

Total No. of Questions : 4]

SEAT No. :

PA-2343

[Total No. of Pages : 3

[5901]-501

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

MATHEMATICS

DSE - 4A : MT 361 : Complex Analysis

(2019 Pattern) (CBCS) (36111)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

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

Q1) Attempt any Five of the following :

[5 × 1 = 5]

- a) If  $f(z) = z^2$ , find  $f^{-1}(z)$ .
- b) Show that  $\text{Log}(i) = i\frac{\pi}{2}$ .
- c) Show that  $z(t) = e^{it}$ ,  $t \in [0, \pi]$  is a smooth arc.
- d) Find the residue at  $z = 0$  of the function  $\frac{1}{z + z^2}$ .
- e) Obtain the Taylor's series  $e^z = e \sum_{n=0}^{\infty} \frac{(z-1)^n}{n!}$  ( $|z-1| < \infty$ ) by writing  $e^z = e^{z-1}e$ .
- f) Evaluate the integral  $\int_0^1 (t-i)dt$ .
- g) Evaluate  $\int_C e^z dz$ , where C is the unit circle  $|z| = 1$ .

P.T.O.

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

- i) If a function  $f(z)$  is continuous and non zero at a point  $z_0$ , then show that  $f(z) \neq 0$  throughout some neighborhood of that point.
- ii) If  $f'(z) = 0$  everywhere in a domain  $D$ , then prove that  $f(z)$  is constant function throughout  $D$ .

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

i) Show that the function  $u(x, y) = zx(1-y)$  is harmonic and find its harmonic conjugate.

ii) Show that

i)  $\exp(2 \pm 3\pi i) = -e^2$

ii)  $\exp\left(\frac{2 + \pi i}{4}\right) = \sqrt{\frac{e}{2}}(1 + i)$

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

i) If  $f(z)$  is piecewise continuous function on a contour  $c$ , then prove that

$$\left| \int_c f(z) dz \right| \leq ML, \text{ where } L = \text{Length of } c$$

and  $M$  is non negative constant such that  $|f(z)| \leq M$ .

ii) Define three types of isolated singularity. Give examples of essential singularity and removable singularity.

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

i) Find all roots of the equation  $\log z = i\frac{\pi}{2}$ .

ii) Using Cauchy's residue theorem, evaluate

$$\int_c \frac{z+1}{z^2-2z} dz$$

Where,  $c$  is the circle  $|z| = 3$  in the positive sense.

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

- i) Let  $f$  be analytic everywhere inside and on a simple closed contour taken in positive sense. If  $z_0$  is any point interior to  $c$ , then show that

$$f(z_0) = \frac{1}{2\pi i} \int_c \frac{f(z)}{(z - z_0)} dz$$

- ii) Prove that a function  $f$  that is analytic at a point  $z_0$  has a zero of order  $m$  there if and only if there is a function  $g$ , which is analytic and nonzero at  $z_0$ , such that

$$f(z) = (z - z_0)^m g(z)$$

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

- i) Find all roots of the equation  $\sin z = \cosh 4$ .
- ii) Show that, when  $0 < |z - 1| < 2$ ,

$$\frac{z}{(z-1)(z-3)} = -3 \sum_{n=0}^{\infty} \frac{(z-1)^n}{2^{n+2}} - \frac{1}{2(z-1)}$$



Total No. of Questions : 4]

SEAT No. :

PA-2344

[Total No. of Pages : 2

[5901]-502

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

MATHEMATICS

MT - 362 : Real Analysis - II

(2019 Pattern) (36112) (CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

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

Q1) Attempt any Five of the following :

[5 × 1 = 5]

- a) If set A contains 100 elements then what will be the measure of A?
- b) Explain why the measure of set of irrational numbers is not zero.
- c) Give an example of a sequence of real valued functions which is pointwise convergent but not uniformly convergent.
- d) If  $\lim_{n \rightarrow \infty} x^n = L$  ( $0 < x < 1$ ) then what will be the value of L? Why?
- e) Explain minimum one difference between Riemann integrable and non-riemann integrable function.
- f) Show that the improper integral  $I = \int_1^{\infty} \frac{1}{x^2} dx$  is convergent.
- g) Explain two types of improper integrals with an example.

Q2) a) Attempt any One of the following :

[5]

- i) Show that if  $f(x)$  and  $g(x)$  are Riemann integrable functions on  $[a, b]$  then  $f(x) \pm g(x)$  is also Riemann integrable on  $[a, b]$ .
- ii) State and prove Fundamental theorem of calculus.

b) Attempt any One of the following :

[5]

- i) Show that, if each of the subsets  $E_1, E_2, \dots$  of  $\mathbb{R}'$  is of measure zero, then  $\bigcup_{n=1}^{\infty} E_n$  is also of measure zero.
- ii) Prove that  $\int_a^a f(x) dx = 0$  for any function  $f(x)$  on the interval  $[a, a]$ .

P.T.O.

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

i) Show that, if  $\sum_{n=0}^{\infty} a_n x^n$  converges on  $(-S, S)$  for some  $S > 0$  and if

$$f(x) = \sum_{n=0}^{\infty} a_n x^n \text{ on } (-S, S) \text{ then } f'(x) \text{ exist for } -S < x < S \text{ and}$$

$$f'(x) = \sum_{n=1}^{\infty} n a_n x^{n-1} \text{ on } (-S, S).$$

ii) If  $\{f_n\}_{n=1}^{\infty}$  is a sequence of functions in  $R[a, b]$  and if  $\{f_n\}_{n=1}^{\infty}$  Converges uniformly to  $f$  on  $[a, b]$  then show that  $f$  is also  $R[a, b]$ .

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

i) Show that, if  $f_n(x) = \frac{1}{n} e^{-nx}$  defined on  $[0, \infty]$  then  $\{f_n\}_{n=1}^{\infty}$  converges uniformly to 0 on  $[0, \infty]$ .

ii) If  $\sum_{n=0}^{\infty} |a_n| < \infty$  then prove that  $\int_0^1 \left( \sum_{n=0}^{\infty} a_n x^n \right) dx = \sum_{n=0}^{\infty} \frac{a_n}{1+n}$ .

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

i) Show that the improper integral  $\int_1^{\infty} \frac{1}{x^p} dx$  is convergent if and only if

$$p > 1.$$

ii) State and prove Abel's test of convergence for improper integral.

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

i) Show that the improper integral  $I = \int_{-\infty}^{\infty} \frac{dx}{1+x^2}$  is convergent.

ii) Show that the improper integral  $I = \int_1^{\infty} \frac{1}{x(1+x^2)} dx$  is convergent.



Total No. of Questions : 4]

SEAT No. :

PA-2345

[Total No. of Pages : 2

[5901]-503

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

MATHEMATICS

DSE - 5A : MT - 363 : Ring Theory

(2019 Pattern) (CBCS) (36113)

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) The set  $\{0, 2, 4\}$  under addition and Multiplication modulo 6 has unity element, find it.
- b) List all zero division in the ring  $\mathbb{Z}_{20}$ .
- c) Determine whether  $f(x) = x^2 + x + 1$  is irreducible over  $\mathbb{Z}_4$ .
- d) State the characteristic of  $\mathbb{Z}_5$  and  $5\mathbb{Z}$ .
- e) Find all maximal ideal of  $\mathbb{Z}_6$ .
- f) Find zeros of  $x^2 + 3x + 2$  in  $\mathbb{Z}_6$ .
- g) Give an example of finite non-commutative ring.

Q2) A) Attempt any One of the following :

[5]

- i) If  $p$  is prime, then show that  $\mathbb{Z}_p$  is field.
- ii) Prove that a Finite Integral domain is a field.

b) Attempt any One of the following :

[5]

- i) A ring  $R$  is called Boolean ring if  $a^2 = 0$  for all  $a \in R$ . Show that a Boolean ring  $R$  is a commutative ring.
- ii) Show that  $a^2 - b^2 = (a + b)(a - b)$  for all  $a$  and  $b$  in the ring  $R$  if and only if  $R$  is commutative.

P.T.O.

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

i) Let  $f(x) \in F[x]$  and  $f(x)$  be of degree 2 or 3. Then prove that  $f(x)$  is reducible over  $F$  if and only if it has zero in  $F$ .

ii) Prove that the product of two primitive polynomials is primitive.

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

i) Show that  $\mathbb{Z}[\sqrt{-5}]$  is an Integral domain but not a UFD.

ii) State Eisenstein's criterion and hence show that  $x^5 + 9x^4 + 12x^2 + 6$  is irreducible over  $\mathbb{Q}$ .

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

i) Prove that Every Euclidean Domain is principal ideal domain.

ii) Let  $R$  be a commutative ring with unity then prove that  $M$  is maximal ideal of  $R$  if and only if  $\frac{R}{M}$  is a field.

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

i) Find all  $c \in \mathbb{Z}_3$  such that  $\frac{\mathbb{Z}_3[x]}{\langle x^3 + x^2 + c \rangle}$  is a field.

ii) Determine whether the mapping  $\phi: \mathbb{Z} \rightarrow M_2(\mathbb{R})$  given by

$$\phi(a + ib) = \begin{pmatrix} a & b \\ -b & a \end{pmatrix}$$
 is ring homomorphism if yes, Find the

Kernel  $\phi$ .



Total No. of Questions : 4]

SEAT No. :

PA-2346

[Total No. of Pages : 3

[5901]-504

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

MATHEMATICS

DSE - 5B : MT - 364 : Partial Differential Equations

(2019 Pattern) (CBCS) (36114)

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) \_\_\_\_\_ state the theorem of existence and uniqueness of solutions of  
$$\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}.$$
- b) Define pfaffian differential equation in two variables.
- c) Eliminate the arbitrary constants  $a$  and  $b$  from the equation  $ax^2 + by^2 + z^2 = 1$ .
- d) Why linear equations of first order differential equations are called as Lagrange's equations.
- e) What is the value of  $\frac{1}{f(D,D')} e^{ax+by}$ ?
- f) Write one example of reducible and one example of irreducible differential operator.
- g) Define quasilinear partial differential equation.

P.T.O.



- Q2) A) Attempt any One of the following :** **[5]**
- i) Prove that the direction cosines of the tangent to the curve  $x = x(s)$ ,  $y = y(s)$  and  $z = z(s)$  at a point  $p(x, y, z)$  are
- $$\left( \frac{dx}{ds}, \frac{dy}{ds}, \frac{dz}{ds} \right)$$
- ii) Prove that a necessary and sufficient condition that the pfaffian differential equation  $\bar{X} \cdot d\bar{r} = 0$  should be integrable is that  $\bar{X} \cdot \text{curl } \bar{X} = 0$ .
- b) Attempt any One of the following :** **[5]**
- i) Show that the direction cosines of the tangent at a point  $p(x, y, z)$  to the conic  $ax^2 + by^2 + cz^2 = 1$ ,  $x + y + z = 1$  are proportional to  $(by - cz, cz - ax, ax - by)$ .
- ii) Solve the equations
- $$\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{z(x-y)}$$
- Q3) A) Attempt any One of the following :** **[5]**
- i) If  $u_i(x_1, x_2, x_3, \dots, x_n, z) = c_i (i = 1, 2, \dots, n)$  are independent solutions of the equations  $\frac{dx_1}{P_1} = \frac{dx_2}{P_2} = \frac{dx_3}{P_3} = \dots = \frac{dx_n}{P_n} = \frac{dz}{R}$  then prove that the relation  $\varphi(u_1, u_2, \dots, u_n) = 0$  in which the function  $\varphi$  is arbitrary is general solution of linear partial differential equation  $P_1 \frac{\partial z}{\partial x_1} + P_2 \frac{\partial z}{\partial x_2} + \dots + P_n \frac{\partial z}{\partial x_n} = R$ .
- ii) Using separation of variable method obtain the solution of one dimensional wave equation  $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$   $0 \leq x \leq L, t > 0$
- Subject to the conditions  $u(0, t) = 0, t > 0; u(L, t) = 0, t > 0$
- b) Attempt any One of the following :** **[5]**
- i) Verify that the differential equation  $ydx + xdy + 2z dz = 0$  is integrable. Find its primitive.
- ii) Find a particular integral of the equation  $(D^2 - D^1) z = e^{2x+y}$ .

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

- i) If  $u_1, u_2, \dots, u_n$  are solutions of the homogeneous linear partial differential equation  $F(D, D') z = 0$  then prove that  $\sum_{r=1}^n c_r u_r$  is also a solution of the PDE, where  $C_r$ 's are arbitrary constants.
- ii) If  $\alpha_r D_r + \beta_r D'_r + \gamma_r$  is a factor of  $F(D, D')$  and  $\varphi_r(\xi)$  is an arbitrary function of the single variable  $\xi$  and if  $\alpha_r \neq 0$ , then prove that  $u_r = e^{-\left(\frac{\gamma_r x}{\alpha_r}\right)} \varphi_r(\beta_r x - \alpha_r y)$  is solution of the equation  $F(D, D') z = 0$ .

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

- i) Find the solution of

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = x - y$$

- ii) Obtain the solution of the Radio equation

$$\frac{\partial^2 v}{\partial x^2} = LC \frac{\partial^2 v}{\partial t^2}$$



Total No. of Questions : 4]

SEAT No. :

PA-2347

[Total No. of Pages : 4

[5901]-505

T.Y. B.Sc.

MATHEMATICS

DSE-6A : MT-365(A) : Optimization Techniques

(2019 Pattern) (CBCS) (Semester - VI) (36115A)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Define the term game.
- b) Two player A and B match coins. If the coin match then A wins Rs. 2, if the coin do not match then B wins Rs. 2, Determine the pay-off matrix.
- c) What is mean by game of chance?
- d) What are the three type of replacement problem?
- e) What are the three time estimates used in PERT.
- f) Give any two difference between PERT and CPM.
- g) What do you mean by passing rule is not allowed in sequencing problem.

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

- i) Determine the optimal sequence of job that minimize total elapsed time required to complete the following job.

Tasks	A	B	C	D	E	F	G	H	I
Machine $M_1$	2	5	4	9	6	8	7	5	4
Machine $M_2$	6	8	7	4	3	9	3	8	11

Also find the idle time for machine  $M_2$ .

P.T.O.

- ii) Using dominance rule. Find the optimal strategies for player A and player B in the following game. Also determine the value of game.

		Player B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Player A	A <sub>1</sub>	19	6	7	5
	A <sub>2</sub>	7	3	14	6
	A <sub>3</sub>	12	8	18	4
	A <sub>4</sub>	8	7	13	-1

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

- i) Solve the following game graphically

		Player B	
		B <sub>1</sub>	B <sub>2</sub>
Player A	A <sub>1</sub>	1	2
	A <sub>2</sub>	4	5
	A <sub>3</sub>	9	-7
	A <sub>4</sub>	-3	-4
	A <sub>5</sub>	2	1

- ii) A machine owner find from his past record that the cost per year of maintaining a machine whose purchase price is Rs. 6000 are as given below.

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	1000	1200	1400	1800	2300	2800	3400	4000
Resale price	3000	1500	750	375	200	200	200	200

Determine at what age is replacement due?

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

- i) Solve the following game by using mixed - strategy. Also find the optimal strategy for player and value of game.

$$\begin{array}{cc} & B_1 & B_2 \\ A_1 & \begin{bmatrix} 6 & 2 \end{bmatrix} \\ A_2 & \begin{bmatrix} 1 & 9 \end{bmatrix} \end{array}$$

- ii) Draw the network diagram for the following data :

Activity	Immediate Predecessors
A	–
B	A
C	A
D	B, C
E	C
F	D
G	E
H	F, G

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

- i) There are 7 jobs, each of which has to go through the machine A and B in the order AB. Processing time in hours are as follows :

Job	:	1	2	3	4	5	6	7
Machine A	:	3	12	15	6	10	11	9
Machine B	:	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T. Also find the idle time.

- ii) Find the extreme point of the following function

$$\begin{aligned} f(x_1, x_2, x_3) &= x_1 + 2x_3 + x_2 x_3 \\ &- x_1^2 - x_2^2 - x_3^2 \end{aligned}$$

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

i) Draw the network of a small project is composed of seven activities whose time estimate are listed in the table below.

Activity	Predecessors	Expected time
A	–	2
B	–	4
C	–	3
D	A	1
E	B	6
F	C	5
G	D, E	7
H	F, G	2

ii) The data for the PERT network is displayed in the table below.

Activity	Time duration (Pays)		
	$t_o$	$t_m$	$t_p$
1-2	2	4	6
1-3	6	6	6
1-4	6	12	24
2-3	2	5	8
2-5	11	14	23
3-4	15	24	45
3-6	3	6	9
4-6	9	15	27
5-6	4	10	16

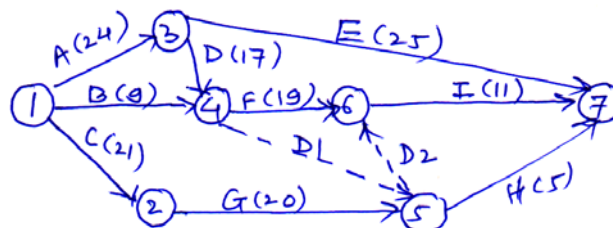
Find the critical path & project completion time.

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

i) Solve the following non-linear programming problem by Lagranges method.

$$f(x) = 2x_1^2 - 24x_1 + 2x_2^2 - 3x_2 + 2x_3^2 - 12x_3 + 200$$

ii) Find the project completion time and critical path for the given project network.



Total No. of Questions : 4]

SEAT No. :

PA-2348

[Total No. of Pages : 3

[5901]-506

T.Y. B.Sc.

