. **[4]**

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

a) Pollution cantrol equipment.

b) Fabric Filters.

c) Water pollution.

d) Anaerobic digestions.

e) Rotating drums.

f) Collidal silver and gold.

x x x

Total No. of Questions : 5]

SEAT No. : ____

PA-2296

[Total No. of Pages : 2

[5901]-393
T.Y.B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
NS-3510 : Basic Instrumentation Skills
(2019 Pattern) (Semester - V) (352610)

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 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) Define sensitivity?

c) What is pulse generation?

d) Define Functional generation?

e) Define distortion?

f) What is Error?

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

i) Explain construction and working of DC bridges.

ii) What is Error measurement? Explain it's different types.

b) Explain the working of Basis of LCR meter. **[4]**

P.T.O.

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

i) Explain construction and working of AC bridges.

ii) Explain basic controls of CRO.

b) Write down the characteristics of digital instruments. **[4]**

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

i) Explain the Block diagram and working of digital multimeter.

ii) Explain chemical composition of CRO.

b) Write down the specifications of function generator? **[4]**

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

a) Write Application of Pulse generator?

b) Write Application of functional generator?

c) Write Advantages and disadvantages of DSO?

d) Write difference between analog instruments and digital instruments?

e) Explain the different types of pulse generator.

f) Write short note on multimeter?

x x x

Total No. of Questions : 5]

SEAT No. : ____

PA-2297

[Total No. of Pages : 2

[5901]-394
T.Y.B.Sc. (Regular)
NANOSCIENCE AND NANOTECHNOLOGY
NS 3511 : C-Programming
(2019 Pattern) (Semester - V) (352611)

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.***

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

a) State different programming language.

b) What is Flowchart?

c) What is keywords?

d) Write syntax to draw circle.

e) What is use of initgraph?

f) Write syntax for print & function.

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

a) Write C-program to find factorial of given number.

b) Write short note on operator in C.

c) State and explain different datatypes.

P.T.O.

Q3) a) Explain use of **[6]**

i) Setcolor

ii) gd

iii) # include <graphics.h>

OR

a) Write C-program to draw simple cubic structure. **[6]**

b) Explain difference between do...while and while loop. **[4]**

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

a) Find integration of an eq^{n} $\frac{1}{x}$ using trapezoidal rule

(given $x_0 = 1$, $x_n = 2$, $n = 4$)

b) Draw Flowchart to find integration of given function using simpson $\frac{1}{3}^{rd}$ rule.

c) What is constant? Explain declaration of constant in C-program.

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

a) Input functions used in C.

b) Identifiers.

c) Variables used in C.

d) Pixel.

e) Switch statement.

Total No. of Questions : 5] **SEAT No. :**

PA-2298 **[Total No. of Pages : 2**

[5901]-395
T.Y.B.Sc. (Electronics Science)
EL 351 : DIGITAL DESIGN USING VERILOG
(2019 Pattern) (Semester - V) (Paper - I) (35221)

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 are the different types of operators in verilog.

b) A = 2'b10 B = 2'b11 what is answer Y={A, B} = ?

c) Technology mapping and optimization is followed by which process.

d) List various abstraction level supported by verilog.

e) List various operators used in data flow modeling.

f) What are the design constraints in logic synthesis?

Q2) Attempt the following :

a) i) What are the different types of comments? How are they written. **[2]**

ii) Write short note on net and reg data types in verilog. Explain it with suitable example. **[4]**

b) Explain with suitable example ‘always statement’ used in behavioral modeling. **[4]**

P.T.O.

Q3) a) i) Compair VHDL and Verilog. **[2]**

ii) What is keywords in verilog? List various keywords how they are represented. **[4]**

b) B = 3'b010 C = 3'b111 **[4]**

i) Y = {B, C} = ?

ii) Y = {2{C}}

Q4) a) i) After execution of following statement what will be the answer A = 7, B = 3 **[2]**

1) A = B

2) A > B

ii) Write verilog code for 4 : 1 multiplexer using logic equation. **[4]**

b) Write RTL for 2 bit magnitude comparator. **[4]**

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

a) What are design constraints in logic synthesis.

b) What is module in case of verilog? What it consist of?

c) Write long form of following

i) PLD

ii) PAL

iii) PLA

iv) GAL

v) FPGA

d) Write down difference between PAL & PLA.

e) Write dom 2 : 1 multiplexer description for verilog construct using if else statement.

f) Explain with example shift operators with suitable example.

Total No. of Questions : 5] **SEAT No. :**

PA-2299 **[Total No. of Pages : 2**

[5901]-396
T.Y.B.Sc. (Electronic Science)
EL - 352 : MICROCONTROLLER ARCHITECTURE AND PROGRAMMING
(2019 Pattern) (Semester - V) (Paper - II) (35222)

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) Write the full form of RISC.

b) What do you mean by machine language?

c) Define algorithm.

d) What is the dual function of PORTA in AVR AT mega16?

e) List the functions used to insert delay in AVR C program.

f) State the role of RS pin in LCD.

Q2) Attempt the following :

a) i) Define : Linker and compiler. **[2]**

ii) Write note on relational operators in C. **[4]**

b) Draw the interfacing diagram for interfacing of LED on pin O of PORTB and write AVR C program to toggle it continuously. **[4]**

P.T.O.

Q3) a) Attempt the following :

i) Define variable and array **[2]**

ii) Write AVR C program to display character 'X' on LCD. **[4]**

b) Explain data types for AVR with size and range. **[4]**

Q4) a) Attempt the following :

i) Give the name and function of ADMUX and ADCSRA registers. **[2]**

ii) Explain timer 0 programming in brief. **[4]**

b) Give the features of AVR Atmega 16. **[4]**

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

a) Give the any five applications of microcontroller.

b) Explain 'for' loop with simple example.

c) Give the structure of C program.

d) Write the AVR C program to read data from PORTA and send its complement to PORTD.

e) Write the AVR C program for logic AND operation between two numbers and store result to PORTC.

f) Write AVR C program to generate sawtooth wave using DAC connected at PORTD.

Total No. of Questions : 5]

SEAT No. : ____

PA-2300

[Total No. of Pages : 2

[5901]-397

T.Y. B.Sc.

ELECTRONIC SCIENCE

EL 353 : Analog Circuit Design and Applications

(CBCS 2019 Pattern) (Semester-V) (Paper-III) (35223)

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) ***Question 2 to question 5 carry equal marks.***

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

a) List the applicatons of peak-detector.

b) State the formula for frequency of wien-bridge oscillator.

c) State the importance of pin number 1 and 5 of IC 741.

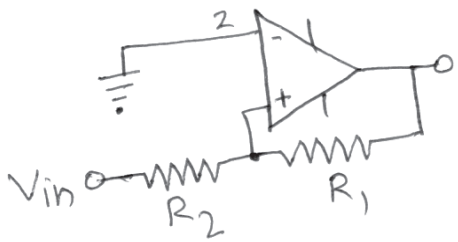
d) What is the number of voltage regulator IC which provides -5v at output.

e) State any two advantages of three terminal IC regulator.

f) Draw the block diagram of phase locked loop (PLL).

Q2) Attempt the following.

a) i) For the non-inverting schmitt trigger as shown in figure, calculate the component values for getting hysteresis width of 6v. Assume the saturation voltage to be ± 12v. **[2]**



ii) What do you mean by precision rectifier? Draw the circuit diagram for half wave precision rectifier and explain its working. **[4]**

b) With the help of proper diagram explain the working of Twin-T oscillator. **[4]**

P.T.O.