MATHEMATICS

DSE-6A : MT-365(B) : Calculus of Variation and Classical  
Mechanics

(2019 Pattern) (CBCS) (Semester - VI) (36115B)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1)** Attempt any five of the following :

**[5]**

- a) Define generalized velocities.
- b) State Newton's second law of motion.
- c) Show that straight line gives shortest distance between two points in a plane.
- d) State Brachistochrone problem.
- e) State Hamilton's variational principle.
- f) Deduce Newton's second law of motion from Hamilton's principle.
- g) State kinetic energy of a mass  $m$  moving in a plane and attracted towards the origin of co-ordinates with a force that is inversely proportional to the square of the distance from it.

**Q2) a)** Attempt any one of the following :

**[5]**

- i) Deduce Hamilton's principle from D' Alembert's principle.
- ii) Derive Euler-Lagrange's equations for finding extremals of a

$$\text{functional } I(y) = \int_a^b f(x, y, y^1) dx$$

**P.T.O.**

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

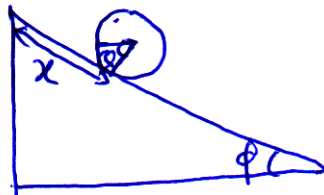
- i) Let  $Q$  be angle between rest position and deflected position of a mass  $m$  attached to a string of length  $l$  then  $\ddot{Q} + \frac{g}{l}\theta = 0$   
Where  $g$  is gravitational acceleration.
- ii) Derive the equation of motion of a simple harmonic motion using Lagrangian.

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

- i) Define cyclic coordinate and if  $a_j$  is cyclic co-ordinate then show that  $\frac{\partial L}{\partial \dot{a}_j} = \text{constant}$ , where  $L$  is the Lagrangian.
- ii) Use Lagrange's method of undetermined multipliers to derive equations of motion of  $m$  particles with  $m$  non-holonomic constraints.

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

- i) Consider a cylinder is rolling down an inclined plane as show in fig.



Where  $x$ ,  $\theta$  are generalized co-ordinates  $l$  is length of an inclined plane.

- ii) State and derive the law of conservation of angular momentum.

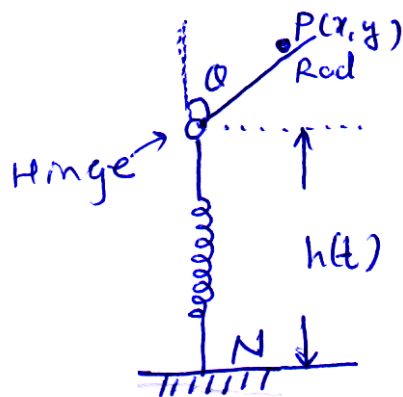
Q4) a) Attempt any one of the following : [5]

- i) Show that Lagrange's equations of motion are invariant under generalized co-ordinate transformations.
- ii) A solid homogeneous cylinder of radius  $r$ , rolls without slipping on the inside of a stationary large cylinder of radius  $R$ . Find the equation of its motion. What is the period of small oscillations about the stable equilibrium position?



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

- i) A uniform disc of radius 'a' and mass 'm', rotates about a fixed axis. A massless rope is fixed to a point on the outside circumference and leads to massless spring which is in turn fastened to a fixed point. At a radius  $a/2$ , another cord is fastened to a spring which connects to a mass, m. Find equations of motion of the disc and the mass using Lagrangian.
- ii) A massless rod of length  $l$ , is hinged at the extremity of a vertical spring that is fixed to the ground. A mass  $m$  rest on the rod. Assuming harmonic motion of the spring, find the equation of motion of the system.



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Total No. of Questions : 4]

SEAT No. :

PA-2349

[Total No. of Pages : 3

[5901]-507

T.Y. B.Sc.

MATHEMATICS

**DSE-6A : MT-365(C) : Financial Mathematics**  
**(2019 Pattern) (CBCS) (Semester - VI) (36115C)**

*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 elasticity of demand.
- b) Explain the term annuity with an example.
- c) State the two equations to obtain recurrence relation for  $p_t$  in a cobweb model.
- d) What is meant by riskless portfolio?
- e) What is the present value of an annuity generating Rs. 10,000 a year for next seven years, given the fixed rate of 8%.
- f) If demand set  $D = \{(q, p)/q + 5p = 30\}$  then show that demand is elastic if  $3 < p < 6$ .
- g) State the first economic principle for a small efficient firm.

**P.T.O.**

- Q2) a) Attempt any one of the following : [5]**
- i) Suppose we invest  $P$ , and withdraw an amount at the end of each year for  $N$  years, at which time the capital is used up. Show that income generated from the principal is  $I(P) = \left( \frac{r(1+r)^N}{(1+r)^N - 1} \right) P$ .
- ii) Suppose that the supply and demand sets  $S = \{(q, p) / 2q - 15p = -20\}$  and  $D = \{(q, p) / q + 5p = 40\}$  are given. Suppose now the government imposes tax  $T$  per item, show that the new equilibrium point will be  $\left( 20 - 3T, 4 + \frac{3}{5}T \right)$ .
- b) Attempt any one of the following : [5]**
- i) Suppose the market for a commodity is governed by supply and demand sets defined as follows.  $S = \{(q, p) / q - 6p = -12\}$  and  $D = \{(q, p) / q + 2p = 40\}$ . Sketch  $S$  and  $D$  and determine the equilibrium point  $E$ , the supply and demand functions and the inverse supply and demand functions.
- ii) Explain the cobweb model using the effect of disturbance over one year cycle.
- Q3) a) Attempt any one of the following : [5]**
- i) An amount of Rs. 1000 is invested and attracts at a rate equivalent to 10% per annum. Find the total after one year if the interest is compounded (a) monthly (b) quarterly (c) monthly (d) daily (Assume the year is not a leap year).
- ii) Suppose that the supply and demand functions for a commodity are  $q^s(p) = p - 2$ ,  $q^D(p) = 7 - 2p$ . Assuming that the suppliers operate according to the cobweb model, find a recurrence equation for the sequence  $p_t$  of prices. Find the explicit solution given that  $p_0 = 3.5$ , and describe in words how the sequence  $p_t$  behaves.
- b) Attempt any one of the following : [5]**
- i) Find the maximum and minimum value of the function  $f(x) = x^3 - 12x^2 + 21x + 100$ .
- ii) Suppose you have won a competition and that you are given a choice between 1,80,000 now or 10,000 at the start of each year for the rest of your life. Assume that the bank has a constant rate of 6% and that you currently have no debts. Which option should you choose if you think you will live until 65?

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

- i) The demand set for a good  $D = \{(q, p)/q(1 + p^2) = 100\}$  :
- a) Determine the elasticity of demand.
  - b) For what values of  $p$  is the demand inelastic?
- ii) Consider an efficient small firm with cost function  $C(q) = 800 + 70q - 12q^2 + q^3$ . Find (i) Fixed cost (ii) Variable cost (iii) Average variable cost (iv) Marginal cost (v) Start up point and going price.

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

- i) Suppose the matrix of returns for the Apathian investor is

$$R = \begin{bmatrix} 1.25 & 0.95 \\ 1.05 & 1.05 \\ 0.90 & 1.15 \end{bmatrix}. \text{ Show that the portfolio } y = (5000 - 10000 \ 5000)$$

is an arbitrage portfolio. Which election might an investor prefer for the portfolio  $Z = (5000 \ 1000 \ 4000)$ ?

- ii) Suppose that Silicon Limited is an efficient small firm and  $C(q) = 800 + 70q - 12q^2 + q^3$  with maximum weekly production  $L = 10$ . Show that (a) At startup, the marginal cost equals the average variable cost (b) At breakeven, the marginal cost equals the average cost.



Total No. of Questions : 4]

SEAT No. :

PA-2350

[Total No. of Pages : 2

[5901]-509

T.Y. B.Sc.

MATHEMATICS

**DSE-6B : MT-366(B) : Computational Geometry  
(2019 Pattern) (CBCS) (Semester - VI) (36116B)**

*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) What is the determinant of the inverse of any pure rotation matrix?
- b) Find the angle through which the line  $y = -x$  is rotated so that it is coincident with  $x$ -axis.
- c) Write down Three - Dimensional transformation matrix of uniform scaling by '2' units.
- d) Define : Plane of projection.
- e) Write down any two characteristics of Be'zier curve.
- f) Define control points.
- g) State types of projection.

**Q2)** a) Attempt any one of the following :

**[5]**

- i) Show that under any  $2 \times 2$  transformation matrix the midpoint  $M$  of the line  $AB$  is transformed into the midpoint  $M^*$  of the transformed line  $A^*B^*$ .
- ii) Prove that under any  $2 \times 2$  transformation matrix point of intersection transforms to point of intersection.

**P.T.O.**

- b) Attempt any one of the following : [5]
- i) Rotate the line segment joining the points A[3, 5], B[4 1] about the point P[2 1] through an angle  $90^\circ$ . Obtain the transformed line segment.
  - ii) Find the point of intersection at infinity, for the lines  $x + y = 1$  and  $x + y = 0$ .

- Q3)** a) Attempt any one of the following : [5]
- i) Write an algorithm for rotation about an axis parallel to  $x$ -axis.
  - ii) Write an algorithm for reflection through the plane which is parallel to  $yz$  plane.

- b) Attempt any one of the following : [5]
- i) Find the concatenated matrix required to make the plane  $x + y + z = 0$  coincident with  $z = 0$  plane.
  - ii) Find the concatenated transformation matrix for following transformations in order :
    - a) Translate in  $x, y, z$  direction by  $-2, -2, -2$  units respectively.
    - b) Rotate about  $x$ -axis by an angle  $45^\circ$ .
    - c) Reduce to half of its size.

- Q4)** a) Attempt any one of the following : [5]
- i) Derive the relation between  $\Theta, \phi$  and  $f_2$  in Dimetric projection.
  - ii) Write an algorithm to generate equispaced  $n$  points on circumference of the circle with centre  $(h, k)$  and radius  $r$ .

- b) Attempt any one of the following : [5]
- i) Generate uniformly spaced 6 points on circle  $x^2 + y^2 = 16$ .
  - ii) Consider the Be'zier curve determined by control points  $B_0[4, 3], B_1[0, 1], B_2[2, -1]$  Find first and second derivative of the curve at  $t = 0.3$ .



Total No. of Questions : 4]

SEAT No. :

PA-2351

[Total No. of Pages : 2

[5901]-510

T.Y. B.Sc.

MATHEMATICS

DSE-6B : MT-366(C) : Lebesgue Integration

(2019 Pattern) (CBCS) (Semester - VI) (36116C)

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) Give an example of closed uncountable set of length zero.
- b) What is inner measure of set of irrationals in  $[0, 1]$ ?
- c) If  $E \subset [a, b]$  then show that  $\underline{m}E \leq \bar{m}E$ .
- d) Let  $f(x) = 5, x \in [a, b]$ . Show that  $f$  is a measurable function.
- e) Let  $f(x) = \frac{1}{\sqrt[3]{x}}, 0 < x \leq 1$ . Find  $\int f$ .
- f) Let  $f(x) = x^4 - 1, x \in [-2, 2]$  then find  $f^+$
- g) True or false? If  $G$  is an open subset of  $[a, b]$  and  $|G| = 0$  then  $G = \phi$ .

Q2) a) Attempt any one of the following :

[5]

- i) If  $E_1$  and  $E_2$  are subsets of  $[a, b]$ , then show that  $\underline{m}E_1 + \underline{m}E_2 \leq \underline{m}(E_1 \cup E_2) + \underline{m}(E_1 \cap E_2)$ .
- ii) If  $E_1$  and  $E_2$  are subsets of  $[a, b]$  such that  $m(E_1 \Delta E_2) = 0$  and  $E_1$  is measurable, then show that  $E_2$  is measurable.

P.T.O.

- b) Attempt any one of the following : [5]
- i) Show that a subset  $E$  of  $[a, b]$  is measurable if and only if for given  $\epsilon > 0$  there exist a closed set  $F \subset E$  and an open set  $G \supset E$  such that  $|G| - |F| < \epsilon$ .
- ii) Let  $\{f_n\}_{n=1}^{\infty}$  be a sequence of measurable functions on  $[a, b]$  such that  $\{f_n(x)\}_{n=1}^{\infty}$  is bounded for each  $x \in [a, b]$  and  $m(x) = g$ . l. b.  $\{f_1(x), f_2(x), f_3(x) \dots\}$  ( $a \leq x \leq b$ ). Show that  $m$  is measurable function.

- Q3) a)** Attempt any one of the following : [5]
- i) If  $f \in \mathbb{R}[a, b]$ , then prove that  $f \in \mathcal{L}[a, b]$ .
- ii) If  $f \in \mathcal{L}[a, b]$  and  $a < c < b$ , then prove that  $f \in \mathcal{L}[a, c], f \in \mathcal{L}[c, b]$  and  $\int_a^b f = \int_a^c f + \int_c^b f$ .

- b) Attempt any one of the following : [5]
- i) Give an example of function  $f \in \mathcal{L}[a, b]$  such that  $f \notin \mathbb{R}[a, b]$ .
- ii) If  $f$  is bounded measurable function on  $[a, b]$  such that  $\int_a^b [f(x)]^2 dx = 0$ , then show that  $f(x) = 0$  for almost all  $x$  in  $[a, b]$ .

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

- i) Let  $f(x) = \frac{1}{\sqrt[5]{x}}$ , ( $0 < x \leq 1$ ). Then show that  $f \in \mathcal{L}[0, 1]$ . Also,

$$\text{find } \int_0^1 f.$$

- ii) If  $f(x) = \cos x$ ,  $x \in [0, 2\pi]$ , then find  $f^+$  and  $f^-$ .

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

- i) Let  $f \in \mathcal{L}[a, b]$ , then show that for given  $\epsilon > 0$ , there exists  $\delta > 0$

$$\text{such that } \left| \int_E f \right| < \epsilon \text{ whenever } E \text{ is measurable subset of } [a, b]$$

with  $m E < \delta$ .

- ii) State Lebesgue dominated convergence theorem and Fatou's Lemma.





Total No. of Questions : 5]

SEAT No. :

PA-2352

[Total No. of Pages : 2

[5901]-511

T.Y. B.Sc. (Physics)

Solid State Physics

(2019 Pattern) (Semester - VI) (36121) (Paper-I)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Que 1 is compulsory.*
- 2) *Solve any three question 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 logatable is allowed.*

**Q1)** Solve any five of the following.

**[5]**

- a) Define the primitive cell in crystal structure.
- b) Define the fold number with formula.
- c) Why the conductivity of semiconductor increases with increase in temperature?
- d) Prove that susceptibility of super conductor is -1.
- e) Calculate the distance between two lattice planes which gives first order diffraction at an angle of  $26.42^\circ$  with molybdenum x-rays of wavelength  $0.75\text{\AA}$ .
- f) Explain the term ferrites.

**Q2)** Solve the following.

- a) What is Bravais lattices in two dimensions? Explain its type in two dimensions. **[6]**
- b) For certain BCC crystal the (110) plane have separation of  $1.181\text{\AA}$ . These (110) planes are irradiated with x-ray of wavelength  $1.54\text{\AA}$ . How many order of Bragg reflections can be observed? **[4]**

**P.T.O.**

**Q3)** Solve the following.

- a) State and explain wiedemann-Franz law. [6]
- b) The critical temperature for a metal with isotopic mass 199.5 is at 4.185°K. Calculate the isotopic mass if the critical temperature fall to 4.133°K. [4]

**Q4)** Solve the following.

- a) Obtain the expression for density of states in one dimension. [6]
- b) A paramagnetic substance has  $10^{28}$  atom/m<sup>3</sup>. The magnetic moment of each atom is  $1.79 \times 10^{-23}$  A-m<sup>3</sup> calculate the paramagnetic susceptibility of a material at temperature 320°k. What would be the dipole moment of the rod of this materials 0.1m long and 1cm<sup>2</sup> cross section placed in a field of  $7 \times 10^4$  A/m? (Given  $k=1.38 \times 10^{-23}$  J/°k  $\mu_0 = 4\pi \times 10^{-7}$  wb/A.m.) [4]

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

- a) Explain density of crystal.
- b) What is symmetry operation?
- c) What are advantages of powder method?
- d) State merit of sommerfeld's free electron model.
- e) Write a note on ferromagnetism and Ferrimagnetism.
- f) What are type - I super conductor and type - II super conductor.



Total No. of Questions : 5]

SEAT No. :

PA-2353

[Total No. of Pages : 3

**[5901]-512**  
**T.Y. B.Sc. (Physics)**  
**362 : Quantum Mechanics**  
**(2019 Pattern) (Semester - VI)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) What is de-Broglie wavelength?
- b) State equation of continuity.
- c) What is potential barrier?
- d) Define commutator.
- e) Draw energy level diagram of free axis rigid rotator.
- f) What is free particle?

**Q2)** A) Solve any one of the following.

- a) With the help of time independent schrodinger's equation, obtain the energy eigen values and eigen functions for a particle in one dimensional deep potential well. **[6]**

OR

- b) i) What is meant by eigen function and eigen values? **[3]**  
ii) Normalise the wave function  $\Psi(x) = A \exp(-k|x|)$  where  $k$  is a positive constant. **[3]**

B) For conservative force field show that  $\frac{d}{dt} \langle px \rangle = \langle -\frac{dv}{dx} \rangle$ . **[4]**

**P.T.O.**

**Q3) A)** Solve any one of the following.

- a) Discuss the electron diffraction experiment to illustrate the uncertainty relation. [6]

OR

- b) Obtain the schrodinger's time dependent equation. [6]

**B)** A particle travelling with energy  $E > 0$  has potential barrier defined as [4]

$$v = 0 \quad x < 0$$

$$v = v_0 \quad 0 \leq x \leq a$$

$$v = 0 \quad x > a$$

Write formula for transmission coefficient and reflection coefficient.

**Q4) A)** Solve any one of the following.

- a) Show that i)  $V_g = v_p + k \frac{dvp}{dk}$  [6]

ii)  $V_g = v_p - \lambda \frac{dvp}{d\lambda}$

OR

- b) Show that time part of the wave function is  $e^{-\frac{iEt}{\hbar}}$ . [6]

**B)** A ruby laser emits light of wavelength 693.4nm. If this light is due to transmission from  $n=2$  to  $n=1$  state of electron in a one dimensional box. Find width of the box. [4]

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

- a) Show that the phase velocity of the de-Braglie wave of a particle of rest

mass  $m_0$  and wavelength  $\lambda$  is given by  $v_p = c \sqrt{1 + \left(\frac{m_0 c \lambda}{h}\right)^2}$  where  $C$  is

the velocity of light. [2½]

- b) i) Show that  $[L_x, x] = 0$

ii) Show that  $[L_x, L_z] = -i\hbar L_y$  [2½]

- c) The moment of inertia of HCL molecule is  $2.7 \times 10^{-40}$ gm. cm<sup>2</sup>. What would be the separation between  $l = 0$  and  $l = 1$  energy levels. [2½]
- d) Write short notes on wave velocity and group velocity. [2½]
- e) Obtain schrodinger's time equation from time dependent equation. [2½]
- f) Explain quantum mechanical motion of a particle through step potential. [2½]



Total No. of Questions : 5]

SEAT No. :

PA-2354

[Total No. of Pages : 2

[5901]-513

T.Y. B.Sc.

PHYSICS

**PHY - 363: Thermodynamics and Statistical Physics  
(2019 Pattern) (Semester - VI) (36123)**

*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 mark.*
- 4) *Figure 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 fermions.
- b) State clapeyron's latent heat equation.
- c) State normalisation condition of probabibility.
- d) Define accessible states.
- e) Calculate  $\beta$  if temperature of a thermodynamic system is 400k.  
(Given : Boltzman constant k,  $k=1.38 \times 10^{-23} \text{J-mole}^{-1} \text{K}^{-1}$ ).
- f) Calculate the amount of workdone it total amount of heat supplied to the system is 20k cal. The change in internal energy of the system is 19500cal.

**Q2)** Answer the following questions.

- a) State transport phenomenon and derive an expression for coefficient of gas. **[6]**
- b) Distinguish between Bose-Einstein and Fermi-Dirac statistics. **[4]**

**Q3)** Answer the following questions.

- a) Attempt the following. **[6]**
  - i) Derive an expression of mean value of  $n_1$  using binomial distribution function.
  - ii) Explain micro canonical, canonical and grand canonical ensemble of a thermodynamic system.

**P.T.O.**

- b) Determine the mean free path of a nitrogen gas molecule at 127°C temperature and 1 atmosphere. Diameter of nitrogen molecule is  $3.5 \times 10^{-8}$  cm. (Given : Boltzman constant  $k = 1.38 \times 10^{-23}$  J/mole/K). [4]

**Q4)** Answer the following questions.

- a) Attempt the following. [6]
- i) Discuss the applications of canonical ensemble in molecules of an ideal gas.
  - ii) Explain mean value and dispersion using Gaussian distribution function.
- b) 4 distinguishable molecules are distributed in 2 cells. Find possible number of macrostates and corresponding number of microstates. [4]

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

- a) Explain application of quantum statistics.
- b) What is meant by  $\mu$ -space.
- c) Explain Gibb's free energy.
- d) Write the probability of finding the state of paramagnetic atom with spin up and down.
- e) A bag contains 10 red balls and 8 white balls. Two balls are drawn at random one after the other. What is the probability that both balls are red.
- f) Using Maxwell equations, prove that  $C_p - C_v = T \left( \frac{\partial P}{\partial T} \right)_v \left( \frac{\partial v}{\partial T} \right)_p$ .



Total No. of Questions : 5]

SEAT No. :

PA-2355

[Total No. of Pages : 2

**[5901]-514**  
**T.Y. B.Sc. (Physics)**  
**PHY : 364 - NUCLEAR PHYSICS**  
**(2019 Pattern) (Semester - VI) (36124)**

*Time : 2 Hours]*

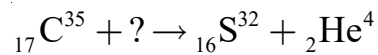
*[Max. Marks : 35*

*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) Define mass defect and binding energy.
- b) Define radioactivity.
- c) What is mean by linear accelerator?
- d) Define effective multiplication factor in nuclear reactor.
- e) What is spectroscopic term for  $L = 1, S = 1, J = 0$ ?
- f) Complete the reaction:



**Q2)** Answer the following questions.

- a) Sketch the binding energy curve & outline the features of the curve. **[6]**
- b) Write the difference between nuclear fusion and nuclear fission. **[4]**

**Q3)** Answer the following questions.

- a) What is successive disintegration? Derive an expression for the ratio of activity of daughter to the activity of parent. **[6]**
- b) If the frequency of the oscillator potential to the does of a cyclotron is 8MHz, what must be the magnetic flux density B to accelerate alpha particles? Given mass of alpha particle =  $6.643 \times 10^{-27}\text{kg}$   $e=1.6 \times 10^{-19}\text{C}$ . **[4]**

**P.T.O.**



**Q4)** Answer the following.

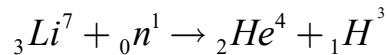
- a) Show that the Q value is given by. [6]

$$Q = \left(1 + \frac{m_4}{m_3}\right) E_4 - \left(1 - \frac{m_1}{m_3}\right) \frac{-2\sqrt{m_1 m_4 E_1 E_4}}{m_3} \cos \theta$$

- b) Show that the quark structure (uud) gives the correct charge, spin, baryon number and strangeness for a proton. [4]

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

- Write any three conservation laws in nuclear reaction.
- Write a note on spin dependence of nuclear forces.
- Explain the half life of a radioactive element and derive expression for it.
- Write any three differences between GM counter and scintillation counter.
- Obtain asymmetric energy for nucleus  ${}_{52}\text{Te}^{120}$  Given  $a = 19.0$  Mev.
- Calculate the energy released in the reaction



Given = Mass of  ${}_{3}\text{Li}^6 = 6.015126$  a.m.u.

Mass of  ${}_2\text{He}^4 = 4.002603$  a.m.u.

Mass of  ${}_1\text{H}^3 = 3.016049$  a.m.u.

Mass of  ${}_0\text{n}^1 = 1.008665$  a.m.u.

1 a.m.u. = 931 Mev



Total No. of Questions : 5]

SEAT No. :

PA-2356

[Total No. of Pages : 4

**[5901] - 515**  
**T.Y. B.Sc. (Semester - VI)**  
**PHYSICS**  
**PHY - 365(A) : Electronics - II**  
**(2019 Pattern)**

*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 carries equal marks.*
- 4) *Figures to the right indicates full marks.*
- 5) *Draw neat circuit diagrams or symbols whenever necessary.*

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

- a) In which operating mode, photo diode is used?
- b) On which factor, energy of Electromagnetic radiation is depends?
- c) How much is the ideal Input Impedance of OP-Amp?
- d) What is the value of  $Y = (A + \bar{B}) \cdot (\bar{A} + B + C)$ .
- e) Which kind of vibrate is flip flop?
- f) Defind band gap in JFET.

**Q2)** Answer the following questions :

- a) Explain serial in parallel out (SIPO) shift register with suitable diagram. **[6]**
- b) Explain OP-AMP as comparator with neat diagram. **[4]**

**Q3)** Answer the following questions.

- a) What is modulation? Explain its need and various type. **[6]**
- b) What is photodiode? Explain with suitable diagram. Also give its advantages. **[4]**

*P.T.O.*

**Q4)** Answer the following questions :

- a) Explain working of depletion type N-Channel MOSFET with suitable diagram. [6]
- b) Explain K-map for half adder. [4]

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

- a) What is counter? Give its applications.
- b) What is cross-over distortion?
- c) Draw symbols of N-Channel and P-channel MOSFET.
- d) Draw block diagram of SMPS.
- e) Draw circuit diagram for IC555 as an Astable multi vibrator.
- f) Draw I/P I-V characteristics of BJT transistor.



Total No. of Questions : 5]

PA-2356

**[5901] - 515**  
**T.Y. B.Sc. (Semester - VI)**  
**PHYSICS**  
**PHY - 365(B) : Advanced Electronics**  
**(2019 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

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

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

- a) What is spring - mass system?
- b) What is De-multiplexer?
- c) What is linear and quadratic approximation of resistance of RTD?
- d) What is active filter?
- e) How second order active filter is superior than. Passive filter?
- f) What are basic elements of process control loop?

**Q2)** Answer the following questions:

- a) Explain working of spring - mass system. What is the role of natural frequency in spring mass system. **[6]**

OR

Explain the working of broadband pyrometer. **[6]**

- b) If a wheastone bridge has  $R_1 = 100 \Omega$ ,  $R_2 = 842\Omega$ ,  $R_3 = 500\Omega$  find  $R_4$  at null condition. **[4]**

**Q3)** Answer the following :

- a) State features and explain instrumentation amplifier using 3 op-amp with circuit diagram. **[6]**

OR

Derive an expression of gain of instrumentation amplifier. **[6]**

*P.T.O.*

- b) Explain the working of photoconductive cell. [4]

**Q4)** Answer the following questions.

- a) Explain binary weighted type DAC in detail. What is an expression of its output. [6]

OR

Explain the working of priority encoder in detail. [6]

- b) Find seebeck emf for a material with  $\alpha = 50\mu\text{v}/^\circ\text{C}$  if junction temperature are  $20^\circ$  and  $100^\circ\text{C}$ . What is thermo emf? [4]

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

- a) Block diagram of process control loop.
- b) Process control using On/Off controller.
- c) First and second order active filter.
- d) Process - LAG
- e) Opamp as temperature sensor.
- f) Thermister characteristics.



Total No. of Questions : 5]

SEAT No. :

PA-2357

[Total No. of Pages : 2

[5901]-516

T.Y. B.Sc.

PHYSICS

**PHY - 366 (P) : Medical Electronics  
(2019 Pattern) (Semester - VI) (Elective - 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) *Figure to the right indicate full marks.*
- 5) *Use of calculator and log-table is allowed.*

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

- a) State the principle of temperature sensor.
- b) What is action potential?
- c) What are bio-potential electrodes.
- d) What is systolic pressure?
- e) Which is the typical range of measurement of bio-potential?
- f) What is patient-safely?

**Q2)** Answer the following questions :

- a) What is sensor? Describe inductive sensor used for biomedical applications? **[6]**
- b) Describe in detail Basic medical instrumentation system. **[4]**

**Q3)** Answer the following questions :

- a) Describe indirect measurement of blood pressure with suitable diagram. **[6]**
- b) Explain an isolation amplifier with block diagram. **[4]**

**P.T.O.**

**Q4)** Answer the following questions :

- a) Describe Silver-Silver Chloride Electrode interface. **[6]**
- b) Explain various sources of biomedical signals. **[4]**

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

- a) Isolation amplifier
- b) Significance of heart-sound.
- c) Ultrasonic blood flow meter.
- d) Patient safety.
- e) Piezoelectric sensor.
- f) Analysis of ECG pattern.



Total No. of Questions : 5]

SEAT No. :

PA-2358

[Total No. of Pages : 2

[5901]-517

T.Y. B.Sc.

PHYSICS

**PHY - 366 (Q) : Physics of Nanomaterials (36126Q)**  
**(2019 Pattern) (Semester - VI) (Elective - II) (Paper - IV)**

*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) What is the significance of nanosize materials?
- b) State any two applications of physical vapour deposition.
- c) State the principle of UV-visible spectroscopy.
- d) Define Nanocrystalline materials.
- e) Give two main uses for nanoparticles in cosmetic products.
- f) State any two issues that examine the challenges in nanotechnology.

**Q2)** Answer the following questions :

- a) Explain the thermal properties of nanosize materials. **[6]**
- b) What are the most important process parameter in ultrasonic spray pyrolysis. **[4]**

**Q3)** Answer the following questions :

- a) Describe X-ray diffraction technique in brief. Also give its advantages and disadvantages. **[6]**
- b) State various applications of carbon nanotubes. **[4]**

**P.T.O.**



**Q4)** Answer the following questions :

- a) Explain Top-down and Bottem-up approach with neat diagram. [6]
- b) Explain the synthesis of nanomaterial by using colloidal method. [4]

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

- a) Applications of nanomaterials in defence.
- b) Draw the typical diagram of chemical vapour deposition.
- c) How optical properties of nanomaterials are recognized?
- d) State the properties of quantum dots.
- e) Explain nano-crystalline ZnO.
- f) Give any two disadvantages of scanning electron microscopy.



Total No. of Questions : 5]

SEAT No. :

PA-2359

[Total No. of Pages : 2

[5901]-518

T.Y. B.Sc.

PHYSICS (Paper - VI)

**PHY - 366 (R) : Microcontrollers (Elective - II)**  
**(2019 Pattern) (CBCS) (Semester - VI) (36126R)**

*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) *Use of log tables or electronic calculators are allowed.*

**Q1)** Attempt any five of the following :

**[5 × 1 = 5]**

- a) What is the size of on-chip ROM in 8051?
- b) How  $(-67)$  is represented in 8051 microcontroller?
- c) How many banks and bank registers are used in RAM of 8051 microcontroller?
- d) Explain the function of ALE pin of 8051 microcontroller.
- e) What is the function of SCON register?
- f) Find the period of machine cycle, if crystal frequency is 18MHz.

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

**[2 × 3 = 6]**

- i) Compare the Simplex, Half duplex and full duplex data communication.
  - ii) Explain the different I/O ports used in 8051 microcontroller.
  - iii) Compare the function of Jump and call instructions used in 8051 microcontroller.
- b) Draw the PSW register format of 8051 microcontroller and explain the use of RS1 and RS0 bits of it. **[4]**

**P.T.O.**

- Q3)** a) Attempt any two of the following : **[2 × 3 = 6]**
- i) What are the different assembler directives? Explain any two of them.
  - ii) Write an 8051 assembly language program to subtract 53H from C6H using 2's complement method.
  - iii) Give the internal interrupts of 8051 microcontroller and their vector addresses.
- b) Explain the use of A and B register in **[4]**
- i) Multiplication
  - ii) Division

- Q4)** a) Attempt any two of the following : **[2 × 3 = 6]**
- i) Explain the function of PC register, SP register and DPTR register of 8051 microcontroller.
  - ii) Explain the logical instructions group of 8051 microcontroller with two suitable examples.
  - iii) Write an 8051 assembly language program to add first twenty integers.
- b) Explain the different rotate instructions of 8051 microcontroller with neat diagram. **[4]**

- Q5)** Attempt any four of the following : **[4 × 2.5 = 10]**
- a) Write a short note on Timer/counter of 8051 microcontroller.
  - b) Explain the meaning of SWAP A and XCH A,R<sup>2</sup> instruction.
  - c) Write a short note on IE register of 8051 microcontroller.
  - d) Name the any five addressing modes of 8051 microcontroller.
  - e) Write a short note on RS232 standard.



Total No. of Questions : 5]

SEAT No. :

PA-2360

[Total No. of Pages : 2

[5901]-519

T.Y. B.Sc.

PHYSICS

PHY - 366 (S) : Lasers

(2019 Pattern) (Semester - VI) (Paper - VI) (36126S)

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) State various types of gas Lasers.
- b) What is hologram?
- c) State two types of coherence.
- d) Define active medium in Laser.
- e) Calculate Length of cavity for He-Ne laser tube which achieves the condition for amplification having wavelength  $6328 \text{ \AA}$  & refractive index of active medium between two neighbouring reflectors is 1.57.
- f) Find the ratio of population of the two states in a He-Ne Laser that produces light of wavelength  $6328 \text{ \AA}$  at  $27^\circ\text{C}$ .

Q2) a) Describe the following : [6]

- i) Describe the working of Ruby Laser.
  - ii) Describe Laser drilling.
- b) What is Laser Light? Give two distinguish point between ordinary light and laser light. [4]

P.T.O.

- Q3)** a) Explain the following : **[6]**
- i) Explain four level optical pumping in laser.
  - ii) Explain the threshold condition for laser action.
- b) The half width of gain profile of laser material device is 0.003 emitted wavelength of  $6328\text{\AA}$ . Calculate maximum length of cavity in order to single mode of oscillation having refractive index 1. **[4]**

- Q4)** a) Discuss the following : **[6]**
- i) Discuss the construction of He-Ne laser.
  - ii) Discuss eye surgery application of laser in medical.
- b) Find the relative population of the two states in a Ruby Laser that produces a light beam of wave length  $6943\text{\AA}$  at 300K & 500K. **[4]**

- Q5)** Write short notes on any four of the following : **[10]**
- a) Interaction of light with matter.
  - b) Metastable state in laser.
  - c) Cavity Resonance Frequencies.
  - d) Doppler broadening.
  - e) Applications of  $\text{CO}_2$  laser.
  - f) Laser in cutting of material.



Total No. of Questions : 5]

SEAT No. :

PA-2361

[Total No. of Pages : 2

[5901]-520

T.Y. B.Sc.

PHYSICS

**PHY - 366 (T) : Astronomy and Astrophysics - II  
(2019 Pattern) (CBCS) (Semester - VI) (Elective - 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 calculator and log table is allowed.*

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

- a) What is meant by solar time?
- b) Define parsec.
- c) Define chromosphere.
- d) What is Halo.
- e) Write principle of UV ray telescope.
- f) What is function of an antenna.