Q3) Attempt the following.

a) i) In a square wave generator using op-amp determine the value of R required to produce output frequency of 1 KHz. Assume feedback factor (beta) to be 0.05 & c=10μf. **[2]**

ii) Draw the circuit diagram of triangular wave generator using op-amp as comparator and an integrator. Explain its working. **[4]**

b) Explain the working of a monostable multivibrator using op-amp. **[4]**

Q4) Attempt the following.

a) i) Draw the internal block diagram of 3 pin voltage regulator IC. **[2]**

ii) Draw and explain the circuit diagram of dual power supply using bridge rectifier for output voltage of +12v and –12v. **[4]**

b) Draw the circuit diagram of offset nullifying circuit used for op-amp as unity gain amplifier and explain it. **[4]**

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

a) Calculate output voltage for IC 317 when I_{adj} is negligible. Given R_1=1kΩ, R_2=2kΩ, V_{ret}=1.25v.

b) For VCO using IC 566 +V=10V, V_c=9V, C_1=0.001μf for frequency F_o=40KH_z. Calculate the value of resistor R_1.

c) For function generator using IC-8038, R=100KΩ C=0.01μf. What will be the output frequency if duty cycle is 50%.

d) What is the range of output voltage for adjustable voltage regulator IC 317?

e) What precautions are taken to minimize electro magnetic noise catched by input pins of op-amp.

f) Define the term.

i) Hold period

ii) Samplying period of sample and hold circuit.

❖ ❖ ❖

Total No. of Questions : 5]

SEAT No. :

PA-2301

[Total No. of Pages : 2

[5901]-398
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 354 : Nanoelectronics
(CBCS 2019 Pattern) (Semester - V) (Paper - IV) (35224)

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 flash memory.

b) What is quantum dot.

c) State Bragg equation used in XRD.

d) What is SEM.

e) Which fullerne has most stable structure.

f) What is CNT.

Q2) Attempt the following.

a) i) State special features of nanoelectronics over microelectronics. **[2]**

ii) Explain top-down and bottom-up approach with example. **[4]**

b) Explain current voltage characteristics of resonant tunneling diode. **[4]**

Q3) Attempt the following.

a) i) State the applications of quantum dot. **[2]**

ii) Explain working principle of transmission electron microscope (TEM). **[4]**

b) Write short note on UV-vis spectroscopy. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) What are advantages of electron microscope over light microscope. **[2]**

ii) What are types of carbon nanotubes? Mention its structure. **[4]**

b) What are basic characteristics of quantum dot lasers. **[4]**

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

a) What is backs scattered electron in scanning electron microscope.

b) Describe different operating modes in Atomic Force Microscope.

c) Explain CNT Erunsistor.

d) What is organic semiconducter list its applications.

e) State types of MOSFETS? Explain its structure.

f) State basic characteristics of quantum well lasers.

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. : ____

PA-2302

[Total No. of Pages : 2

[5901]-399
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 355 : Signals and Systems
(CBCS 2019 Pattern) (Semester - V) (Paper - V) (35225)

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) Give the classification of systems.

b) What do you mean by a signal?

c) Define inverse Laplace transform of a function.

d) Classify the signals.

e) Define Nyquist frequency in sampling of a signal.

f) Define sampling of a signal.

Q2) Attempt the following.

a) i) Find Laplace transform of e^{2t}. **[2]**

ii) List elementary signals and explain unit - step CT signal. **[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) State Shannon's sampling theorem. **[2]**

ii) Find Laplace transform of cos2t. **[4]**

b) Find $L^{-1}\left[\frac{S+3}{S^2+9}\right]$ **[4]**

P.T.O.

Q4) Attempt the following:

a) i) What is aliasing effect in sampling of a signal? **[2]**

ii) Find Laplace transform of $f'(t)$. **[4]**

b) Draw a block diagram of DSP system and explain each block in brief. **[4]**

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

a) Explain CT time variant and time invariant systems in brief.

b) State the convolution theorem in Laplace transform.

c) Define Fourier series of a periodic function.

d) Define a quantization error. How can it be reduced?

e) Explain DT time variant and time invariant systems in brief.

f) Explain in brief the concept of sampling a continuous- time signal.

♦ ♦ ♦

Total No. of Questions : 5] **SEAT No. :**

PA-2303 **[Total No. of Pages : 2**

[5901]-400
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 356 (A) : Optics and Fiber Optic Communication
(CBCS 2019 Pattern) (Semester - V) (Paper - VI(A)) (35226A)

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

Instructions to the candidates:

1) ***Q 1 is compulosry.***
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) Define numerical operature (NA) of fiber optic cable.

b) State any two advantages of fiber optic communication.

c) State different types at losses in fiber optic cable.

d) Write the formula for Radious at curvature (Rc) of fiber optic cable.

e) Stat the name of photo detector used of detecting the very low power optical signal in fiber optic communication.

f) What do you mean by SONET.

Q2) Attempt the folllowing.

a) i) State the difference between single mode step Index and multimode step Index fiber optic cable. **[2]**

ii) Calculate the quantum efficiency (η). Given Responsivity is 0.294 Ampper watt and wavelength is 0.90 micrometer. **[4]**

b) Calculate the number of reflection of ray of light in one meter length of fiber cable. Give RI of core n_1 - 1.50,RI of cladding n_2=1.49 and diameter of care is 50 micrometer. **[4]**

Q3) Attempt the following.

a) i) State any two differences between spontaneous and stimulated emission of Radiation. **[2]**

ii) Calculate the number of modes of fiber optic cable (v). Given diameter of care is 100 micrometer, wavelength is 0.09 micrometer and NA=0.5. **[4]**

b) State any four differences between PIN diode and Avalanche Photodiode. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) What is Network topology? Draw the block diagram of Bus topology. **[2]**

ii) Explain the working principle of Avalanche photodiod with suitable diagram. **[4]**

b) Draw the block diagram of fiber optic communication and explain each block in detail. **[4]**

Q5) Attempt the following. **[10]**

a) Write any two differences between multi-mode step Index and mono mode step Index fiber optic cable.

b) Write a short note on chromatic dispersion in fiber optic cable.

c) State any two differcences between dispersion compensated and dispersion shifted fiber optic cable.

d) Write the equation of responsivity (R) of photo detector and meaning of parameters use in this equation.

e) Write the names of five block use in SONET.

f) Draw the block diagram of Synchzonous digaital hierarchy (SDH).

Total No. of Questions : 5]

SEAT No. : ____

PA-2304

[Total No. of Pages : 2

[5901]-401
T.Y.B.Sc.(Regular)
ELECTRONIC SCIENCE
EL - 356 (B) : Electronic Product Design and Entreprenurship
(2019 CBCS Pattern) (Semester - V) (Paper - VI) (35226 B)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three 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 do you mean by product debugging?

b) What is process of simulation?

c) Define the term ergonomics.

d) What is proposal in documentation?

e) Define enterpreneurship development.

f) What do you mean by MTBF?

Q2) Attempt the folllowing.

a) i) Mention the techniques of troubleshooting of product. **[2]**

ii) Describe various stages in product designing. **[4]**

b) Explain in short the various characteristics of an entreprenuer. **[4]**

Q3) Attempt the following.

a) i) Explain the term BOM in product documentation. **[2]**

ii) Write the motivational factors to become entrepreneur. **[4]**

b) Discuss the role of DSO in product testing. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) Give any four applications of ergonomics in product design. **[2]**

ii) Describe the top-down approach with the help of block diagram. **[4]**

b) Explain any four elements of successful product desing. **[4]**

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

a) Write a short note on engineering notebook.

b) Describe in short bath-tub curve.

c) Explain failure rate in product development.

d) Give the role of entrepreneurer in economic development.

e) Write in short “the importance of manual”.

f) Explain logic analyzer in product testing.