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

- a) Explain stellar radii and masses of stars. **[6]**
- b) How stars are distance estimators. **[4]**

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

- a) What is sunspot? Explain Butter fix diagram. **[6]**
- b) Give significance of Hubble's law. **[4]**

**P.T.O.**

- Q4)** Answer the following questions : **[10]**
- a) Explain photospheric phenomenon. **[6]**
  - b) What are the different past instruments of HST. **[4]**

- Q5)** Write short notes on any four of the following : **[10]**
- a) Interstellar Medium
  - b) Apparent solar time
  - c) Hubble's law
  - d) Radio Galaxy
  - e) Fate of the universe
  - f) Equation of time



Total No. of Questions : 5]

SEAT No. :

PA-2362

[Total No. of Pages : 2

[5901]-521

T.Y. B.Sc.

PHYSICS

**PHY - 366 (U) : Renewable Energy Sources - II  
(2019 Pattern) (Semester - VI) (Elective - II) (36126U)**

*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 calculator and log table is allowed.*

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

- a) What is thermochemical process?
- b) What is meant by anaerobic digestion?
- c) Why wind data is important?
- d) What are various classification of winds machine.
- e) What are the applications of thermo cell?
- f) What do you mean by on energy management system?

**Q2)** Answer the following questions :

- a) What are advantages and disadvantages of Floating and Fixed dome type biogas plant? **[6]**
- b) Describe various component of wind energy conversion system. **[4]**

**Q3)** Answer the following questions :

- a) Discuss advantages and disadvantages of tidal energy? **[6]**
- b) Discuss case studies on fuel substitution? **[4]**

**P.T.O.**



**Q4)** Answer the following questions :

- a) Discuss geothermal Applications. [6]
- b) What do you meant by wind energy? Explain how is formed? [4]

**Q5)** Write Short Notes on any four of the following : [10]

- a) Biomass.
- b) Construction of biogas plant.
- c) Classification of wind machine.
- d) Advantages and Disadvantages of wind energy.
- e) Challenges of Geothermal System.
- f) Need of energy saving.



Total No. of Questions : 5]

SEAT No. :

PA-2363

[Total No. of Pages : 2

[5901]-522

T.Y. B.Sc.

PHYSICS (Paper - VI)

PHY-366(V) : Acoustics - II

(2019 Pattern) (Semester - VI) (Elective - II)

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) Q2 to Q5 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 a volume - limiter?
- b) What do you mean by constant - Q graphic equalizer.
- c) Give two characteristics of a stereophonic SRS.
- d) Give significance of the expression :

$$\text{dBW} = L_{\text{ref}} - L_{\text{sens}} + 20 \log_{10} \left( \frac{D_2}{D_{\text{ref}}} \right) + \text{HR}$$

- e) Give significance of the expression :

$$Z_m = (R_r + R_m) + j \left( X_r + w_0 m - \frac{s}{w_0} \right)$$

- f) What is meant by transformation factor?

P.T.O.

**Q2)** Answer the following questions :

- a) Give the construction and the working principle of a moving coil microphone. Draw its equivalent circuit and give the expression for its sensitivity. [6]
- b) A condenser microphone diaphragm of radius 0.01 m is stretched to a tension of  $2.2 \times 10^4$  N/m. If the spacing between the diaphragm and the backing plate is  $4 \times 10^{-5}$  m, determine the polarizing voltage required for a sensitivity of  $-68$  dB re 1 volt /  $\mu$  bar. [4]

**Q3)** Answer the following questions :

- a) Give the construction and working principle of a direct radiator loudspeaker. Draw its equivalent circuit and give the expression for its efficiency. [6]
- b) A cone speaker has a total mass of  $1.1 \times 10^{-2}$  kg. Its mechanical resistance is 0.9 kg/s. Its radiation resistance and reactance are 2.1 kg/s each. Determine the frequency of mechanical resonance, if the stiffness of the cone system is  $5.1 \times 10^3$  N/m. Also. [4]

**Q4)** Answer the following questions :

- a) Give the wave equation for an infinite exponential horn. Give the expression for its cut-off frequency. What is a folded horn? [6]
- b) A 3.0 Watt direct radiator dynamic loudspeaker has a mechanical impedance of 13.2 kg/s and a radiation resistance of 2.2 kg/s. The voice coil is 7.3m in length and suspended in a magnetic field of 1.2 Wb/m<sup>2</sup>. Determine the current flowing through the speaker. [4]

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

- a) Phacoemulsification
- b) C-weighted SPL
- c) NDT
- d) MP3 audio format
- e) Phon
- f) Sone



Total No. of Questions : 5]

SEAT No. :

PA-2364

[Total No. of Pages : 2

[5901]-523

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

PHYSICS

PHY-3610(W) : Scientific Data Analysis Using Python  
(2019 Pattern) (361210W)

*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 python list?
- b) Write syntax of if else statement in python.
- c) If `>>> a = "Python programming" >>> a[2 : 5]` what is the output?
- d) What is mean by series? Write its syntax.
- e) What is append function?
- f) Define line plot.

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

[6]

- i) Explain how to create, initialize & indexing of tuples in python. [3]
- ii) How to convert a list into Num arrays with example? [3]
- iii) What are the significant features of the pandas library? [3]

b) Attempt the following :

[4]

- i) If `>>> list 1 = [11, 12, 13], >>> list 2 = [21, 22, 23]` [2]

`>>> list 1 + list 2` write the outputs

`>>> list 1 [-1]`

- ii) Write two properties of Dictionary. [2]

*P.T.O.*

- Q3) a)** Attempt any two of the following : [6]
- i) What are the features of Numpy? [3]
  - ii) How to create dictionary and how to access their element? [3]
  - iii) Write the output of following program [3]
- ```

If data = {'Name' : ['Reva','Shital','Meera','Kiran']
          'Mark' : [50, 20, 32, 43]
          }
df = pd. Dataframe (data)
print (df)

```
- b) How to create 2D array? [4]

- Q4) a)** Attempt any two of the following : [6]
- i) What is math module? [3]
  - ii) Explain any two functions in Tuples. [3]
  - iii) Write short notes on area plot [3]
- b) Explain Histogram with their parameter. [4]

- Q5) Attempt any four of the following. [10]**
- a) Write the short note on Packages. [2½]
  - b) Write short note on scatter plot. [2½]
  - c) Write short note on logical operators used in python. [2½]
  - d) Write short note on Python keywo [2½]
  - e) Create tuple 1 with contents 1, 2, 3 & tuple 2 with context 'x', 'y', 'z'. Now concatenate these two tuples into tuple 3. Write python script.[2½]



Total No. of Questions : 5]

SEAT No. :

PA-2365

[Total No. of Pages : 2

[5901]-524

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

PHYSICS (Skill - 3)

PHY-3610(X) : Solar PV System : Installation Repairing and  
Maintenance

(2019 Pattern) (361210 X)

*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 the use of sunshine recorder?
- b) Write any two benefits of photovoltaic system.
- c) Define Balance of a system.
- d) What is net metering in a hybrid system?
- e) What is offgrid solar PV system?
- f) What is the use of inverter in a solar PV system?

**Q2)** a) Describe the following :

**[6]**

- i) Describe DC to AC conversion.
- ii) Describe solar cell with neat diagram.
- b) Describe the construction, working of the instrument pyranometer. **[4]**

**Q3)** a) Explain the following :

**[6]**

- i) Explain the applications of offgrid PV system.
- ii) Explain solar system sizing.
- b) Explain solar cell, solar module & solar array with suitable neat diagram. **[4]**

**P.T.O.**

- Q4) a) Discuss the following : [6]**
- i) Discuss some advantages and disadvantages of the instrument pyrheliometer.
  - ii) Discuss hybrid solar PV system in short.
- b) Explain solar tracking system its type. [4]**

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

- a) Hybrid Solar PV system applications
- b) Lux meter
- c) Solar module & solar array
- d) Solar Architecture
- e) Pyranometer applications
- f) Solar radiation measurement



Total No. of Questions : 5]

SEAT No. :

PA-2366

[Total No. of Pages : 2

[5901]-525

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

PHYSICS

PHY-3610(Y) : Applications of Internet of Things

(2019 Pattern) (3612110Y)

*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 IoT.
- b) What is SCADA?
- c) Define information?
- d) Give use of embedded system in IoT.
- e) List the I/o interfaces used in IoT.
- f) State communication protocols.

**Q2)** Answer the following :

a) Explain IoT components with neat diagram.

**[6]**

b) Formulate logical design of IoT.

**[4]**

**Q3)** Answer the following :

a) Explain IoT enabled technologies in detail.

**[6]**

b) What are advantages of M2M communication.

**[4]**

**P.T.O.**



**Q4)** Answer the following :

- a) Explain IoT in Indian scenario as a case study. [6]
- b) Discuss about IoT communication model. [4]

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

- a) Cloud computing in IoT.
- b) Wireless sensor network
- c) IoT standards in practice.
- d) Functions of C#.
- e) Exception handling .
- f) Control of flow.



Total No. of Questions : 5]

SEAT No. :

PA-2367

[Total No. of Pages : 2

[5901]-526

T.Y. B.Sc.

PHYSICS

**PHY-3610(Z) : Calibration Techniques  
(2019 Pattern) (Semester - VI) (361210Z)  
(Skill Enhancement Course - III)**

*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 calculator and log-table is allowed.*

**Q1)** Solve any five of the following :

**[5]**

- a) What is calibration?
- b) State any two factors affecting on calibration?
- c) Write any two disadvantage of pressure comparator.
- d) What is oscillator?
- e) What is principle of capsule pressure gauge?
- f) State principle of bimetallic thermometer.

**Q2)** Answer the following questions :

- a) What is thermoelectric effect? Explain how thermocouple is used as thermometer? **[6]**
- b) With the help suitable diagram explain the working of pressure comparator. **[4]**

**Q3)** Answer the following questions :

- a) What is thermistor? What is NTC and PTC? State their applications. **[6]**
- b) With the help suitable diagram explain the working of master gauges. **[4]**

**P.T.O.**

**Q4)** Answer the following questions :

- a) Describe the working of function generator with the block diagram. [6]
- b) Explain the brief of digital and electronic multimeter. [4]

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

- a) Radiation pyrometer
- b) CRT (Cathode Ray Tube)
- c) Bellows pressure Gauge
- d) Manometer pressure gauge
- e) Factors affects on calibrations
- f) Traceability in calibration



Total No. of Questions : 5]

SEAT No. :

PA-2368

[Total No. of Pages : 2

[5901]-527

T.Y. B.Sc. (Physics)

**PHY-3611 (AA): MICRO CONTROLLERS (SEC)**  
**(CBCS) (2019 Pattern) (Semester - VI) (Paper - VIII)**  
**(361211AA)**

*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) *Use of logtables or electronic calculators are allowed.*

**Q1) Attempt any Five of the following :**

**[5 × 1 = 5]**

- a) What is the size of program counter (PC) in 8051 microcontroller?
- b) What is the function of TMOD register?
- c) How (-52) is represented in 8051 microcontroller?
- d) State two registers used in LCD module.
- e) If the clock frequency of timer is found 1.5 MHz, what is crystal frequency which is used?
- f) Give ASCII code for character 'B' in binary and in hex as well.

**Q2) a) Attempt Any Two of the following :**

**[2 × 3 = 6]**

- i) Explain the different I/O ports used in 8051 microcontroller
  - ii) Draw the interfacing diagram of (4 x 4) keyboard to 8051 microcontroller.
  - iii) Explain any three addressing modes of 8051 microcontroller with suitable example.
- b) Explain the different flags of PSW register of 8051 microcontroller with neat diagram. [4]**

*P.T.O.*

**Q3) a) Attempt Any Two of the following :** **[2 × 3 = 6]**

- i) Write an 8051 assembly language program to add first ten natural numbers.
  - ii) Explain the internal interrupts of 8051 microcontroller.
  - iii) Explain the structure of internal RAM of 8051 micro - controller.
- b)** Explain the A and B registers and how they are used in multiplication and division operation. **[4]**

**Q4) a) Attempt Any Two of the following :** **[2 × 3 = 6]**

- i) Write an 8051 assembly language program to subtract 67H from 89H using 2's complement of 67H.
  - ii) Explain the different logical instructions of 8051 microcontroller with suitable examples.
  - iii) Define the terms: simplex, Half duplex and full duplex.
- b)** Draw the block diagram of 8051 microcontroller. Explain the function of serial port of it. **[4]**

**Q5) Attempt any Four of the following :** **[4 × 2½ = 10]**

- a) Distinguish between microprocessor and microcontroller.
- b) Write short on Timers/counter of 8051 microcontroller.
- c) Compare the function of Jump and Call instructions used in 8051 microcontroller.
- d) Write short on Banks and Bank registers of 8051 microcontroller.
- e) How LM35 temperature sensor is interfaced to 8051 microcontroller.



Total No. of Questions : 5]

SEAT No. :

PA-2369

[Total No. of Pages : 2

[5901]-528

T.Y. B.Sc. (Physics)

PHY-3611 (AB): INSTRUMENTATION FOR AGRICULTURE

(Skill Enhancement Course - IV)

(2019 Pattern) (Semester - VI) (361211AB)

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 calculator and log table is allowed.

**Q1) Solve any Five of the following :**

**[5 × 1 = 5]**

- a) What is the need of agriculture?
- b) What are physical properties of soil?
- c) Define sucrose or saccharose.
- d) What is the aim of Irrigation.
- e) What is photosynthesis?
- f) What is Biosensors?

**Q2) Answer the following questions :**

- a) Explain various applications of remote sensing in Agriculture. **[6]**
- b) What is Anemometer? Explain sonic Anemometer. **[4]**

**Q3) Answer the following questions :**

- a) Draw Flow Diagram of sugar plant and explain it. **[6]**
- b) Describe auto drip irrigation system with its working. **[4]**

**P.T.O.**

**Q4) Answer the following questions :**

- a) What are different green house parameters? Explain how humidity and soil moisture affects the green house. [6]
- b) What is the role of Instrumentations in modern agriculture? [4]

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

- a) Sensors requirement in agriculture.
- b) Fine wire thermocouple sensor.
- c) Advantages of batch Fermentation.
- d) Upstream and downstream control system.
- e) Lysimeters.
- f) Advantages of greenhouse effect.



Total No. of Questions : 5]

SEAT No. :

PA-2370

[Total No. of Pages : 2

**[5901]-529**  
**T.Y. B.Sc. (Physics)**  
**PHY-3611 (AC): RADIATION PHYSICS**  
**(Skill Enhancement)**  
**(2019 Pattern) (Semester - VI)**

*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) *Figure to the right indicate full marks.*
- 5) *use of calculator and log, table is allowed.*

**Q1) Attempt Any Five :**

**[5 × 1 = 5]**

- a) What is straggling?
- b) Define excitation.
- c) What is KERMA?
- d) Define I curie activity of radioactive substance.
- e) State names of any two dosimeters.
- f) State different types of radiation detectors.

**Q2) Answer the following questions :**

- a) Explain construction and working of gas filled detector. **[6]**
- b) What are the different applications of gamma rays. **[4]**

**Q3) Answer the following questions :**

- a) Discuss the interaction of electrons and ions with matter. **[6]**
- b) A GM counter has a dead time  $400\mu\text{s}$ . What is the counting rates when observed rate is 1000 per minute? **[4]**

**P.T.O.**



**Q4) Answer the following questions :**

- a) Explain natural and artificial radioactive sources in detail. [6]
- b) The count rate of a GM counter for the radiation of a radio active material of half life of 30 minutes decreases to 5 per second after 2 hours. What was the initial count rate? [4]

**Q5) Attempt Any Four :** [10]

- a) Which gases are used in GM counter and proportional counter?
- b) Define RAD and REM.
- c) Explain exposure dose of radiation.
- d) What is radiation shielding? Why it is necessary?
- e) What is equivalent dose and effective dose?
- f) State important safety codes for handling radioactive sources.



Total No. of Questions : 5]

SEAT No. :

PA-2371

[Total No. of Pages : 2

**[5901]-530**  
**T.Y. B.Sc. (Physics)**  
**PHY-3611 (AD): PHOTOGRAPHY**  
**(Skill Enhancement Course - II)**  
**(2019 Pattern) (Semester - VI) (361211AD)**

*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) *Figure to the right indicate full marks.*
- 5) *use of calculator and log table is allowed.*

**Q1) Solve Any Five of the following :**

**[5 × 1 = 5]**

- a) What do you mean by angle of view?
- b) Mention angle of view of wide angle of lens?
- c) What do you meant by contact printing?
- d) List the different types of lenses?
- e) What do you meant by aperture?
- f) What do you meant by zoom lens?

**Q2) a) Answer the following questions Any Two :**

**[6]**

- i) Explain the construction and working of S.L.R. camera? **[3]**
- ii) What do you meant by lightning technique? **[3]**
- iii) List the different types of filters and explain UV filter in brief? **[3]**
- b) Draw neat labeled diagram of colour enlarger **[4]**

*P.T.O.*

- Q3) a) Answer the following questions Any Two :** [6]
- i) Explain pin hole camera in brief? [3]
  - ii) What do you mean by Aperture and shutter speed? [3]
  - iii) Explain slow speed in brief? [3]
- b) Explain in brief how fast speed is maintained. [4]

**Q4) Answer the following questions :**

- a) Explain Sources of light used in colour photography in detail? [6]
- b) Draw neat labeled diagram of stages of focal plane shutter and explain [4]

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

- a) Draw neat labeled diagram of studio camera? [2½]
- b) Explain types of digital camera and its features in brief? [2½]
- c) Describe telephoto lens in brief? [2½]
- d) Explain the maintenance of camera? [2½]
- e) Explain the shutter speed of camera in brief? [2½]
- f) Describe the memory card in brief? [2½]



Total No. of Questions : 5]

SEAT No. :

PA-2372

[Total No. of Pages : 3

[5901] - 531

T.Y. B.Sc.

CHEMISTRY

CH - 601 : Physical Chemistry - II

(2019 Pattern) (CBCS) (Semester - VI) (36131)

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 single electrode potential.
- b) What is Unit Cell?
- c) What are isotones?
- d) Define one curie.
- e) If the oxidation potential of  $\text{Fe}^{2+}/\text{Fe}^{3+}$  electrode is  $-0.712$  volt and the reduction potential of  $\text{Ag}/\text{AgCl}_{(s)}, \text{Cl}^-$  electrode is  $0.351$  volt, find the E.M.F. of the cell.
- f) If the Weiss indices of the plane are  $\frac{3}{4}, 1, \frac{1}{2}$  Find out the Miller indices.

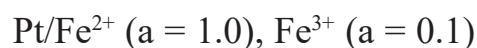
P.T.O.

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

- i) What are Metal-Metal ion electrode? How it is represented?
  - ii) Sketch (100), (110) and (111) plane in body centred cubic lattice (BCC).
  - iii) What are tracers? Describe use of tracers in structure determination.
- b) Give the principle of Bragg method and derive the relation  $n\lambda = 2d \sin \theta$ . [4]

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

- i) Explain the Calomel electrode with respect to its Construction and Working.
  - ii) What is Crystallography? Explain the law of Constancy of interfacial angles.
  - iii) Discuss Glass electrode with respect to its formation, electrode reaction and expression for electrode potential.
- b) Calculate the electrode potential of the following electrode at 25°C. [4]



$$\text{Given: } E_{\text{Fe}^{2+}/\text{Fe}^{3+}}^0 = -0.771 \text{ volt}$$

$$R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$$

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

- i) Explain standard hydrogen electrode with respect to its construction, electrode reaction and expression for electrode potential.

- ii) Derive the rate equation for the decay constant of a radioactive element.
- iii) Explain chemical cell without transference with a suitable example.
- b) Calculate the mass defect, binding energy and average binding energy for  ${}_{27}^{59}\text{Co}$  having atomic mass = 58.9518 a.m.u. [4]

Given:  $m_{\text{H}} = 1.0078$  a.m.u.

$m_{\text{n}} = 1.0086$  a.m.u.

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

- a) Primary batteries.
- b) Redox electrode.
- c) Weiss indices and Miller indices.
- d) Law of Symmetry.
- e)  ${}^{14}\text{C}$  Dating.
- f) General characteristics of radioactivity.



Total No. of Questions : 5]

SEAT No. :

PA-2373

[Total No. of Pages : 2

[5901]-532

T.Y. B.Sc

CHEMISTRY

CH - 602 : PHYSICAL CHEMISTRY - III

(2019 Pattern) (Semester - VI) (CBCS) (36132)

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 number 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) A sample of Nylon 6,6 has an average molecular weight of 12 kg/mol. Calculate average degree of polymerization. (Given : Mol. wt of monomer is 226 g/mol)
- b) Define cohesive energy of ionic solids.
- c) Enlist the type of solid-state reactions.
- d) Define the term colligative property.
- e) Explain the deaquation - anation phenomenon with one example.
- f) 3 g of substance is dissolved in 120 g water the solution freezes at  $-0.136^{\circ}\text{C}$ . If  $K_f$  for water is 1.86. Calculate the molecular weight of the solute.

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

- i) Explain the classification of polymers based on structure with suitable example.
  - ii) Give the Arrhenius theory of Electrolytic dissociation.
  - iii) Write short note on band structure of solids.
- b) Derive the Prout-Tompkins equation. [4]

P.T.O.

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

- i) Explain the kinetics of two solid reactants with example.
  - ii) Explain the experimental determination of viscosity average molecular weight.
  - iii) Explain the phenomena of photoconductivity.
- b) A solution of 0.235 g of substance X in 25.0 g of acetic acid has a freezing point  $16.276^{\circ}\text{C}$ . Calculate the molecular weight of x, given that the specific latent heat of fusion of acetic acid is 180.75 J/g and the freezing point of pure acetic acid is  $16.600^{\circ}\text{C}$ . [4]

**Q4) a) Solve Any Two :** [6]

- i) Discuss the classification of the polymers based on molecular forces.
  - ii) Explain conductors and insulator properties on the basis of energy bands in the solids.
  - iii) Derive contracting volume rate law.
- b) 0.5% aqueous solution of KCl was found to freeze at  $-0.22^{\circ}\text{C}$ . Calculate van't Hoff factor (i) and degree of dissociation ( $\alpha$ ) of the solute. Modal freezing point depression constant  $K_f$  is 1.86 for 1000 g of water. [4]

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

- a) Hartley & Berkeley's method.
- b) Factors affecting reactions in solids.
- c) Molecular weight determination by End Group Analysis.
- d) Practical significance of polymer molecular weight.
- e) n - type semiconductor.
- f) Born-Haber cycle.





Total No. of Questions : 5]

SEAT No. :

PA-2374

[Total No. of Pages : 2

[5901]-533

T.Y. B.Sc (Regular)

CHEMISTRY

CH - 604 : Inorganic Chemistry (Paper - II)

(2019 Pattern) (Semester - VI) (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 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 the following :

[5]

- a) Which metal is Present in Vitamin B<sub>12</sub>?
- b) Define - Liquid Crystals.
- c) What is copolymer?
- d) How many bridging carbonyls are there in [Fe<sub>2</sub>(CO)<sub>g</sub>]?
- e) What is the name of RhCl (PPh<sub>3</sub>)<sub>3</sub> Catalyst?
- f) What is meant by mesogenic phase?

Q2) a) Answer the following : (Any Two)

[6]

- i) Find out total number of electrons in the following metal carbonyls and whether they obey 18 e<sup>-</sup> rule or not?  
A) [Mn<sub>2</sub>(CO)<sub>10</sub>]  
B) [V(CO)<sub>6</sub>] [At. No Mn = 25, V = 23]
- ii) Distinguish between Oxyhaemoglobin and deoxyhaemoglobin.
- iii) Write Mechanism of hydrogenation of alkene to alkane using Rahey nickel catalyst.

P.T.O.

- b) Answer the following : [4]
- i) Draw structures of
- A)  $\text{Si}_2\text{O}_7^{6-}$
- B)  $\text{Si}_3\text{O}_4^{4-}$
- ii) Give classification of heterogeneous catalyst.

**Q3) a) Answer the following : (Any Two) [6]**

- i) Discuss biodiesel synthesis using heteropoly acids as a catalyst.
- ii) Distinguish between Organic Polymer and Inorganic Polymer.
- iii) Discuss Heat and beat method for synthesis of Inorganic solids.

b) Draw the structures of the following metal carbonyls. [4]

- i)  $\text{Fe}(\text{CO})_5$
- ii)  $\text{Ni}(\text{CO})_6$
- iii)  $\text{Ni}(\text{CO})_4$
- iv)  $\text{Co}_2(\text{CO})_8$

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

- i) Give Applications of organometallic compounds in Industrial Catalysis.
- ii) Explain catalytic cracking using zeolite as a catalyst.
- iii) What are Fe-S Proteins? Explain 4Fe-4S Ferredoxin Protein.

b) What is Cobalamin and Cyanocobalamin? [4]

**Q5) Write a note on : (Any Four) [10]**

- a) Halogenation of ferrocene.
- b) Inorganic liquid crystals.
- c) Siloxanes.
- d) The catalytic convertor.
- e) Activity and selectivity in catalysis.
- f) Nitrogenase enzymes.



Total No. of Questions : 5]

SEAT No. :

PA-2375

[Total No. of Pages : 2

[5901]-534

T.Y. B.Sc (Regular)

CHEMISTRY

CH - 605 : Inorganic Chemistry (Paper - III)

(2019 Pattern) (Semester - VI) (CBCS) (36135)

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.
- 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 HOMO and LUMO?
- b) What are Voids?
- c) What is lewis acid?
- d) What are zeolites?
- e) Which disease is caused due to  $cd^{2+}$  ions?
- f) What is meant by cluster?

Q2) a) Attempt any two of the following :

[2 × 3 = 6]

- i) What are the limitations of Arrhenius theory?
- ii) What is unit cell and name different types of unit cell?
- iii) Explain the synthesis and stabilization of nanoparticles by chemical reduction method.

b) i) Discuss application of zeolites.

[2 × 2 = 4]

- ii) Explain the effect of toxic chemicals on enzymes.

P.T.O.

**Q3) a) Attempt any two of the following :** [2 × 3 = 6]

- i) Explain Lowry-Bronsted theory of acids and bases. What are the advantages of this theory?
- ii) Explain Biochemical effects of cadmium.
- iii) Discuss zeolites structure with reference to framework compositions.

**b) Calculate the lattice energy of NaF from the following data :** [4]

- i) Heat of formation of NaF =  $\Delta H_f = -569 \text{ kJ mole}^{-1}$
- ii) Heat of sublimation  $S_{\text{Na}} = +108.7 \text{ kJ mole}^{-1}$
- iii) Heat of ionisation  $I_{\text{Na}} = +493.8 \text{ kJ mole}^{-1}$
- iv) Heat of dissociation  $\frac{1}{2}D_{\text{F}_2} = +153.0 \text{ kJ mole}^{-1}$
- v) Election affinity  $EA_{\text{F}} = -332.6 \text{ kJ mole}^{-1}$

**Q4) a) Attempt any two of the following :** [2 × 3 = 6]

- i) Distinguish between schottky and frenkel defects.
- ii) Mention main characteristics of zeolites.
- iii) Discuss the concept of hard and soft acids and bases.

**b) i) Write in brief Minamater disease.** [2×2=4]

- ii) Classify the following species into lewis acids and bases
  - a)  $\text{BF}_3$
  - b)  $\text{NH}_3$
  - c)  $\text{AlCl}_3$
  - d)  $\text{CO}$

**Q5) Write short notes on any four of the following :** [4 × 2.5 = 10]

- a) Applications of Burn-Haber Cycle.
- b) Classification of Zeolites.
- c) Concept of conjugate acid and base pair with suitable example.
- d) Biochemical effect of Arsenic.
- e) Application of nanoparticles.
- f) Types of Voids.



Total No. of Questions : 5]

SEAT No. :

PA-2376

[Total No. of Pages : 5

[5901]-535

T.Y. B.Sc

CHEMISTRY

CH - 607 : Organic Chemistry (Paper - II)

(2019 Pattern) (Semester - VI) (CBCS) (36137)

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.
- 4) Figures to the right indicate full marks.
- 5) Draw neat diagrams wherever necessary.

Q1) Attempt any five of the following :

[5]

- a) Express  $\lambda_{\max} = 690 \text{ nm}$  in  $\text{cm}^{-1}$ .
- b) Calculate fundamental modes of vibration in ammonia.
- c) Define chromophore.
- d) How many sets of protons present in  
 $\text{CH}_3\text{-CH}_2\text{-O-CH}_3$
- e) Draw chair conformation of cis 1,3 dimethyl cyclohexane.
- f) Write name of radiations used in NMR spectroscopy.

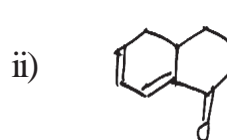
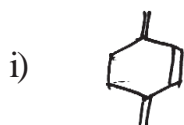
Q2) A) Attempt any two of the following :

[6]

- i) What is bathochromic Shift? Transstilbene absorbs at higher wavelength than cis. Explain.
- ii) Write note of coupling constant.
- iii) Explain various types of vibrations in IR.

P.T.O.

B) Calculate  $\lambda_{\max}$  values for the following : [4]



Q3) A) Attempt any two of the following : [6]

- Draw chair conformation of trans 1,4 dimethyl cyclohexane. Comment on their stability.
- Write note on shielding and deshielding.
- Discuss various regions of IR spectroscopy.

B) Answer the following : [4]

How will you distinguish following pairs by IR spectroscopy.

- Ph-CHO & Ph-CH<sub>2</sub>-OH
- CH<sub>3</sub>-CH<sub>2</sub>-COOH & CH<sub>3</sub>-CH<sub>2</sub>-COCl.

Q4) A) Propose the structures for the compounds with following spectroscopic data. (Any Two) [6]

- i) Molecular formula – C<sub>5</sub>H<sub>10</sub>O

IR – 1720 cm<sup>-1</sup>

NMR - a) 1.05 $\delta$  t 6H

b) 2.5 $\delta$  qr 4H

- ii) Molecular formula - C<sub>7</sub>H<sub>8</sub>O

IR - 1500, 1600, 750, 690 cm<sup>-1</sup>

NMR - a) 3.8 $\delta$  s 3H

b) 7.2 $\delta$  s 5H

- iii) Molecular formula - C<sub>4</sub>H<sub>8</sub>O

IR - 1740 cm<sup>-1</sup>

NMR - a) 1.1 $\delta$  t 3H

b) 2.12 $\delta$  s 3H

c) 2.48 $\delta$  q, 2H

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

- i) Discuss factors affecting IR frequencies.
- ii) Explain Beer-Lamberts law.

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

- a) Draw chair conformation of cis & transdecalin. Comment on their relative enthalpy.
- b) Give applications of IR spectroscopy.
- c) Explain electronic transitions in UV spectroscopy.
- d) Write note on chemical shift.
- e) Give applications of UV spectroscopy.
- f) Why TMS is used as internal standard in NMR?



TABLE - 1  
Characteristic Infrared Absorptions of Functional Groups

| GROUP                                                                                                   | FREQUENCY RANGE $\text{cm}^{-1}$ | INTENSITY    |
|---------------------------------------------------------------------------------------------------------|----------------------------------|--------------|
| A. Alkyl                                                                                                |                                  |              |
| C-H (stretching)                                                                                        | 2853-2962                        | (m - s)      |
| Isopropyl - $\text{CH}(\text{CH}_3)_2$                                                                  | 1380 - 1385                      | (s)          |
| and                                                                                                     | 1365 - 1370                      | (s)          |
| tert - Butyl - $\text{C}(\text{CH}_3)_3$                                                                | 1385 - 1395                      | (m)          |
|                                                                                                         | and, <del>at</del> 1365          | (s)          |
| B. Alkenyl                                                                                              |                                  |              |
| C-H (stretching)                                                                                        | 3010-3095                        | (m)          |
| C=C (stretching)                                                                                        | 1620 - 1680                      | (v)          |
| R-CH=CH <sub>2</sub>                                                                                    | 985 - 1000                       | (s)          |
|                                                                                                         | and 905 - 920                    | (s)          |
| R <sub>2</sub> C=CH <sub>2</sub>                                                                        | 880 - 900                        | (s)          |
| cis - RCH=CHR                                                                                           | 675 - 730                        | (s)          |
| trans - RCH=CHR                                                                                         | 960 - 975                        | (s)          |
|                                                                                                         | (out of plane C-H bendings)      |              |
| C. Alkynyl                                                                                              |                                  |              |
| $\equiv$ C-H (stretching)                                                                               | 3300                             | (s)          |
| C $\equiv$ C (stretching)                                                                               | 2100 - 2260                      | (v)          |
| D. Aromatic                                                                                             |                                  |              |
| Ar - H (stretching)                                                                                     | -3030                            | (v)          |
| Aromatic substitution type<br>(C-H out-of-plane bendings)                                               |                                  |              |
| Mono-substituted                                                                                        | 690 - 710                        | (very s)     |
| and                                                                                                     | 730 - 770                        | (very s)     |
| o - Disubstituted                                                                                       | 735 - 770                        | (s)          |
| m - Disubstituted                                                                                       | 680 - 725                        | (s)          |
| and                                                                                                     | 750 - 810                        | (very s)     |
| p - Disubstituted                                                                                       | 800 - 840                        | (very s)     |
| E. Alcohols, Phenols, Carboxylic Acids                                                                  |                                  |              |
| OH (alcohols, phenols, dilute solutions)                                                                |                                  |              |
| OH (alcohols, phenols, hydrogen bonded)                                                                 | 3200 - 3550                      | (broad)      |
| OH (carboxylic acids, hydrogen bonded)                                                                  | 2500 - 3000                      | (very broad) |
| F. Aldehydes, Ketones, Esters and Carboxylic Acids                                                      |                                  |              |
| C=O stretch                                                                                             | 1630 - 1780                      | (s)          |
| aldehydes                                                                                               | 1690 - 1740                      | (s)          |
| ketones                                                                                                 | 1680 - 1750                      | (s)          |
| esters                                                                                                  | 1735 - 1750                      | (s)          |
| carboxylic acids                                                                                        | 1710 - 1780                      | (s)          |
| amides                                                                                                  | 1630 - 1690                      | (s)          |
| G. Amines                                                                                               |                                  |              |
| N-H                                                                                                     | 3300 - 3500                      | (m)          |
| H. Nitriles                                                                                             |                                  |              |
| C=N                                                                                                     | 2220 - 2260                      | (m)          |
| I. $\begin{array}{c}   \\ -\text{C}-\text{O} \text{ stretch (alcohol, ether, phenol)} \\   \end{array}$ | 1000 - 1300                      | (s)          |
| J. Nitro N=O                                                                                            | 1550 - 1350                      | (s)          |
| K. Halides                                                                                              |                                  |              |
| F                                                                                                       | 1400 - 1000                      | (s)          |
| Cl                                                                                                      | 785 + 540                        | (s)          |
| Br                                                                                                      | <667                             | (s)          |