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. : ____

PA-2305

[Total No. of Pages : 2

[5901]-402
T.Y.B.Sc.
ELECTRONIC SCIENCE
ELSEC 351-SEC1 : Electronic Design Automation Tools
(2019 Pattern) (Semester - V) (Paper - X) (352210)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Question 2 to Question 5***
3) ***Question no. 2 to Question no. 5 carry equal marks.***

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

a) What is simulation?

b) What are the advantageous of PSPICE?

c) What is placing component?

d) What is Schematic in Proteus?

e) What is LTSPICE?

f) What are the three types of circuit analysis are available in multisim.

Q2) Attempt the following.

a) i) What are the features of PSPICE? **[2]**

ii) Draw and explain the circuit diagram of voltage regulator? What is the output on multisim. **[4]**

b) Differentiate between ORCAD and Proteus? **[4]**

Q3) Attempt the following.

a) i) How to use multisim software? **[2]**

ii) Write the design flow of PCB. **[4]**

b) Draw and explain circuit of transistor biasing. What will be output on simulation usin LTSPICE. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) What is design rule check (DRC) in PCB design. **[2]**

ii) Write the steps for Schematic using circuit Mod. **[4]**

b) Write the types of simulation. **[4]**

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

a) Why simulation is used?

b) How to make schematic diagram.

c) What is multisim?

d) How to select the components in ORCAD software?

e) Differentiate between LTSPICE and SPICE.

f) What are the types of design rule?

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. :

PA-2306

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T.Y. B.Sc.
ELECTRONIC SCIENCE
ELSEC - 352 : Internet of Things & Applications
(CBCS 2019 Pattern) (Semester - V) (352211) (Paper - XI)

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 IOT.

b) What is mean by HTTP.

c) Define smart grids.

d) What is Raspberry Pi?

e) Which sensors are used in weather monitoring system.

f) How Raspberry Pi used in IOT?

Q2) Attempt the following. **[10]**

a) i) Explain MQTT. **[2]**

ii) Draw & explain block diagram of IOT. **[4]**

b) Determine the IOT - Levels for designing structural health monitoring system. **[4]**

Q3) Attempt the following. **[10]**

a) i) What is need for IOT management systems. **[2]**

ii) Explain XMPP. **[4]**

b) What is the use of SPI & I2C interface on Raspberry Pi. **[4]**

P.T.O.

Q4) Attempt the following. **[10]**

a) i) Explain the use of HDMI output port on Raspberry Pi. **[2]**

ii) State the difference between IOT & Machine to Machine (M2M). **[4]**

b) Write a python program for controlling LED ON/OFF. **[4]**

Q5) Attempt Any Four. **[10]**

a) Write advantages of IOT.

b) What are the application layer in IOT protocol.

c) Explain domain specific IOTs in Environment.

d) Which are the building blocks of an IOT device? Explain it.

e) Which are the applications used in smart cities.

f) How is IOT used in smart forming?

Total No. of Questions : 5]

SEAT No. : ____

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T.Y. B.Sc.

PSYCHOLOGY

Cognitive Psychology

(2019 Pattern) (Semester-V) (Paper-I) (35201)

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

Instructions to the candidates:

1) ***Questions 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Questions from 2 to 5 caary equal marks.***

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

a) Define cognitie psychology.

b) Define sensation.

c) Define learning.

d) Define perception.

e) Define memory.

f) Define eonditioning.

Q2) a) Explain the various gestalt principles of perception. **[6]**

OR

Describe the components of classical conditioning with experiments.

b) Critically analyse the piagets cognitive developmental theory. **[4]**

Q3) a) Discuss the various types of cognitive processes. **[6]**

OR

Compare the various functions and types of memory.

b) Analyze the various types of problem. **[4]**

P.T.O.

Q4) a) Describe the vygotsky's sociocultural theory. **[6]**

OR

Explain the different types of determinatnts of attention.

b) Analyze the various types of memory improvement techniques. **[4]**

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

a) Application of cognitive psychology.

b) Process of sensation.

c) Trial and error method of learning.

d) Types of learning.

e) Problem solving cycle.

f) Process of memory.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2308

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T.Y. B.Sc.

PSYCHOLOGY

Psychopathology-I

(2019 Pattern) (Semester-V) (Paper-II) (35202)

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 from 2 to 5 carry equal marks.***

Q1) Answer the following in one or two sentences (any five). **[5]**

a) Define stress.

b) What is generalized anxiety?

c) What is intellectual disability?

d) What is depression?

e) What is abnormal behaviour?

f) Two criteria of abnormal behaviour.

Q2) a) Explain the pre DSM classification of abnormal behaviour. **[6]**

OR

Discuss the symptoms of Mania.

b) Critically evaluate Diathesis stress model. **[4]**

Q3) a) Explain in detail symptoms of schizophrenia. **[6]**

OR

Explain psychotheraphic interventions for schizophrenia.

b) Critically analyse clinical signs of brain damage. **[4]**

P.T.O.

Q4) a) Discuss the causes of abnormal behaviour. **[6]**

OR

Explain the concept and description of DSM-5.

b) Critically evaluate psychodynamic model of abnormality. **[4]**

Q5) Write short notes (Any four) **[10]**

a) Panic disorder.

b) Delirium

c) Mood disorder.

d) Cognitive disorder.

e) OCD.

f) Dementia.

Total No. of Questions : 5]

SEAT No. : ____

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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) ***Questions 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Questions from 2 to 5 caary equal marks.***

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

a) What is graphical representation?

b) Define orclinal scale.

c) Define correlation.

d) What is mean by the term statistics.

e) Define variability.

f) What is probalility.

Q2) a) Explain the various types of scales of measurement. **[6]**

OR

Calculate the standard deviation for the following.

Class interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	27	10	7	5	4	2

b) Analyse the various types of central tendencies. **[4]**

Q3) a) Describe the types of variables and its application **[6]**

OR

Draw a pie/circle diagram to represent the following data.

P.T.O.

i)	Salary of the staff	-	60,000.00
ii)	Electricity, water and telephone bills	-	15,000.00
iii)	Office stationary	-	10,000.00
iv)	Miscellaneous expenses	-	15,000.00
			1,00,000,00

b) Critically analyse the properties of normal probalility. **[4]**

Q4) a) Distinguish between rank order correlation and product moment correlation. **[6]**

OR

Compute the mean for the following frequency distribution.

Scores	135-144	124-134	115-124	105-114	95-104	85-94	75-84	65-74
Frequency	1	2	8	22	33	22	9	2

b) Evaluate the advantages of graphical representation. **[4]**

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

a) Application of statistics in psychology

b) Percentile rank

c) Bar Graph

d) Advantage of line graph

e) Characterstics of normal distribution

f) Computation of coefficient of correlation.

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Total No. of Questions : 5]

SEAT No. : ____

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T.Y. B.Sc.

PSYCHOLOGY

Organizational Behaviour

(2019 Pattern) (Semester-V) (Paper-IV) (35204)

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

Instructions to the candidates:

1) ***Questions 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Questions 2 to Q. 5 caary equal marks.***

Q1) Answer the following in one or two sentences (any five). **[5]**

a) Define organizational behavior.

b) Define leadership.

c) Define motivation.

d) What is job satisfaction?

e) Define learning.

f) What is stress?

Q2) a) What are the biographical characteristics of individual behaviour. **[6]**

OR

Discuss the challenges of organizational behaviour.

b) Critically evaluate extrinsic intrinsic motivation with suitable examples. **[4]**

Q3) a) Explain various factors affecting job satisfaction. **[6]**

OR

Explain the application of Emotional Intelligence in organizational setting.

b) Evaluate trait and behavioral models of leadership. **[4]**

P.T.O.