TABLE - 2  
Approximate Proton Chemical Shifts in NMR

| TYPE OF PROTON                                        | CHEMICAL SHIFT, DELTA, PPM ( $\delta$ ) |                                    |              |
|-------------------------------------------------------|-----------------------------------------|------------------------------------|--------------|
| 1° Alkyl, RCH <sub>3</sub>                            | 0.8 - 1.0                               |                                    |              |
| 2° Alkyl, RCH <sub>2</sub> R                          | 1.2 - 1.4                               |                                    |              |
| 3° Alkyl, R <sub>3</sub> CH                           | 1.4 - 1.7                               |                                    |              |
| Allylic, R <sub>2</sub> C=C-CH <sub>2</sub><br> <br>R | 1.6 - 1.9                               | Ester R-C(=O)-O-CH <sub>2</sub> -R | 4 to 4.5     |
| Benzylic, ArCH <sub>2</sub>                           | 2.2 - 2.5                               |                                    |              |
| Alkyl chloride, RCH <sub>2</sub> Cl                   | 3.6 - 3.8                               |                                    |              |
| Alkyl bromide, RCH <sub>2</sub> Br                    | 3.4 - 3.6                               |                                    |              |
| Alkyl iodide, RCH <sub>2</sub> I                      | 3.1 - 3.3                               |                                    |              |
| Ether, ROCH <sub>2</sub> R                            | 3.3 - 3.9                               |                                    |              |
| Alcohol, HOCH <sub>2</sub> R                          | 3.3 - 4.0                               |                                    |              |
| Ketone, RC(=O)CH <sub>2</sub> -<br>  <br>O            | 2.1 - 2.6                               | R-C(=O)-CH <sub>2</sub> -          | 2.4 $\delta$ |
|                                                       |                                         | R-C(=O)-CH-                        | 2.5 $\delta$ |
| Aldehyde, RCH=O<br>  <br>O                            | 9.5 - 9.0                               |                                    |              |
| Vinyl, R <sub>2</sub> C=CH <sub>2</sub>               | 4.6 - 5.0                               |                                    |              |
| Vinyl, R <sub>2</sub> C=CH<br> <br>R                  | 5.2 - 5.7                               |                                    |              |
| Aromatic, ArH                                         | 6.0 - 9.5                               |                                    |              |
| Acetylenic, RC $\equiv$ CH                            | 2.5 - 3.1                               |                                    |              |
| Alcohol hydroxyl, ROH                                 | 0.5 - 6.0 <sup>a</sup>                  |                                    |              |
| Carboxylic, RCOH<br>  <br>O                           | 10 - 13 <sup>a</sup>                    |                                    |              |
| Phenolic, ArOH                                        | 4.5 - 7.7 <sup>a</sup>                  |                                    |              |
| Amino R-NH <sub>2</sub>                               | 1.0 - 5.0                               |                                    |              |

<sup>a</sup>The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3  
U.V. Absorption rules for diene chromophores

|                                                                         |        |                      |       |
|-------------------------------------------------------------------------|--------|----------------------|-------|
| 1) Parent                                                               | 215 nm | 6) - halogen         | 5 nm  |
| 2) Each extra conjugation                                               | 30 nm  | 7) - SR              | 30 nm |
| 3) Homoannular                                                          | 39 nm  | 8) - NR <sub>2</sub> | 60 nm |
| 4) Exocyclic double bond                                                | 05 nm  | 9) - OH, - OR        | 5 nm  |
| 5) Each alkyl (R) substituent directly attached to double bonded carbon | 05 nm  |                      |       |

U.V. Absorption rules for Enone System

|                                             |                                                            |                      |                |
|---------------------------------------------|------------------------------------------------------------|----------------------|----------------|
| 1) Parent                                   | 215 nm (207 nm for aldehyde) (202 nm for five member ring) |                      |                |
| 2) Each extra conjugation                   | 30 nm                                                      | 6) - Cl              | $\alpha$ 15 nm |
| 3) Homoannular                              | 39 nm                                                      | 7) - OH, -OR         | $\beta$ 12 nm  |
| 4) Substituents                             |                                                            | 8) - SR              | $\alpha$ 35 nm |
| a) Alkyl group at $\alpha$                  | 10 nm                                                      | 9) - NR <sub>2</sub> | $\beta$ 30 nm  |
| b) Alkyl group at $\beta$                   | 12 nm                                                      |                      | $\beta$ 85 nm  |
| c) Alkyl group at $\gamma, \delta$ & higher | 18 nm                                                      |                      | $\beta$ 95 nm  |
| 5) Exocyclic double bond                    | 05 nm                                                      |                      |                |

Total No. of Questions : 5]

SEAT No. :

PA-2377

[Total No. of Pages : 3

[5901]-536

T.Y. B.Sc

CHEMISTRY

CH - 608 : Organic Chemistry - III

(2019 Pattern) (Semester - VI) (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 5 carry equal marks.
- 4) Figures to the right indicate full marks.
- 5) Draw neat diagrams wherever necessary.

Q1) Solve any five of the following :

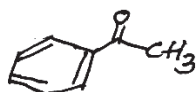
[5]

- a) Define the term FGI.
- b) What is carbocation?
- c) Give the structure of DIBAL.
- d) What are alkaloids?
- e) How Lithium Aluminium Hydride is prepared?
- f) What is Wolff rearrangement?

Q2) a) Attempt any two of the following :

[6]

- i) Write the retrosynthesis and synthesis of



- ii) Explain Michael reaction with mechanism.
- iii) Write Nagai Synthesis of Ephedrine.

P.T.O.

b) Answer the following : [4]

- i) Write two applications of DDQ
- ii) Give general properties of alkaloids.

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

- i) Write the mechanism involved in reduction of aldehydes/ketones by using Lithium Aluminium Hydride.
- ii) What are terpenoids? Give classification of terpenoids.
- iii) Discuss witting rearrangement with mechanism.

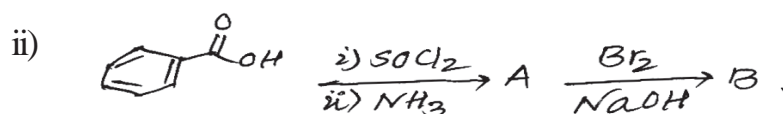
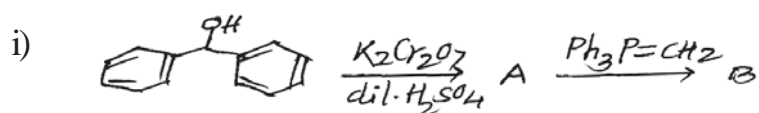
b) Answer the following : [4]

- i) How will you prove presence of  $-\text{NHCOCH}_3$  group in Ephedrine.
- ii) Explain Simmon-Smith reaction with suitable example.

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

- i) Give preparation, Properties and applications fo sodium borohydride.
- ii) Write carbon skeleton of citral. How will you prove presence of gem dimethyl group in citral.
- iii) What is oxidation? Explain mechanism involved in Oxidation of alkene by using  $\text{OsO}_4$ .

b) Indentify A & B and rewrite the reaction [4]



**Q5) Attempt any four of the following :**

**[10]**

- a) Discuss Diels - Alder reaction with mechanism.
- b) Write disconnection approach and synthesis of 2-butenal.
- c) Write any three applications of Lithium Aluminium Hydride.
- d) Explain the term carbanion, free radicals with suitable example.
- e) Write short note on McMurry Reaction.
- f) Explain Synthons and Synthetic equivalent with suitable example.



Total No. of Questions : 5]

SEAT No. :

PA-2378

[Total No. of Pages : 2

[5901]-537

T.Y. B.Sc.

CHEMISTRY

CH-610(A): Chemistry of Soil & Agrochemicals

(2019 Pattern) (Semester - VI) (CBCS) (361310A)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

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

Q1) Solve any five of the following :

[5]

- a) Explain the term soil testing.
- b) What is mean by fertility of soil?
- c) What are fumigants?
- d) Define right soil.
- e) Explain nano-pesticides.
- f) Explain role of soil organism.

Q2) a) Answer any two of the following :

[6]

- i) What are herbicides? Explain in brief selective and non-selective herbicides.
- ii) How different factors affects the composition of F.Y.M explain in brief.

P.T.O.

- iii) What is soil structure? Explain various types of soil structure with suitable diagrams.
- b) What are fertilizers? Define Mixed fertilizers. Give advantages & disadvantages of mixed fertilizers. [4]
- Q3)** a) Answer any two of the following : [6]
- i) Explain how to collect sample and draw a diagram of sampling pattern for collecting a representative soil sample.
- ii) Classify nitrogenous fertilizers. Explain the action of urea on soil.
- iii) Give advantages of use of nano-pesticides.
- b) What is vermicompost? Describe small culturing technique along with proper diagram. [4]
- Q4)** a) Answer any two of the following : [6]
- i) Define F.Y.M. and explain in detail the French method of preparing F.Y.M.
- ii) Write advantages & disadvantages of vermicomposting.
- iii) Explain the role of Biofertilizers.
- b) What is alkali soil? Explain in brief classification of alkali soil. [4]
- Q5)** Write short notes on any four of the following : [10]
- a) Surface soil & subsoil.
- b) Importance of soil reactions.
- c) Sampling tools & Sampling depth.
- d) Fungicides.
- e) Gobar gas.
- f) Ion exchange capacity of soil.



Total No. of Questions : 5]

SEAT No. :

PA-2379

[Total No. of Pages : 2

[5901]-538

T.Y. B.Sc.

CHEMISTRY

**CH-610(B): Introduction to Forensic Chemistry  
(2019 Pattern) (CBCS) (Semester - VI) (361310B)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Question 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 table and calculator is allowed.*

**Q1)** Solve any five of the following :

**[5]**

- a) Define Drug of Abuse.
- b) Give the statement of law of individuality.
- c) Define Suspect.
- d) Give the long form of CBI.
- e) Draw the structure of Barbituric acid.
- f) Give the long form of NADA.

**Q2)** a) Answer any two of the following :

**[6]**

- i) How GC is used for testing narcotic drugs?
- ii) Explain natural and synthetic drugs with example.
- iii) What are the codes of conduct for forensic scientist?

*P.T.O.*

- b) Answer the following : [4]
- i) Explain the need of forensic science.
  - ii) How microcrystalline test is useful in NDPS cases?
- Q3)** a) Attempt any two of the following : [6]
- i) What are depressants? Give example and symptoms of use.
  - ii) Write historical aspects of forensic science.
  - iii) How crime scene management is done?
- b) Answer the following : [4]
- i) Define stimulants with example.
  - ii) How searching of vehicle is done in NDPS cases?
- Q4)** a) Explain any two of the following : [6]
- i) Explain the violation of WADA code.
  - ii) Explain blood analysis done in NDPS cases.
  - iii) Explain searching of a dwelling in NDPS cases.
- b) Answer the following : [4]
- i) Give the statements of “law of progressive change” and “law of probability”.
  - ii) Define “Tolerance” and “Withdrawal symptoms”.
- Q5)** Write short note on the following any four : [10]
- a) Purpose of NDPS Act.
  - b) Duties of forensic scientist.
  - c) Presumptive test.
  - d) Scope of forensic science.
  - e) Collection and preservation of drug evidence.
  - f) Cathinones Designer Drugs.





Total No. of Questions : 5]

SEAT No. :

PA-2380

[Total No. of Pages : 2

[5901]-539

T.Y. B.Sc. (Chemistry)

CH-611 (A) : ANALYTICAL CHEMISTRY-II

(CBCS) (2019 Pattern) (Semester - VI) (361311A)

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 indicates full marks.
- 5) Use of calculator and log table is allowed.

Q1) Solve any Five of the following questions :

[5 × 1 = 5]

- a) Calculate distribution ratio D when concentration of solute in organic phase was 0.25M and in aqueous phase concentration of solute is 0.2M.
- b) What is HETP?
- c) Enlist the components of gas chromatogram.
- d) What do you mean by 'Gradient elution'.
- e) Give name of detector used in AAS.
- f) What do you mean by interferences.

Q2) a) Solve any Two of the following

[6]

- i) What is the role of Nebulizer-burner system in AAS? What are types of burners?
  - ii) Describe the construction and working of thermal conductivity detector.
  - iii) What is chromatography? Describe principle of partition chromatography.
- b) In the extraction of cerium (IV) with 2-thionyl trifluoroacetone in benzene, the distribution ratio was 999. If volume of organic phase was 10ml and that of aqueous phase was 25ml, what was the percentage of extraction?[4]

P.T.O.

**Q3) a) Answer any Two of the following:**

- i) Give experimental procedure for quantitative analysis in FES.
- ii) Describe the area normalization method with suitable example.
- iii) Sketch a block diagram of AAS. and describe the function of each component. [6]

**b)** Two components X and Y were analysed by HPLC using column of length 25cm. The retention times of X and Y were found to be 6.4min and 17.2 min respectively. The peak width at the base were 1.1min and 1.2 min. Calculate the resolution between compounds X and Y. [4]

**Q4) a) Solve any Two of the following:** [6]

- i) Sketch and label basic components of HPLC.
- ii) What is Eddy diffusion in Van Deemter equation?
- iii) Discuss the interferences in FES.

**b) Solve the problem.**

Two grams of solute are dissolved in 100ml aqueous solution calculate amount of solute remaining in aqueous phase after.

- i) A single extraction with 80ml of organic solvent with suitable reagent.
- ii) A single extraction with 20ml organic solvent. [4]

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

- a) Limitations of FES.
- b) Match Box Model.
- c) Column efficiency.
- d) Instrumentation of Gas chromatography.
- e) Hollow cathode lamp.
- f) Distribution Law.



Total No. of Questions : 5]

SEAT No. :

PA-2381

[Total No. of Pages : 2

[5901]-540

T.Y. B.Sc. (Chemistry)

**CH-611 (B) : CHEMISTRY OF COSMETICS AND PERFUMES  
(2019 Pattern) (CBCS) (Semester - VI) (361311B)**

*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 indicates full marks.*
- 5) *Draw neat diagrams whenever necessary.*

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

- a) What are the two functions of cosmetics used for skin.
- b) Which extraction method is used to isolate eugenol from clove.
- c) Define perfumes and fragrances.
- d) Use of which chemicals in cosmetics are prohibited in India?
- e) Name the act that regulates manufacturing importing and distribution of cosmetics in India.
- f) Write any two ingredients of cosmetics.

**Q2) a) Answer the following (any three) [6]**

- i) Write a note on oils, Fats & waxes used in cosmetics.
- ii) Discuss the chemistry of perfumes and fragrances
- iii) Give the structures of cis - civetone and cis - jasmone.
- iv) What is the permissible limit of mercury for general cosmetic products and also particularly for eye products.

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

- i) Write any two uses of muscone.
- ii) What is mascara? Give its formulation.

*P.T.O.*

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

- i) Write a note on skin colourant.
- ii) Discuss in detail the methods of isolation of essential oil.
- iii) Write the steps of online application for registration of cosmetics.

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

- i) What are the post - approval changes for which the firm can apply online on sugam portal of CDSCO?
- ii) Differentiate between epilatories and depilatories.

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

- i) Give the components of shaving preparations.
- ii) What are the requirements of general label.
- iii) Give the list of documents required for grant of registration certificate for import of cosmetics into India.

**b) Discuss in detail, both the classifications of perfumes. [4]**

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

- a) Surfactants.
- b) Lotions.
- c) Amendment of the cosmetic rules 2020 with respect to registration and import of cosmetics.
- d) Sandalwood oil.
- e) Rose oil.
- f) Manufacture Licensing.



Total No. of Questions : 5]

SEAT No. :

PA-2382

[Total No. of Pages : 2

[5901]-541

T.Y. B.Sc. (BOTANY)

BO-361 Plant Phtsiology and Metabolsm

(2019 Pattern) (CBCS) (Semester - VI) (Paper - I) (38141)

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) Que - 2 to Que - 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) What is ion antagonism?
- b) What is photo phosphorylation?
- c) What is anaerobic respiration?
- d) Give two functions of stomata?
- e) Whar are photo hormones?
- f) Define respiration.

Q2) a) Give pracrical application to Gibberellins.

[6]

b) Explain the role of potassiam.

[4]

Q3) a) Give an outline of E.M.P. Pathway.

[6]

b) Explain the pressure flow model.

[4]

P.T.O.

**Q4) a) Describe C<sub>4</sub> Pathway. [6]**

b) Write role and function to phyto chrome [4]

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

a) Girdling experiment.

b) What is plant growth regulators? Give discovery of Auxins.

c) Electromagnetic spectrum of light.

d) Name of different types of photo receptors.

e) Types of respiration.

f) Significance of photo respiration.



Total No. of Questions : 5]

SEAT No. :

PA-2383

[Total No. of Pages : 2

**[5901]-542**  
**T.Y. B.Sc. (Semester - VI)**  
**BOTANY**  
**BO - 362 : Biochemistry**  
**(2019 Pattern) (CBCS) (Paper - II) (36142)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

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

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

- a) Define biomolecule.
- b) Write two physical properties of water.
- c) What is peptide bond?
- d) Define enzyme.
- e) Define carbohydrates.
- f) Write two sources of Vitamin C.

**Q2)** a) Describe structure of proteins. **[6]**

b) Explain water soluble vitamins. **[4]**

**Q3)** a) Describe classification of enzymes. **[6]**

b) Explain functions of lipids. **[4]**

**Q4)** a) Describe commercial applications of carbohydrates. **[6]**

b) Explain classification of carbohydrates. **[4]**

*P.T.O.*

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

**[10]**

- a) Functional groups of biomoleculer.
- b) Interaction of water molecule with other molecules.
- c) Saturated fatty acids.
- d) Effect of temperature on enzymes.
- e) Phenylketonuria.
- f) Conformation.





Total No. of Questions : 5]

SEAT No. :

PA-2384

[Total No. of Pages : 2

[5901]-543

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

BOTANY

BO - 363 : Plant Pathology

(2019 Pattern) (CBCS) (Paper - III) (36143)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Question 1 is compulsory.
- 2) Attempt any 3 questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.
- 4) Figures to right indicate full marks.
- 5) Draw neat labelled diagrams whenever necessary.