Q4) a) Explain job enrichment in organizational planning **[6]**

OR

Explain Group dynamics in organization.

b) Compare any two theories of motivation. **[4]**

Q5) Write short notes (any four) **[10]**

a) Any tow consequences of conflict.

b) Contingency model of leadership.

c) Role of power in leadership.

d) Opportunities to study organizational behaviour.

e) Incentive system.

f) Time Management

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Total No. of Questions : 5]

SEAT No. : ____

PA-2311

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T.Y. B.Sc.

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 from 2 to 5 carry equal marks.***

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

a) Define developmental Psychology

b) State the types of happiness.

c) Name the components of wellbeing.

d) State the basic types of emotion.

e) What is positive emotion

f) Define trait.

Q2) a) Differentiate between hedonic and eudaimonic happiness. **[6]**

OR

Explain the process of cultivating positive emotions.

b) Critically differentiate between traditional and positive Psychology. **[4]**

Q3) a) Explain the applications of positive Psychology in different areas. **[6]**

OR

Describe the developmental and clinical perspectives of resilience.

b) Analyze the three aspects of wellbeing **[4]**

P.T.O.

Q4) a) Describe how does positive emotion affect wellbeing. **[6]**

OR

Explain the factors affect resilience and techniques to imporve resilience.

b) Analyse the relationship between wellbeing & happiness. **[4]**

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

a) Classifications of human virtues

b) Health Psychology & positive Psychology

c) Challenges of positive Psychology

d) Advantages of self realization

e) Components of happiness

f) Health resources

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Total No. of Questions : 5]

SEAT No. : [ ]

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T.Y. B.Sc.

PSYCHOLOGY

Counseling Psychology

(2019 Pattern-New) (Semester-V) (Paper-VI) (35206)

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

Instructions to the candidates:

1) ***Questions 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Questions from 2 to 5 caary equal marks.***

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

a) Define initial disclosure.

b) What is directive counseling.

c) State the types of Psychlogical tests.

d) What is Eclectic approach.

e) Define positive regard.

f) What are the applications of psychological test.

Q2) a) Explore the existential approach of counseling. **[6]**

OR

Explain the stages of positive regars in counseling.

b) Differentiate between premarital & marital counseling.

Q3) a) Describe the advantages and challenges of family counseling. **[6]**

OR

Discuss the applications and limitations of Psychological tests in counselling.

b) Differentiate between directive and non-directive counseling. **[4]**

P.T.O.

Q4) a) Explain the main concepts of humanistic approach. **[6]**

OR

Describe the process of diagnosis of problems during counseling.

b) Justify the implication of behaviouristic approach in counseling. **[4]**

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

a) Advantages of career counseling.

b) Genuineness

c) Test interpretation in counseling

d) Challenges in building trust during counseling

e) Limitations of diagnosis

f) challenges following ethics in counseling

Total No. of Questions : 5]

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T.Y. B.Sc.

PSYCHOLOGY

SEC-I : Basic Counselling Skills

(2019 Pattern) (New) (Semester-V) (Regular) (352010)

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

Instructions to the candidates:

1) ***Questions 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) Define counselling.

b) Define immediacy

c) What is empathy?

d) State the types of question asked to the client during counselling process.

e) Name the tips for active listening.

f) What is a meaning of gesture?

Q2) a) Explore the challenge of self disclosure in counselling. **[6]**

OR

Explain the importance of the counselor maintaining proper body gesture.

b) Analyse the goals of counselling. **[4]**

Q3) a) Describe the different types of counselling. **[6]**

OR

Why it is important for counsellor to have unconditional positive regard with their clients.

b) What are the four components of attending behaviour. **[4]**

P.T.O.

Q4) a) Discuss the stages of counselling process. **[6]**

OR

Describe the importance of body language in counselling.

b) Differentiate between genuineness and concreteness in counselling. **[4]**

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

a) Nature of counselling.

b) Clothing of counselor.

c) Importance of confrontation

d) Types of empathy

e) Process of communication

f) Relationship skills of counselor

Total No. of Questions : 5]

SEAT No. : ____

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T.Y. B.Sc. (Regular)

PSYCHOLOGY

Personality Development

(2019 Pattern) (Semester-V) (Paper-Sec-II) (352011)

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 from 2 to 5 carry equal marks.***

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

a) Define personality.

b) Define communication.

c) Define Goal setting.

d) What is team building?

e) State the types of written communication.

f) Define etiquettes.

Q2) a) Explain the barriers of communication. **[6]**

OR

Describe the different skills required in team work.

b) Analyse the various determinants of personality development. **[4]**

Q3) a) Explain the type of personality with their characteristics. **[6]**

OR

Describe the various types of interview.

b) Analyse the various characteristics of effective team. **[4]**

P.T.O.

Q4) a) Explain the various self assessment techniques and challenges in self assessment. **[6]**

OR

Discuss the various types of non verbal communication.

b) Compare the etiquettes in social and official setting. **[4]**

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

a) Telephone etiquettes

b) Importance of career planning

c) SWOT Analysis

d) Interview mistakes

e) Need of goal setting

f) Process of communication

Total No. of Questions : 5]

SEAT No. :

PA-2315

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T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 351 : Terrestrial Ecosystem and Management

(2019 Pattern) (Semester-V) (35241) (Paper-I)

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 from 2 to 5 caary equal marks.***

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

a) Enlist various Hotspots of Biodiversity found in India.

b) What is meant by keystone species.

c) Define the term Carbon sequestration.

d) Enlist various threats to Terrestrial Ecosystem.

e) Define the term Biome.

f) Enlist various methods involved in vegetation sampling.

Q2) a) Write short note on sustainable Management of Terrestrial Ecosystem. **[6]**

b) Write short note on biogeographic regions of the world or Realms. **[4]**

Q3) a) Write short note on Applications of Remote sensing and GIS for Terrestrial Ecosystem Management. **[6]**

b) Explain various methods of vegetation sampling and data analysis. **[4]**

Q4) a) Write short note on community based Terrestrial Ecosystem Management with a case study. **[6]**

b) Explain importance of Government and its role in Terrestrial Ecosystem Management. **[4]**

P.T.O.

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

a) Explain various reasons for forest Fires.

b) General structure of terrestrial communities.

c) What is meant by Traditional Methods of Terrestrial Ecosystem management.

d) Cultural Benefits of Terrestrial Ecosystem.

e) Carbon Pool.

f) Enlist various NGO's in India working for terrestrial Ecosystem management.

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Total No. of Questions : 5]

SEAT No. :

PA-2316

[Total No. of Pages : 2

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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) ***Question 1 is compulsory.***
2) ***Solve any Three questions from Q.2 to Q.5.***
3) ***Question from 2 to 5 caary equal marks.***

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

a) What is GIS? Application of GIS in wildlife management-Explain in short.

b) What is Arachnids?

c) What is Bryophytes?

d) What do you mean by wildlife census?

e) What is Biosphere?

f) Write the examples of Aquatic habitat.

Q2) a) Describe Terrestial habitat with reference to desert habitat. **[6]**

b) Explain DNA finger printing. **[4]**

Q3) a) Write note on silent valley movement. **[6]**

b) Habitat Destruction of wildlife **[4]**

Q4) a) Write detail note on exploitation of plants. **[6]**

b) Explain marking wildlife with suitable examples. **[4]**

P.T.O.

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

a) What is track and sign technique?

b) Define wildlife Biology.

c) What is Ringing in marking wildlife.

d) What is pugmark?

e) What is wildlife tourism in forest?

f) What is Bio-telemetry?

Total No. of Questions : 5]

SEAT No. : [ ]

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T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 353 : Water and Soil Quality

(2019 Pattern) (Semester-V) (35243)

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.***

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

a) Write the definition of water cycle.

b) Differentiate between point and Non-Point sources of water pollution.

c) Name any two water borne diseases.

d) Enlist the sources of ground water pollution.

e) Define: Soil Toxicology.

f) What is soil pollution management.