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

- a) Define Incitants.
- b) What is disease cycle?
- c) What is Prepenetration.
- d) Give the causal organism of Tikka disease of Groundnut.
- e) Write any one peculiarity of Mycoplasma.
- f) Explain the term Biological control.

**Q2)** a) What is Epidemics? Explain different forms of epidemics. [6]

b) Describe the Induced structural defense mechanism in plants. [4]

**Q3)** a) Describe any Microscopic method of studying plant disease? [6]

b) Describe the causal organism, symptoms & disease management of Grassy shoot of sugarcane. [4]

**Q4)** a) Write on causal organism, symptoms and disease management of Root Knot disease of vegetables. [6]

b) Explain any two pure culture methods. [4]

P.T.O.

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

**[10]**

- a) Microbial Pesticide.
- b) Media for fungi.
- c) Principles of Koch's Postulates.
- d) Preexisting chemical defenes mechanism in plants.
- e) ICRISAT.
- f) Symptoms of Bacterial Plant diseases.



Total No. of Questions : 5]

SEAT No. :

PA-2385

[Total No. of Pages : 2

[5901]-544

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

BOTANY

BO - 364 : Evolution & Population Genetics

(2019 Pattern) (CBCS) (Paper - IV) (36144)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Question 1 is compulsory.
- 2) Attempt any 3 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 whenever necessary.

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

- a) Define organic evolution.
- b) What is Geological time scale?
- c) What is direct evidences of evolution?
- d) What is mendelian population?
- e) What is name of theory written by Lamark?
- f) What is Speciation?

**Q2)** a) Write a note on natural selection. [6]

b) What is fossilization? Write it's process. [4]

**Q3)** a) Write a note on primordial soup. [6]

b) What is indirect evidences of evolution? Elaborate any one example of it. [4]

**Q4)** a) What is allopetric speciation? Elaborate with any one example. [6]

b) Write any one example of seasonal isolation. [4]

P.T.O.

**Q5)** Write a short note on any Four of the following :

**[10]**

- a) Write a note on Panspermia theory.
- b) Give any one example of Biogeographical Evolution.
- c) Describe life forms in any one era.
- d) Write a note on gene pool.
- e) Write a note on genetic polymorphism.
- f) What is Hardy-Weinberg law of gene frequencies?



Total No. of Questions : 5]

SEAT No. :

PA-2386

[Total No. of Pages : 2

[5901]-545

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

BOTANY

BO - 365 : Advanced Plant Biotechnology

(2019 Pattern) (CBCS) (Paper - V)

*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 whenever necessary.*

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

- a) Enlist branches of Biotechnology.
- b) Define totipotency.
- c) What is recombinant DNA technology?
- d) Define YAC.
- e) What is PCR?
- f) Enlist stages of fermentation.

**Q2)** a) Explain how society is benefitted through Biotechnology. **[6]**

b) How long term storage of plant material is achieved? **[4]**

**Q3)** a) Explain advantages and limitations of somatic embryogenesis. **[6]**

b) Discuss limitations of fermentation. **[4]**

**Q4)** a) What are vectors? Mention in brief, role of phages as vectors. **[6]**

b) Describe method for commercial production of citric acid. **[4]**

*P.T.O.*

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

**[10]**

- a) Nanopesticides.
- b) Metabolic engineering of starch.
- c) Safety of GM foods.
- d) Pollen bank.
- e) Role of auxins in plant tissue culture.
- f) Hardening in plant tissue culture.



Total No. of Questions : 5]

SEAT No. :

PA-2387

[Total No. of Pages : 2

[5901]-546

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

BOTANY

BO - 366 : Plant Breeding and Seed Technology

(2019 Pattern) (CBCS) (Paper - VI) (36146)

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 whenever necessary.

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

- a) Define Plant breeding.
- b) What is intravarietal hybridization?
- c) Write any two achievements of selection breeding.
- d) What is long form of NSC?
- e) Define Seed Technology.
- f) Give importance of seed legislation.

**Q2)** a) Define hybridization. Write procedure of hybridization. [6]

b) What is selection? Write about clonal selection method. [4]

**Q3)** a) Explain general procedure for seed production. [6]

b) Define mutation. Give types of mutation. [4]

**Q4)** a) What is Physical purity analysis? Write procedure of purity analysis of seeds. [6]

b) Define plant introduction give merits and demerits of plant introduction.[4]

P.T.O.

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

**[10]**

- a) Applications of tissue culture.
- b) Field Inspection.
- c) Seed borne fungi.
- d) Fumigation.
- e) Hybrid vigour & heterosis.
- f) Moisture Testing.





Total No. of Questions : 5]

SEAT No. :

PA-2388

[Total No. of Pages : 2

[5901]-547

T.Y. B.Sc.

BOTANY

**BO-3610 : Nursery and Gardening Management  
(2019 Pattern) (CBCS) (Semester - VI) (Paper - X) (361410)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1)** Attempt any five of the following :

**[5]**

- a) Define Nursery.
- b) What is Seed?
- c) What is vegetative propagation?
- d) Define artificial propagation.
- e) Define Gardening.
- f) What is Nursery Bed?

**Q2)** a) Define layering. Explain air layering in detail.

**[6]**

b) Give objectives and importance of Nursery.

**[4]**

**Q3)** a) Give detail account on different aspects of landscape gardening.

**[6]**

b) Write methods of breaking of seed dormancy.

**[4]**

**P.T.O.**

- Q4)** a) Give detail account on method of cultivation diseases and pests and their management of tomato. [6]  
b) Comment on methods of natural vegetative propagation method. [4]

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

- a) Criteria for selection of plants for gardening.
- b) Advantages of cutting.
- c) Seed viability and factors affecting it.
- d) Diseases and pests of Brinjal.
- e) Scope and objectives of gardening.
- f) Methods and types of Nursery beds.



Total No. of Questions : 5]

SEAT No. :

PA-2389

[Total No. of Pages : 2

[5901]-548

T.Y. B.Sc.

BOTANY

BO-3611 : Biofertilizers

(2019 Pattern) (CBCS) (Semester - VI) (Paper - XI)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) Write the name of carrier used in biofertilizers.
- b) What are ectomycorrhiza?
- c) Define organic farming.
- d) What is biological Nitrogen fixation?
- e) Define vermicomposting.
- f) What is algal biofertilizers.

**Q2)** a) Explain the scope of biofertilizers. **[6]**

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

**Q3)** a) Explain the process of vermicomposting. **[6]**

b) What is the isolation process of Azotobacter? **[4]**

*P.T.O.*

- Q4)** a) Explain the application of BGA. [6]  
b) Write a note on characteristics of Rhizobium. [4]

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

- a) Symbiotic association
- b) Biocomposting
- c) PSB
- d) Endomycorrhiza
- e) Green manures
- f) Algae as biofertilizers.



Total No. of Questions : 5]

SEAT No. :

PA-2390

[Total No. of Pages : 2

[5901]-549

T.Y. B.Sc. (Regular)

ZOOLOGY

36151 ZO-361 : Medical & Forensic Zoology

(2019 Pattern) (CBCS) (Semester - VI) (Paper - 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) *Question 2 to 5 carry equal marks.*

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

- a) What is urine?
- b) What is Diabetes?
- c) Define poison.
- d) What is forensic zoology?
- e) Define medical helminthology?
- f) What is rigor mortis?

**Q2)** a) Describe the external & internal examination of deceased body. **[6]**

OR

Describe abnormal constituents of urine.

b) Give symptoms & causes of hypertension. **[4]**

**Q3)** a) What is myocardial infarction? Discuss its causes & risk factors. **[6]**

OR

What is hepatitis? Discuss its common symptoms & dignosis.

b) Describe the sub branches of forensic Zoology. **[4]**

**P.T.O.**

**Q4) a) Give an account of blood at crime scene. [6]**

**OR**

**Discuss the role of DNA finger print technique in criminal investigation.**

**b) Describe Asphyxiants. [4]**

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

- a) Prevention of Diabetes.
- b) Medical jurisprudence.
- c) Scope of forensic zoology.
- d) Infectious diseases.
- e) Mechanical injuries
- f) Late post-mortum changes.



Total No. of Questions : 5]

SEAT No. :

PA-2391

[Total No. of Pages : 2

[5901]-550

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

ZOOLOGY

ZO-362 : Animal Physiology

(2019 Pattern) (CBCS) (Paper - II) (36152)

*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 Nutrition.
- b) What is pacemaker?
- c) Define diastole.
- d) Write two name of water soluble vitamin.
- e) What is sarcoplasm?
- f) Write function of alfa cells in Islet's of Langerhan's.

**Q2)** a) Describe the structure of uriniferous tubule with well labelled diagram.

**[6]**

OR

Describe the hormonal control of spermatogenesis.

b) Write the normal & abnormal constituents of urine.

**[4]**

**Q3)** a) Explain the Digestion of carbohydrates & protein in digestive tract. **[6]**

OR

Explain the defination, constituents & function of blood.

b) Write note on Respiratory quotient.

**[4]**

*P.T.O.*

**Q4) a)** Discuss the transport of O<sub>2</sub> and CO<sub>2</sub> gases. [6]

OR

Discuss the hormones secreted by thyroid gland and mention their role.

b) Write mechanism of muscle contraction by sliding filament theory. [4]

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

- a) Fat soluble Vitamin
- b) Neurogenic & myogenic heart
- c) Haemocyanin as a respiratory pigment
- d) Dialysis
- e) Function of parathyroid gland
- f) Cardiac muscle





Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

**PA-2392**

**[5901]-551**

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

**ZOOLOGY**

**ZO - 363 : Molecular Biology**

**(CBCS 2019 Pattern) (Semester - VI) (36153) (Paper - III)**

*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 Chromatin.
- b) What is semi conservative replication.
- c) Define exon.
- d) Enlist any two stop codons.
- e) Mention any two types of RNA.
- f) Define cloning vector.

**Q2)** a) Explain Avery et al. experiment in detail and state its outcome. **[6]**

OR

Explain basic mechanism of transcription in Prokaryotes.

b) Give an account of Plasmid Vectors. **[4]**

**Q3)** a) Describe the basic mechanism of initiation of translation in Prokaryotes. **[6]**

OR

Describe the photo repair mechanism in detail and add a note on photolyase enzyme.

b) Explain the central Dogma in molecular biology. **[4]**

**P.T.O.**

**Q4) a)** Discuss the concept of Lac operon in E.coli. [6]

OR

Discuss the process of DNA amplification using PCR.

b) Explain the structure of t.RNA. [4]

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

- a) Chargoff's Rule
- b) Application of DNA fingerprinting
- c) Restriction enzymes
- d) Wobble hypothesis
- e) 5' capping
- f) function of operator gene in Lac operon.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2393**

[5901]-552

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

**ZOOLOGY**

**ZO - 364 : Entomology**

**(2019 CBCS Pattern) (Semester - VI) (Paper - IV) (36154)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

**Q1)** Solve any FIVE of the following.

**[5]**

- a) Define social insects.
- b) Explain elytra.
- c) Define holometabolous.
- d) Explain insect mouth parts.
- e) Function of Antenna.
- f) Explain jointed appendages.

**Q2)** a) Describe the salient features of Insects.

**[6]**

OR

Describe Insect head & its parts & orientation.

- b) Explain integuments & its derivatives.

**[4]**

**P.T.O.**

**Q3) a)** Describe social organization & polymorphisum with suitable example.[6]

OR

Write the effect of abiotic factors on insect population.

b) Describe Economic importance of Insects. [4]

**Q4) a)** Define metamorphosis & add a note on its types. [6]

OR

Explain structure of typical insect leg. Describe its types of modifications in insect leg.

b) Describe insect ecology & add biotic factors. [4]

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

a) Modification of Insects wings.

b) Respiratory system of Insects.

c) Describe mimicry of Insects.

d) Insects thorax.

e) Compound eye.

f) Moulting in insects.



Total No. of Questions : 5]

SEAT No. :

PA-2394

[Total No. of Pages : 2

[5901]-553

T.Y.B.Sc.

ZOOLOGY

ZO - 365 : Techniques In Biology

(2019 CBCS Pattern) (Semester - VI) (Paper - V) (36155)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question No.1 is compulsory.
- 2) Solve any three questions from Q2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

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

- a) Define Dealcoholization?
- b) Afixation meaning.
- c) What is expanded form of TEM.
- d) Define Immunodiffusion.
- e) Sweep netting
- f) Mega pixels

**Q2)** a) Basic principles of microscopy explain briefly with exmaples.  
(any 2 examples) [6]

OR

What is ELISA explain it's working principle and types of ELISA.

b) Cutting Paraffin Ribbons [4]

**Q3)** a) What is Feulgen Reaction? Explain Briefly. [6]

OR

What is camera lens? Explain it's types.

b) What is mounting & labelling of section. [4]

P.T.O.

**Q4)** a) What is species Richness? Explain shannon Index. [6]

OR

What Image? Explain in Brief.

b) Enlist common Faults in section cutting. [4]

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

- a) Transect sampling
- b) Impregnation
- c) Bleeding time
- d) Total count of leukocytes
- e) Application of PCR
- f) DNA Barcoding



Total No. of Questions : 5]

SEAT No. :

**PA-2395**

[Total No. of Pages : 2

**[5901]-554**

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

**ZOOLOGY**

**ZO - 366 : Evolutionary Biology**

**(CBCS 2019 Pattern) (Semester - VI) (Paper - VI) (36156)**

*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 organic evolution.
- b) Define Analogy.
- c) What is Neo-Darwinism?
- d) Define favourable variations.
- e) Define Allopetric speciation.
- f) Hardy-Weinberg law.

**Q2) a) Describe the evolution of eukaryotes.** **[6]**

OR

Describe embryological evidences of evolution.

b) Use and disused theory of Lamarck's. **[4]**

**Q3) a) Explain pre-zygotic isolation.** **[6]**

OR

Explain mechanism of speciation.

b) Write short note on types of variations. **[4]**

**P.T.O.**

**Q4)** a) Discuss the character's of Neanderthal man. [6]

OR

Discuss fauna of oriental realm.

b) What is role of extinction in evolution? [4]

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

- a) Gene flow
- b) Sources of mutation
- c) Homologous organs
- d) Geographical Isolation
- e) Founder effect
- f) Australopithecus





Total No. of Questions : 5]

SEAT No. :

**PA-2396**

[Total No. of Pages : 2

**[5901]-555**

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

**ZOOLOGY**

**ZO - 3610 : Environmental Impact Assessment  
(CBCS 2019 Pattern) (Semester - VI) (361510) (Paper - VII)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question 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 EIA?
- b) What is wild life?
- c) What is Biological diversity?
- d) What is IAA?
- e) What is pollutant?
- f) Define water pollution.

**Q2)** a) What is natural resources, describe factors of natural resources exploitation. **[6]**

OR

Describe importance of EIA.

b) Describe Biological Diversity Act - 2002. **[4]**

**Q3)** a) Describe UN 17 sustainable development Goals. **[6]**

OR

Describe baseline data collection in EIA.

b) Explain any two types of EIA. **[4]**

**P.T.O.**

**Q4) a)** Describe the Environment protection Act, 1986. [6]

OR

Explain any two stakeholder's in EIA process.

b) Describe role of MPCB. [4]

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

- a) NABET
- b) Importance of Environment
- c) Impact of Pollution
- d) Carrying capacity
- e) EIA agency IAA
- f) Pillars of sustainability



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages :2

**PA-2397**

**[5901]-556**

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

**GEOLOGY**

**GL - 321 : Geology of India-II (Paper-I)**

**(2019 Pattern) (Semester-VI) (Revised Syllabus) (36161) (Regular)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instruction to the candidates:*

- 1) *Q.1 is compulsory.*
- 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 five) **[5]**

- a) Saline series
- b) Give the criterias for classification of cambrian system
- c) Golden Age of trilobite
- d) Economic importance of Deccan Trap
- e) Physiographic division of Himalayas
- f) Fossil content of Siwalik

**Q2)** Answer the following.

- a) Classification of Gondwana super group **[6]**
- b) Trichinopoly-classification **[4]**

**Q3)** Answer the following.

- a) Regression & transgression **[6]**
- b) Climatic conditions of Siwalik group. **[4]**

**Q4)** Answer the following.

- a) Karewas of Kashmir **[6]**
- b) Stratigraphy of Maharashtra **[4]**

**P.T.O.**

**Q5)** Write notes on Any five of the following.

**[10]**

- a) Duration of Deccan Volcanism.
- b) Give the importance of permian.
- c) Karakoram Granite batholith.
- d) Tecto-magnetic evolution of Himalayas.
- e) Lithological succsion of kutch.
- f) K-T boundary.



Total No. of Questions : 5]

SEAT No. :

**PA-2398**

[Total No. of Pages : 2

[5901]-557

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

**GEOLOGY**

**GL-322: Mining and Mineral Exploration  
(2019 Pattern) (Semester-VI) (36162)**

*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)** Answer the following 2-3 sentences (any 5)

**[5]**

- a) Define gangue.
- b) What are stratigraphic guides?.
- c) Give the stages of mineral exploration.
- d) What is elemental dispersion.
- e) What is strip mining?
- f) What are Grab samples?

**Q2)** Answer the following:

- a) Magnetic method of mineral prospecting.
- b) Rationale of National Mineral Policy.

**[6]**

**[4]**

**Q3)** Answer the following:

- a) Explain Geochemical prospecting.
- b) Explain Triangular method of ore reserve estimation.

**[6]**

**[4]**

**Q4)** Answer the following:

- a) Explain Gophering method of underground mining
- b) Explain channel sampling.