Q2) a) Discuss in detail the characteristics of sewage water. **[6]**

b) Explain the concept of soil fertility and plant growth. **[4]**

Q3) a) Write the application of GIS & Remote sensing for water resources management. **[6]**

b) Write a note an NPK in soil? **[4]**

Q4) a) Describe any two secondary water treatment processes. **[6]**

b) Explain any two soil remediation methods. **[4]**

P.T.O.

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

a) Entuophication processes.

b) Effects of water pollution on water quality.

c) Role of National agencies in water health.

d) Importance of soil in ecosystem and Agriculture.

e) Nitrogen pathway in ecosystem.

f) Soil as waste disposal site.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2318

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T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 354 : Atmospheric and global Climate change

(2019 Pattern) (Semester-V) (Paper-IV) (35244)

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 from 2 to 5 carry equal marks.***

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

a) What are the five atmosphere layer of earth.

b) What is meant a by air masses.

c) Define El-nino

d) What are the standard Metrological parameters.

e) What are the major drivers of green house gas emission.

f) What is Montreal protocol of 1987?

Q2) Answer the following.

a) What is earth radiation budget and why it is so important. **[6]**

b) Briefly explain the atmospheric window. **[4]**

Q3) Answer the following.

a) What are the factors important for atmospheric stability and mixing height. **[6]**

b) Briefly explain global conveyor belt. **[4]**

P.T.O.

Q4) Answer the following.

a) What are the important atmospheric factors responsible for Indian mansoon. **[6]**

b) Briefly explain the evolution of earth atmosphere. **[4]**

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

a) Salient features of Kyoto protocol.

b) Carbon credit and carbon sequestration

c) Global warming and agriculture

d) The nebular hypothesis

e) Composition of atmosphere

f) Types of air masses.

Total No. of Questions : 5]

SEAT No. :

PA-2319

[Total No. of Pages : 2

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T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 355 : Environmental Legislation and Policy

(2019 Pattern) (Semester-V) (Paper-V) (35245)

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 caarry equal marks.***

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

a) Write the short Title of forest Act.

b) Write the legal definition of Biodiversity.

c) Write any 2 Role of National Green tribunal.

d) Write one objective of UNCED, 1992.

e) Enlist the elements of Environmental Governance.

f) In which year public liability Act has been enacted.

Q2) a) Write short note on stockholm Conference, 1972. **[6]**

b) Explain the fundamental rights as per constitution of India. **[4]**

Q3) a) Write note on The Wildlife (Protection) Act. 1972. **[6]**

b) What are the penalities for the different sections under The Biological Diverstiy Act. 2002. **[4]**

Q4) a) Describe Hazardous waste Management Rule, 2016. **[6]**

b) Explain the Kyoto Protocol 1997. **[4]**

P.T.O.

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

a) Need of the Environment (Protection) Act, 1986.

b) Role of Local People under the wildlife (Protecion Act, 1972.)

c) MOEFCC.

d) Noise Pollution (Regulation & Control) Rules 2000.

e) Paris Summit.

f) Rio Declaration.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2320

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T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 356 : Environmental Biotechnology-I

(2019 Pattern) (Semester-V) (Paper-VI) (35246)

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

Instructions to the candidates:

1) ***Questions 1 is compulsory.***
2) ***Solve any Three questions from Q.2 to Q.5.***
3) ***Questions no. 2 to Q. No. 5 caary equal marks.***

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

a) What is the role of environmental biotechnology in Environment?

b) Which species of earthworm are mostly used for composting?

c) How many countries are in cartagena protocol?

d) When enumerating bacteria what units are used?

e) Who discover microbes first?

f) Which enume is most important in xenobiotic metabolism?

Q2) Answer the following.

a) Which is the best application for environmental biotechnology? **[6]**

b) What are four risk in biotechnology. **[4]**

Q3) Answer the following.

a) What are the benefits of compost? **[6]**

b) Which technique is used in micropropogation? **[4]**

Q4) Answer the following.

a) Explain in detail phases of vermicomposting? **[6]**

b) Which type of biotechnolgoy are involved in agriculture? **[4]**

P.T.O.

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

a) Cartagena protocol

b) NADEP method of composting

c) Important bacteria used in xenobiotic degradation.

d) GMO's

e) Necessity of Environmental biotechnology.

f) Use of biofertilizer

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Total No. of Questions : 5]

SEAT No. :

PA-2321

[Total No. of Pages : 2

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T.Y. B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

EVS-511 : Remote Sensing and GIS and Modeling

(2019 Pattern) (Semester-V) (Paper-IV) (352410)

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 caary equal marks.***

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

a) Define the term Remote Sensing.

b) What are Satellites?

c) Write the full form of EMR.

d) What is GIS?

e) Mention any two types of statistical distributions.

f) What does Kurtosis mean in statistics?

Q2) a) What is Aerial Photogaphy? How does it help to study Environment? **[6]**

b) Enlist the principles of Remote Sensing. **[4]**

Q3) a) Discuss the role & importance of GIS in Environmental studies. **[6]**

b) What are the components of GIS? **[4]**

Q4) a) Discuss the applictions & principles of Remote Sensing. **[6]**

b) Enlist and discuss about any two GIS related softwares. **[4]**

P.T.O.

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

a) Electromagnetic spectrum.

b) Energy Response Mechanism.

c) Applications of GIS in water Resource Management.

d) Disadvantages of Remote Sensing.

e) GIS Software Packages.

f) Advantages of GIS.

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Total No. of Questions : 5]

SEAT No. :

PA-2322

[Total No. of Pages : 2

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T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS3512 : Soil Health Management

(2019 Pattern) (Semester-V) (Paper-IV) (352411)

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

Instructions to the candidates:

1) ***Questions 1 is compulsory.***
2) ***Solve any Three questions from Q2 to Q5.***
3) ***Questions no. 2 to 5 caary equal marks.***

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

a) What type of main ingredients present insoil?

b) What is purpose of strip cropping?

c) What is full form of IPM?

d) What is soil Health card?

e) Enlist any two discuss occured on plants.

f) Give two examples of agroforestry.

Q2) Answer the following

a) Why we need water conservation scheme? What are the benifits of Maharastra Jalyuikt Shivar Yojana? **[6]**

b) What is Biocompost? What are three types of composting? **[4]**

Q3) Answer the following.

a) What is Biopesticides? Write types and Importance of Biopesticides. **[6]**

b) With the help of suitable example explain Energy crops. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain in details Biological measures used in conservation of Soil. **[6]**

b) What are farm Ponds? How Farm Ponds are useful in Recharge of ground water? **[4]**

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

a) Integrated plant nutrient management (IPNM)

b) Shifting cultivation.

c) Importance of Irrigation scheduling.

d) Classification of Fertilizers.

e) Organic crop production?

f) Soil fertility.

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Total No. of Questions : 4]

SEAT No. :

PA-2323

[Total No. of Pages : 1

[5901]-420

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) DefineNatural Disaster.

b) Define Manmade Disaster.

c) What is an Earthquake?

d) What is a Cataclysm disaster?

e) Define Tsunami.

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

a) Cataclysm

b) Tsunami

c) Earthquake

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

a) Explain the Meaning and Concept Disaster.

b) State the role of Information in Disaster Preparedness.

c) Explain the Disaster Management Cycle.

Q4) Answer in details (any one) **[10]**

a) Describe in detail Early Warnings and Safety Majors of Disaster.

b) Describe in detail Meaning, Concept, Nature and Scope Disaster Management.

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Total No. of Questions : 4]

SEAT No. :

PA-2324

[Total No. of Pages : 1

[5901]-421

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 502 : United Nation Organization-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) Why is it called the United Nations?

b) What is the meaning of the General Assembly?

c) Security Council.

d) International court of justice.

e) Who is the Secretary-General of the UN.

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

a) Secretariat

b) UN Charter

c) UDHR

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

a) What are the main purposes of the UN?

b) State the role of the General Assembly.

c) What are the five functins of the Security Council?

Q4) Answer in details (any one) **[10]**

a) Describe in detail the role of the International Court of Justice in Global Peace and Security.

b) What is the role of the Security Council in maintaining world peace?

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Total No. of Questions : 4]

SEAT No. :

PA-2325

[Total No. of Pages : 2

[5901]-422

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 503: International Relations Part - I

(35233) (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 bipolar and multipolar world?

b) Define Realism.

c) What is a simple definition of idealism?

d) How do you define development?

e) What is the meaning of international relations?

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

a) Idealism.

b) Multipolar.

c) Unipolar.

P.T.O.

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

a) What is international relations with examples?

b) State the importance of the Study of Theories of International Relation.

c) What is development and why is it important?

Q4) Answer in details (any one) : **[10]**

a) What is game theory explained in detail?

b) Describe in detail Realism Theories.

Total No. of Questions : 4]

SEAT No. :

PA-2326

[Total No. of Pages : 2

[5901]-423
T.Y. B.Sc. (Semester - V)
DEFENCE AND STRATEGIC STUDIES
DS - 504 : Terrorism
(2019 Pattern) (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) What are the types of Terrorism?

b) What is National Development?

c) Define Right Wing Terrorism.

d) Define of Terrorism.

e) What is Religious Extremist Terrorism.

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

a) Explain the Causes of Terrorism.

b) State the Impact of Terrorism on National Development.

c) State the Social Impact of Terrorism on National Development.

P.T.O.

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

a) State the Cross Border Terrorism.

b) Explain the Left Wing Terrorism.

c) State the Insurgency in North East India.

Q4) Answer in details (any one) : **[10]**

a) State the Economical Impact of Terrorism on National Development.

b) State the Problem of Naxalism-Maoism.

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Total No. of Questions : 4]

SEAT No. :

PA-2327

[Total No. of Pages : 4

[5901]-424

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-506(A) : Major Global Conflict - I

(2019 Pattern) (Semester - V) (35236A)

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 conflict of oil?

b) What is the matter between Israel and Palestine?

c) What is the question of Palestine?

d) What caused the Afghanistan issue?

e) What is the location of Kashmir?

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

a) Afghanistan Issue

b) Historical Background Israel Palestine.

c) Suez Canal

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

a) Explain the Religious Conflict.

b) State the Afghanistan Issue Brief historical account of wars.

c) State the Oil- Source of Conflict.

P.T.O.

Q4) Answer in details (any one) : **[10]**

a) Explain the Israel Palestine Historical Background.

b) Describe the Kashmir Issue Present Status of the Issue.

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Total No. of Questions : 4]

PA-2327

[5901]-424

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-506(B) : Regional Security System - I

(2019 Pattern) (Semester - V) (35236B)

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) Why was SEATO formed

b) Full form of NATO

c) Full form of CENTO

d) Define Warsaw

e) Full form of SAARC

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

a) Objectives of ASEAN

b) Aims of WARSAW

c) Structure of SAARC

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

a) Explain the Origin and Development of SAARC.

b) State the Structure ASEAN.

c) Write the aims and objectives of seato.

Q4) Answer in details (any one) : **[10]**

a) What is the main reason for ASEAN development?

b) State the Objectives of the World Trade Organization.

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Total No. of Questions : 4]

SEAT No. :

PA-2328

[Total No. of Pages : 2

[5901] - 425
T.Y. B.Sc. (Semester - V)
DEFENCE AND STRATEGIC STUDIES
DS 507(A) : India's Maritime Security - I
(2019 Pattern) (35237A)

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

Instructions to the candidates :

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

Q1) Answer the following questions. **[5]**

a) What is human rights?

b) What is the coast guard?

c) What are maritime boundaries?

d) Define an exclusive economic zone?

e) What is the purpose of Defence?

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 is the importance of the Indian Coast Guard?

b) Explain an introduction to the Naval Bases and Naval Commands.

c) State the Strategic Importance of Indias Maritime Boundaries.

Q4) Answer in details (any one) : **[10]**

a) What is the role of the Indian's Coast Guard?

b) Explain the Maritime Threats to India's Security through External Powers.

P.T.O.

Total No. of Questions : 4]

PA-2328

[5901] - 425
T.Y. B.Sc. (Semester - V)
DEFENCE AND STRATEGIC STUDIES
DS 507(B) : Peace and Conflict Studies - I
(2019 Pattern) (35237B)

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 Post-Cold War

b) Define classical approach.

c) Define regionalism.

d) Define functional approach.

e) Define Diplomacy.

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

a) Regionalism

b) Cold War

c) Confidence Building Measures

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

a) Explain the Conceptual analysis of conflict and peace.

b) Explain the Post Cold War.

c) State the Nature and Forms of Conflict.

Q4) Answer in details (any one) **[10]**

a) Describe the Success of Disarmament and Arms Control in today's War Scenario.

b) Explain the Peace Research and Peace Movements.

Total No. of Questions : 4]

SEAT No. : ____

PA-2329

[Total No. of Pages : 4

[5901] - 426

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 508 (A) : Chhatrapati Shivaji Maharaj Military System

(2019 Pattern) (Semester - V) (35238 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) Define Swarajya.

b) What is Maratha?

c) Define Military discipline.

d) What is Hindvi swaraj?

e) Write the meaning of Chhatrapati.

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

a) Dadoji Kondev.

b) Chhatrapati Shivaji Maharaj.

c) Adil Shahi.

P.T.O.

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

a) State the Economic State of during Chhatrapati Shivaji Maharaj's time.

b) Explain the Battle of Pratapgad.

c) Explain the Battle of Kolhapure.

Q4) Answer in detail (any one) : **[10]**

a) What was decided in the treaty of purandar?

b) Explain in detail the Political and Cultural state of Maharashtra during Chhatrapati Shivaji Maharaj's time.

Total No. of Questions : 4]

PA-2329

[5901] - 426

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 508 (B) : Chhatrapati Shivaji Maharaj as Strategic Thinker

(2019 Pattern) (Semester - V) (35238 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 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) Chhatrapati 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 Chhatrapati 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 Chhatrapati Shivaji the Father of the Indian Navy.

Total No. of Questions : 4]

SEAT No. : ____

PA-2330

[Total No. of Pages : 4

[5901]-427
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-509(A) : World Military History (1900 - 1945)
(2019 Pattern) (Semester - V) (35239A)

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 true meaning of war?

b) Define World War.

c) Define Balkan War.

d) What is the difference between defence and security?

e) Define Security.

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

a) World War I

b) World War II

c) Cold war

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

a) Explain the Causes of War of World War I.

b) Explain the main causes of World War II.

c) Explain the Causes of the Cold War.

P.T.O.

Q4) Answer in details (any one) : **[10]**

a) What was the main goal of the Woodrow Wilson Peace Programme?

b) Explain in detail the Technology used in World War I.

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Total No. of Questions : 4]

PA-2330

[5901]-427
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-509(B) : India's Foreign Policy
(2019 Pattern) (Semester - V) (35239B)

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 Policy.

b) Define Foreign Policy.

c) Define India's Foreign Policy.

d) Define Neighborhood.

e) Define Diplomacy.

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

a) Foreign Policy.

b) India's Foreign Policy.

c) Act East Policy.

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

a) Explain India's Foreign Policy from 1947-1975.

b) State the Meaning and Concept Foreign Policy.

c) Explain India's Foreign Policy from 1975-1984.

Q4) Answer in details (any one) : **[10]**

a) Explain in detail the India's Neighborhood First Policy.

b) Explain in detail the India's Look East Policy.

□□□

Total No. of Questions : 4]

SEAT No. :

PA-2331

[Total No. of Pages : 1

[5901]-428

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS510 : 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) ***Figures to the right indicate full marks.***

Q1) Define the following questions : **[5]**

a) Define Human rights.

b) Define Values.

c) Define Justice.

d) Define Dignity.

e) Define Liberty.

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

a) Human rights

b) Minorities

c) Women

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

a) Explain the Meaning and concept of Human rights.

b) State the Significance of Value - Human Values.

c) Explain the Human Rights and Gender Issues.

Q4) Answer in details (any one) : **[10]**

a) Explain in detail the Significance of Human Rights Education.

b) Explain in detail the Human Rights and Child Labour.

Total No. of Questions : 4]

SEAT No. :

PA-2332

[Total No. of Pages : 1

[5901]-429
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 511 : 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) Define Value.
b) Define the UN.
c) Define preamble.
d) Define mission.
e) Define liberty.

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

a) Human Rights.
b) UN
c) Equality

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

a) Explain the provisions in the United Nations Charter on Human Rights.
b) State the Historical background of the Universal Declaration of Human Rights.
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) Explain in detail the Prevention of discrimination.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2333

[Total No. of Pages : 2

[5901]-430
T.Y. B.Sc. (Vocational)
BIOTECHNOLOGY
VBt 311 : Animal and Plant Tissue Culture
(2019 Pattern) (Semester - V) (CBCS) (35571)

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) ***Draw neat labeled diagrams wherever necessary.***

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

a) Which type of cell line is MCF - 7?

b) What is pH of media used in Animal tissue culture?

c) Define Hormone.

d) What is Transfection?

e) What cannon contaminant's in tissue culture?

f) What are artifical seeds?

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

i) Comment on History of Animal Tissue Culture.

ii) Explain in detail how maintenance of cell lines is done in ATC lab.

iii) What are advantages of secondary metabolites?

b) Answer any one : **[4]**

i) Explain procedure for IVF technique.

ii) Comment on History & Methodology of Embryoculture.

P.T.O.

Q3) **a) Answer the following (Any Two) :** **[6]**

i) Explain in detail how characterization of cell lines is done.

ii) Give brief explanation on production of monoclonal antibodies.

iii) Enlist and explain method of samaclone selection.

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

i) Draw a neat flow chart for Rhizogenesis.

ii) Enlist biological methods of gene transfer. Explain any two methods in detail.

Q4) **a) Answer the following (Any two) :** **[6]**

i) Give applications of Embryo culture.

ii) Comment as cell fusion studies as specialized technique in ATC.

iii) What is cauliogenesis? Explain in detail.

b) Answer any one : **[4]**

i) Explain in detail how transportation of cultured cells is done in ATC.

ii) Draw flow chart to demonstrate Embryo rescue after hybridisation.

Q5) **Write short notes on :** **[10]**

a) Hormones in plant Tissue Culture.

b) Disadvantages of somaclonal variations.

c) Continuous cell lines.

d) Direct organogenesis.

e) Precursors used in Hairy root culture.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2334

[Total No. of Pages : 2

[5901]-431

T.Y. B.Sc. Vocational Biotechnology

VBT - 312 : INDUSTRIAL BIOTECHNOLOGY

(2019 Pattern) (Semester - V) (CBCS) (35572)

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

a) Define industrial biotechnology.

b) Name any two nitrogen sources used in fermentation media.

c) Give the role of baffles in fermenter.

d) Name any one method of measuring temperature during fermentation process.

e) What is the role of phenyl-acetic acid (PAA) during production of penicillin?

f) Define brewing.

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

i) Write a short note on synthetic media.

ii) Define fermentation. Add a note on its historical development.

iii) Describe secondary metabolites in detail.

b) With the help of well labelled diagram, explain the parts of a typical fermentation process. **[4]**

OR

With the help of well labelled diagram, explain the working of air-lift fermenter. **[4]**

P.T.O.

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

i) Explain any three properties shown by antifoaming agents.
ii) Describe the use of r-DNA technology for strain improvement.
iii) Write a short note on "Sporulation in submerged media" method of inoculum development in fungi.

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

i) Describe crowded plate technique in detail.
ii) Write a short note on "polarographic electrode".

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

i) Describe continuous fermenter in detail.
ii) Explain the process of production of citric acid in detail.

b) Explain the basic steps involved in downstream processing. **[4]**

OR

Give any four applications of industrial biotechnology. **[4]**

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

a) Role of precursors in fermentation media.
b) Objectives of inoculum development.
c) Advantages of air-lift fermenters.
d) Role of hops in production of beer.
e) Centrifugation step of downstream processing.
f) Thermistors.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2335

[Total No. of Pages : 2

[5901]-432
T.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
ST - 3.1 : Seed Pathology & Entomology
(2019 Pattern) (Semester - V) (CBCS) (35891) (2 Credits)

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) What are seed borne fungi?

b) What is seed infection?

c) What is pest?

d) What is seed damage?

e) Define seed health.

f) Define control measure.

Q2) **Attempt the following questions :**

a) Comment on seed borne fungi- Aspergillus sp. **[6]**

b) What are seed borne pathogens? **[4]**

Q3) **Attempt the following questions :**

a) Explain the mechanism of seed transmission. **[6]**

b) What is the importance of seed testing? **[4]**

P.T.O.

Q4) **Attempt the following questions :**

a) Comment on seed borne fungi- Alternaria sp. **[6]**

b) What are the objectives of seed health testing? **[4]**

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

a) Seed entomology.

b) Methods of Seed health testing.

c) Characters of order Lepidoptera.

d) Infestation and symptoms of any one pest of pulse crop.

e) Seed storage.

f) Common Insect Pest in vegetables.

g) Common Insect Pest in cereals.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2336

[Total No. of Pages : 2

[5901]-433

T.Y. B.Sc. (Vocational) (Seed Technology)

ST 3.2 : Entrepreneurship Development

(2019 Pattern) (Semester - V) (CBCS) (35892) (2 Credits)

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 entrepreneur.

b) What is partnership?

c) What is Sales Tax

d) Full form of SISI

e) Full form of SIDBI

f) What is Income Tax?

Q2) Attempt the following questions.

a) Explain the role of Pollution Control Board. **[6]**

b) Give the types of Small Scale Industry. **[4]**

Q3) Attempt the following questions.

a) Explain the sources of finance. **[6]**

b) Give the scope and importance of marketing. **[4]**

P.T.O.

Q4) Attempt the following questions.

a) Comment on different modes of employment. **[6]**

b) Give the role of consultancy organizations. **[4]**

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

a) Legal liabilities of employees.

b) Interpersonal relations and communication skills.

c) Commercial and Co-operative Banks.

d) Forms of business organizations.

e) Patent Rules.

f) Digital marketing.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2337

[Total No. of Pages : 2

[5901]-434

T.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY

IMB 355: Applications of Microbial Systems

(CBCS) (2019 Pattern) (Semester - V) (35825)

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

Instructions to the candidates :

1) ***Q1 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) Screens are used in _____ of water.

b) State two methods of disinfection.

c) Name two flow measuring devices.

d) Define probiotic and state one example.

e) What are functional dairy foods?

f) Why is nutrient cycling important?

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

a) Draw a neat labelled diagram of sequential biological reaction. **[6]**

OR

Explain concept of sustainable agriculture.

b) Explain characteristics of waste water. **[4]**

P.T.O.

Q3) Solve the following :

a) Explain role of Insitu Bioremediation in waste water treatment. **[6]**

OR

Explain therapeutic importance of dairy foods.

b) Note on sustainable Agricultural practices. **[4]**

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

a) Discuss merits of Biological treatment of waste water. **[6]**

OR

Give descriptive account of functional dairy foods.

b) Enlist 4 starter cultures with their products. **[4]**

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

a) Write note on Break point Chlorination.

b) Role of disinfectants in water treatment.

c) Preliminary screening methods of waste water treatment.

d) Phosphate solubilizing Bacteria.

e) Nutrient cycling.

f) Functional Dairy foods as therapeutic agents.

Total No. of Questions : 5]

SEAT No. : ____

PA-2338

[Total No. of Pages : 2

[5901]-435

T.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY

35826: IMB-356: Cell Culture Technology

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

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 Q5 carry equal marks.***

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

a) State importance of Harrison in ATC.

b) State an example of Continuous cell line.

c) State the role of Sodium bicarbonate in ATC medium.

d) What is pronuclear microinjection technique?

e) Which microscope is used to visualise animal cell culture and why?

f) State an example of Monoclonal antibody with its therapeutic use.

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

i) Enlist steps involved in IVF.

ii) Write short note on ECM. State examples.

iii) Discuss any one technique for performing Organ culture.

b) Diagrammatically explain construction and working of Hollow fibre Reactor. **[4]**

P.T.O.

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

i) Draw a flow chart for production of monoclonal antibodies.

ii) What is embryo biopsy? Where is it used?

iii) Explain concept of stem cells and discuss types of stem cell.

b) Write a short note on Primary cell culture. **[4]**

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

i) Write a short note on media used for ATC.

ii) State applications of Transgenic animals.

iii) State applications of animal cell culture.

b) What is Hayflick limit? Explain the concept of contact inhibition. **[4]**

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

a) Types of animal cells based on morphology.

b) Nunc cell factory.

c) Enlist any three products of animal cell culture technology with it's use/ application.

d) Different methods for disaggregation of animal tissues.

e) Characterization of cell lines.

f) Compare normal & transformed cell lines.

Total No. of Questions : 5]

SEAT No. : ____

PA-2339

[Total No. of Pages : 2

[5901]-436

T.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY

IMB 3510: Plant Tissue Culture

(CBCS) (2019 Pattern) (Semester - V) (358210)

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

Instructions to the candidates :

1) ***Q1 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) Give an example of commercially available Bt crop.

b) State importance of plant tissue culture.

c) What is protoplast fusion?

d) Which carbon source is commonly used for PTC media?

e) What are virus free plants?

f) Surface sterilization of plant's explant is carried out by ____

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

i) What is Somatic embryogenesis?

ii) Discuss Gene gun method for transformation of plant cell.

iii) Describe different advantages of PTC over conventional farming.

b) What are transgenic plants? Explain "Golden rice". **[4]**

P.T.O.

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

i) Define Totipotency, differenciation and dedifferenciation.

ii) Write short note on Herbicide resistant crops.

iii) Explain micropropagation.

b) Write a short note on types of bioreactors used for PTC. **[4]**

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

i) Write a flow chart depicting setting up a callus culture from explant.

ii) Write a short note on Molecular pharming.

iii) Write a short note on Ovary culture.

b) Write short note on Haploid plants. **[4]**

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

a) Plantibodies and their examples.

b) Edible vaccines.

c) MS medium.

d) Role of Auxin & Cytokinin.

e) Types of Callus.

f) Syn-seeds.

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Total No. of Questions : 5]

SEAT No. : ____

PA-2340

[Total No. of Pages : 2

[5901]-437

T.Y. B.Sc. (Vocational)

VOC : ELECTRONIC EQUIPMENT MAINTENANCE

EEM-355: Trouble Shooting & Repair of Audio & Video Equipments

(35811) (CBCS) (2019 Pattern) (Semester - V) (Paper - V)

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

Instructions to the candidates :

1) ***Q.No. 1 is compulsory.***
2) ***Solve any three questions from Q.No. 2 to Q.No. 5.***
3) ***Q.No. 2 to 5 carry equal marks.***

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

a) What is the IF frequency in AM radio receiver?

b) What is satellite receiver?

c) Which microphone is used in PA system?

d) What is digital TV?

e) Which battery type is used in Laptop?

f) What is the typical print speed of dot matrix printer?

Q2) a) Answer the following : **[6]**

i) Describe in brief the troubleshooting procedure with AM receiver.

ii) Explain in brief the replay mechanism of CD player.

b) Draw the black diagram of satellite receiver. Also explain in brief the fault diagnosis with it. **[4]**

P.T.O.

Q3) a) Answer the following : **[6]**

i) Explain in brief the working principle of LCD TV.

ii) Explain the fault diagnosis with LCD monitor.

b) Explain in details the working principle of inkjet printer. **[4]**

Q4) a) Answer the following : **[6]**

i) Give at least two faults with blue-ray disk. Also give remedies for them.

ii) Give at least two faults with Laptop. Also suggest remedies for them.

b) Give in details the troubleshooting and fault diagnosis with smart phones. **[4]**

Q5) Attempt any <u>four</u> of the following : **[10]**

a) The fault is with antenna of AM receiver. How to troubleshoot it?

b) Compare the performance of audio CD and blue ray disc.

c) Give at least one performance parameter of home theatre. How to improve it?

d) What is set-top box? Give its two performance parameters.

e) Compare dot matrix printer with laser printer.

f) Write in brief about the types of catridges used in different printers.

Total No. of Questions : 5]

SEAT No. :

PA-2341

[Total No. of Pages : 2

[5901]-438

T.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE

35812:VOC EEM-356: Electronic Instrumentation

(CBCS) (2019 Pattern) (Semester - V) (Paper - VI)

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

Instructions to the candidates :

1) ***Q.No. 1 is compulsory.***
2) ***Solve any three questions from Q.No. 2 to Q.No. 5.***
3) ***Q.No. 2 to 5 carry equal marks.***

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

a) What is instrumentation amplifier?

b) Define Sensor. Give its one example.

c) How to measure impedence.?

d) How to calculate accuracy?

e) What is spectrum?

f) What is PLC?

Q2) a) Answer the following : **[6]**

i) What is error? How to obtain it from accuracy?

ii) A thermometer has a range of 100ºC. It has accuracy of I 0.5% of range. What will be maximum error in measurement using it.

b) Draw the block diagram of digital signal processing. Give its one application. **[4]**

P.T.O.

Q3) a) Answer the following : **[6]**

i) What is spectrum analyser? Give its one application.

ii) How does a motion sensor work?

b) Draw the block diagram of data acquisition system. Explain its working. **[4]**

Q4) a) Answer the following : **[6]**

i) Write in brief a note on motion sensor applications.

ii) What is distortion? How to analyse it?

b) Write a detailed note on fault detection technique used in PLC. **[4]**

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

a) How to use tracibility in quality control?

b) What is difference between force sensor and pressure sensor?

c) What are the steps in DSP?

d) With one example explain the use of logic analyser.

e) Differentiate between data processing and acquisition.

f) What are the types of data acquisition systems. Give one example of each of them.

Total No. of Questions : 4]

SEAT No. : [ ]

PA-2342

[Total No. of Pages : 2

[5901]-439

T.Y. B.Sc. (Semester - V)

DEFENCE AND STRATEGIC STUDIES

DS - 505 : Research Methodology

(2019 Pattern) (35235)

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

Instructions to the candidates :

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

c) Research

P.T.O.

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

a) Explain the Meaning and Concept of Research.

b) State the Aims and 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) What is the meaning and definition of research and explaining the need for research in Defence and strategic studies?

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