**[6]**

**[4]**

**P.T.O.**

**Q5)** Answer any 4 of the following :

**[10]**

- a) Stratigraphic lithological guides.
- b) Magnetometers or magnetic variometers.
- c) Trenching in mining.
- d) Path finder elements.
- e) Geobotanical prospecting.



Total No. of Questions : 5]

SEAT No. :

PA-2399

[Total No. of Pages : 2

[5901]-558

T.Y.B.Sc.

GEOLOGY

GL 323 : Oceanography

(2019 Pattern) (Semester - VI) (Paper - III) (36163)

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's 2 to 5 carry equal marks.

**Q1)** Answer the following questions in 2-3 lines (Any 5)

[5]

- a) Define El - Nino.
- b) Draw a diagram showing sea surface salinity & temperature variation with Latitude.
- c) How evaporation affects the seawater salinity?
- d) Define : Bay barrier.
- e) Enlist any two effects of sealevel Rise.
- f) Enlist the soft structural options for coastal conservation methods.

**Q2)** Answer the following :

[10]

- a) What is oceanography? Draw a venn diagram showing the interdisciplinary nature of oceanography. Give main disciplines of oceanography. [6]
- b) Explain Indian Ocean circulation. [4]

**P.T.O.**

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

- a) Explain the EI-Nino - LA-Nina effect relation between climate & Ocean in the Indian context. [6]
- b) Explain the Isostatic adjustment with neat labelled diagram for changes in sea level. [4]

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

- a) What features exist along Erosional & Dipositional shores? [6]
- b) Explain surface salinity variation. [4]

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

- a) Density of seawater.
- b) Equitorial counter currents and subpolar ayres.
- c) Subtropical ayres.
- d) Sea level changes during late Holocene.
- e) Causes of coastal erosion.
- f) Prohibited activities within CR2.

**x x x**



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2400**

[5901]-559

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

**GEOLOGY**

**GL-324 : Petroleum Geology**

**(2019 Pattern) (Semester - VI) (Revised Syllabus) (36164)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Answer the following question in 2-3 line (any 5)

**[5×1=5]**

- a) Enlist reservoir fluids.
- b) Enlist source material as organic matter.
- c) Enlist physical properties of crude oil.
- d) What is edge water.
- e) Source rock.
- f) What is primary migration.

**Q2)** Answer the following.

- a) Explain secondary migration of Hydrocarbons. **[6]**
- b) Seepage and mud volcanoes. **[4]**

**P.T.O.**

**Q3)** Answer the following.

- a) Explain any one hydrocarbon trap of structural origin. [6]
- b) Petroliferous basins of Kuwait. [4]

**Q4)** Answer the following.

- a) Describe Bombay petroliferous basin. [6]
- b) Sources of organic matter. [4]

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

- a) Reservoir fluids.
- b) Krishna - Godavari oil basin.
- c) Greater Burgan oil field.
- d) Kerogene.
- e) Recycled oil.
- f) Secondary migration.



Total No. of Questions : 5]

SEAT No. :

**PA-2401**

[Total No. of Pages : 2

**[5901]-560**

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

**GEOLOGY**

**GL - 325 : Climate Change : Past, Present and Future  
(2019 Pattern) (Semester - VI) (Paper - V) (36165)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following questions in 2-3 lines (any 5) **[5]**

- a) What is troposphere?
- b) What are the three main elements of Milankovitch Cyclicity?
- c) What is El-Nino?
- d) What are the two concepts of origin of monsoon?
- e) What are climate proxies?
- f) Which agro-climate zone (division) is represented by North-Eastern States (region) of India?

**Q2)** Answer the following

- a) What is climate model? What are the different types of climate change models? **[6]**
- b) Explain how anthropogenic factors affects the Earth's climate regionally and globally? **[4]**

**Q3)** Answer the following

- a) Add a note on flood and drought hazards in India. **[6]**
- b) Write a short note on climate and landscape evolution. **[4]**

**P.T.O.**

**Q4)** Answer the following

- a) What are Milankovitch cycles? And how they controls the Earth's climate? **[6]**
- b) What is agro-climatic zone? Enlist the agro-climatic divisions in peninsular India. **[4]**

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

- a) Structure of the atmosphere
- b) Ocean circulation
- c) Effects of El-Nino on Indian Subcontinent.
- d) Cyclones
- e) Climate proxies
- f) Indian monsoon.



Total No. of Questions : 5]

SEAT No. :

**PA-2402**

[Total No. of Pages : 2

**[5901]-561**

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

**GEOLOGY**

**GL - 326 : Geological Field Methods and Mapping  
(2019 Pattern) (Semester - VI) (Revised) (36166)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question No. 1 is compulsory.*
- 2) *Solve any Three questions from Question 2 to Question 5.*
- 3) *Questions No. 2 to 5 carry equal marks.*

**Q1)** Answer the following question in 2-3 line (any 5)

**[5]**

- a) Define planimetric map.
- b) What is base map.
- c) Uses of geological map.
- d) What is million sheet.
- e) What is forebearing.
- f) What is lineation.

**Q2)** Answer the following.

- a) Explain front and Back bearing. **[6]**
- b) How to describe Igneous and sedimentary contact in the field? **[4]**

**Q3)** Answer the following.

- a) Explain preliminary preparation for field work. **[6]**
- b) Give uses of brunton compass. **[4]**

**P.T.O.**

**Q4)** Answer the following.

- a) Explain procedure of Geological mapping. [6]
- b) Explain process of labelling a sample. [4]

**Q5)** Write a notes on any five of the following. [10]

- a) Clinometer compass
- b) GPS
- c) Lithology
- d) Conventional signs on toposheet.
- e) Equipments for geological field work.
- f) field correlation.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2403**

**[5901]-562**

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

**GEOLOGY**

**SEC - III : Applications of Remote Sensing in Geosciences  
(2019 Pattern) (Semester - VI) (361610)**

*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) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Answer the following in 2-3 lines (Any 5) **[5]**

- a) LIDAR
- b) Define Nadir point.
- c) Atmospheric window.
- d) What is high sun angle photography?
- e) Landsat.
- f) Give two applications of Remote sensing in mineral resources.

**Q2)** a) Explain photorecognition element: **[6]**

- i) Texture
- ii) Pattern

b) Give interpretation of photo lineament map. **[4]**

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

- i) Tip
- ii) Tilt
- iii) Drift
- iv) Crab

b) Define aerial photograph and give classification based on camera axis. **[4]**

**P.T.O.**

- Q4)** a) Define Electromagnetic spectrum. Explain Stefan Boltzman's law. [6]  
b) Explain interpretation of faults on aerial photo. [4]

**Q5)** Write note on (Any 4) [10]

- a) Types of Remote sensing.
- b) Spectral reflectance of water.
- c) Scale of aerial photograph
- d) Advantages of aerial photos.
- e) Oceansat
- f) Emissivity





Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2404**

**[5901]-563**

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

**GEOLOGY**

**GL - SEC IV : Oil Field Services**

**(2019 Pattern) (Semester - VI) (361611) (Revised)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1)** Answer the following question in 2-3 line (any 5) **[5]**

- a) State uses of core samples.
- b) Importance of directional drilling
- c) Type of drilling rigs.
- d) What is LWD.
- e) What is exploratory well.
- f) What is GTO.

**Q2)** Answer the following.

- a) Explain temperature log and caliper log. **[6]**
- b) Explain techniques of mud logging. **[4]**

**Q3)** Answer the following:

- a) Explain Geotechnical order in type of oil wells. **[6]**
- b) Explain components of rotary drilling. **[4]**

**P.T.O.**

**Q4)** Answer the following:

- a) What is drilling fluid? Explain its uses. [6]
- b) Explain controlled directional drilling. [4]

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

- a) Caliper logs
- b) Cable tool drilling
- c) Oil wells
- d) Properties of drilling mud
- e) Wire line logging
- f) Horizontal drilling

**\*\*\* \*\***

Total No. of Questions : 5]

SEAT No. :

PA-2405

[Total No. of Pages : 2

[5901]-564

T.Y. B.Sc.

GEOLOGY

GL-SEC-V : Watershed Development

(2019 Pattern) (Semester-VI) (Revised Syllabus) (361612)

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 carry equal marks.

**Q1)** Answer the following questions in 2-3 line (any 5) [5]

- a) Write any two importance of Watershed Planning in National Development.
- b) What is Afforestation?
- c) What is relief ratio of Watershed?
- d) What is check dam?
- e) Define rainfall-runoff
- f) Define drainage

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

- a) Write a short note on Rain water Harvesting system in brief. [6]
- b) Discuss watershed management as a part of Sustainable development.[4]

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

- a) Explain in detail about the integrated watershed management approach.[6]
- b) Difference between in land use/Land cover. [4]

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

- a) Explain the basic objectives of watershed management. [6]
- b) What is the project implementation agency? Describe its important Functions. [4]

P.T.O.

**Q5)** Write short notes any Five of the following.

**[10]**

- a) Environmental impact assessment.
- b) Percolation tank in Rainwater harvesting
- c) Watershed Delineartion
- d) Role of Watershed
- e) Effect of erosion on land fertility
- f) Contour bunding.



Total No. of Questions : 4]

SEAT No. :

PA-2406

[Total No. of Pages : 2

[5901]-565

T.Y. B.Sc.

STATISTICS

ST - 361 : Distribution Theory - II

(2019 Pattern) (Semester - VI) (Regular) (36171)

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 calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

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

[1 each]

A) Choose the correct alternative in each of the following :

a) If  $(X, Y) \sim \text{BN}(\mu_x, \mu_y, \sigma_x^2, \sigma_y^2, \rho)$ , then the second raw moment of marginal distribution of X is

i)  $\sigma_x^2 / \mu_x^2$

ii)  $\sigma_x^2 - \mu_x^2$

iii)  $\sigma_x^2$

iv)  $\sigma_x^2 + \mu_x^2$

b) If  $X \sim \text{LN}(2, 2.5, 1.32)$ , then the distribution of  $\log_e(X-2)$  is

i)  $N(2.5, 1.32)$

ii)  $N(2.5, 2)$

iii)  $N(2, 1.32)$

iv)  $N(0, 1.32)$

c) If  $X \sim W(\alpha, \beta)$ , then the distribution of  $\left(\frac{x}{\alpha}\right)$  is

i)  $W(\alpha, \beta)$

ii)  $W(\alpha, 1)$

iii)  $W(1, \beta)$

iv)  $W(0, 1)$

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

a) Laplace distribution is a positively skewed distribution.

b) If  $(X, Y) \sim \text{BN}(\mu_1 = 2.2, \mu_2 = 3.1, \sigma_1^2 = 9, \sigma_2^2 = 10, \rho = 0.2)$ , then X and Y are independent.

P.T.O.

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

- a) Let  $(X, Y) \sim \text{BN}(\mu_1, 3, \sigma_1^2, 9, 0.5)$ . If  $E(Y|X=3) = 3.75$  and  $V(X|Y=2) = 3$ , then find  $\mu_1$  and  $\sigma_1^2$ .
- b) If  $X \sim L(\mu, \lambda)$ , derive its moment generating function.
- c) Let  $X \sim \text{LN}(0, \mu, \sigma^2)$ , find first quartile and median of the distribution.

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

- a) If  $X \sim L(\mu, \lambda)$ , find the distribution function of  $X$  and hence find the first quartile.
- b) State probability distribution function (p.d.f.) of Pareto distribution with parameter  $\lambda$ . Hence, derive its mean.
- c) If  $X \sim W(\alpha, \beta)$ , obtain the distribution function of  $X$  and hence obtain third quartile.

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

- a) i) Derive  $r^{\text{th}}$  moment about  $X = a$  for  $\text{LN}(a, \mu, \sigma^2)$ . Hence find its mean and variance. **[7]**
- ii) If  $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ , then find the marginal probability distribution of  $X$ . **[3]**
- b) i) State the p.d.f. of normal distribution truncated below 'a'. Hence, derive its mean. **[4]**
- ii) Let  $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \delta)$  and  $f(x, y)$  is the p.d.f. of this distribution. Show that  $\iint f(x, y) dx dy = 1$ . **[6]**



Total No. of Questions : 4]

SEAT No. :

PA-2407

[Total No. of Pages : 3

[5901]-566

T.Y. B.Sc.

STATISTICS : (Principal)

ST-362 : Testing of Hypotheses

(2019 Pattern CBCS) (Semester - VI) (Paper-II) (Regular) (36172)

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 calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following: [5]

A) Choose the correct alternative in each of the following:

- a) Neyman Pearson's lemma provides the most powerful test for testing.
  - i) a simple null hypothesis against a simple alternative hypothesis.
  - ii) a simple null hypothesis against a composite alternative hypothesis.
  - iii) a composite null hypothesis against a simple alternative hypothesis.
  - iv) a composite null hypothesis against a composite alternative hypothesis.
- b) Which of the following test is not a non parametric test?
  - i) Sign test
  - ii) Mann-Whitney test
  - iii) Kolmogorov-Smirnov test
  - iv) F-test
- c) Let  $X_1, X_2, \dots, X_{25}$  be a random sample of size 25 from  $N(\mu, 100)$  distribution. To test  $H_0: \mu = 85$  against  $H_1: \mu = 90$ , the best critical region of size 0.05 based on a random sample of size 25 is of the form [Given:  $P(Z > 1.64) = 0.05$ ]
  - i)  $\{(X_1, X_2, \dots, X_n) | \bar{X} \geq 81.72\}$
  - ii)  $\{(X_1, X_2, \dots, X_n) | \bar{X} \geq 88.28\}$
  - iii)  $\{(X_1, X_2, \dots, X_n) | \bar{X} \leq 81.72\}$
  - iv)  $\{(X_1, X_2, \dots, X_n) | \bar{X} \leq 88.28\}$

P.T.O.

- B) State whether each of the following statements is true or false:
- For testing whether two independent random samples come from identically distributed continuous populations, Mann-Whitney U test can be used.
  - The value of the likelihood ratio statistic close to zero indicates that data supports the alternative hypothesis ( $H_1$ ).

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

- Let  $X_1, X_2, \dots, X_n$  be a random sample from Poisson distribution with mean  $\lambda$ . Construct MP test of size  $\alpha$  for testing  $H_0: \lambda = \lambda_0$  against  $H_1: \lambda = \lambda_1, (\lambda_1 > \lambda_0)$ .
- Let  $X_1, X_2, \dots, X_n$  be a random sample from Bernoulli distribution with parameter  $P$ . Construct UMP test of level of significance  $\alpha$  for testing  $H_0: P = 0.4$  against  $H_1: P = P_1, (P_1 < 0.4)$ . Does it remain UMP for testing  $H_0: P = 0.4$  against  $H_1: P > 0.4$ ?
- Let  $X_1, X_2, \dots, X_n$  be a random sample from an exponential distribution with mean  $\frac{1}{\theta}$ . Construct likelihood ratio test of level of significance  $\alpha$  for testing  $H_0: \theta = \theta_0$  against  $H_1: \theta \neq \theta_0$ .

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

- Construct likelihood ratio test of level of significance  $\alpha$  for testing  $H_0: \mu = \mu_0$  against  $H_1: \mu \neq \mu_0$ , where  $\mu$  is the mean of normal distribution with unknown variance  $\sigma^2$  based on random sample  $X_1, X_2, \dots, X_n$  drawn from it.
- Let  $X$  be a random variable with p.m.f. under  $H_0$  and  $H_1$  as given below:

|              |      |      |      |      |     |      |
|--------------|------|------|------|------|-----|------|
| $X$          | 1    | 2    | 3    | 4    | 5   | 6    |
| $f(x   H_0)$ | 0.02 | 0.01 | 0.03 | 0.04 | 0.6 | 0.3  |
| $f(x   H_1)$ | 0.1  | 0.05 | 0.15 | 0.25 | 0.4 | 0.05 |

Find all critical regions of size 0.05. Also state which one is the best. Why?

- Following is sequence of ups U and downs D in the price of gold for 15 consecutive days, provided price did not remain same on two consecutive days:

UUUDUDDDUUDUDUD

Test the randomness of the above sequence at 5% level of significance.



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

- a) i) Describe Wilcoxon Signed rank test procedure. [5]
- ii) Let  $X_1, X_2, \dots, X_n$  be a random sample from a  $N(\mu, 36)$ . Construct UMP test of level of significance  $\alpha$  for testing  $H_0 : \mu = \mu_0$  against  $H_1 : \mu = \mu_1, (\mu_1 > \mu_0)$ . Is this remains UMP for testing  $H_0 : \mu = \mu_0$  against  $H_1 : \mu = \mu_1, (\mu_1 < \mu_0)$ ? [5]
- b) i) Define the following terms. [1+2+2]
- 1) Critical Region
  - 2) Best Critical Region
  - 3) Uniformly Most Powerful Critical Region
- ii) Following is a random sample of size 5 drawn from a continuous distribution with distribution function  $F_x(\cdot)$ . [5]
- 0.65, 0.35, 0.85, 0.60, 0.90
- Test whether the sample can be regarded as drawn from  $U(0, 1)$  distribution. Use 5% level of significance.



Total No. of Questions : 4]

SEAT No. :

PA-2408

[Total No. of Pages : 3

[5901]-567

T.Y.B.Sc.

STATISTICS

ST 363 : SAMPLING THEORY

(2019 Pattern) (Semester - VI) (Paper - III) (Regular) (36173)

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.

Q1) Attempt each of the following.

[1 each]

A) In each of the following cases, choose the correct alternative:

a) In case of stratified random sampling with proportional allocation, the sample size from  $i^{\text{th}}$  stratum is

- |                                     |                                  |
|-------------------------------------|----------------------------------|
| i) $nW_i$                           | ii) $nW_iS_i$                    |
| iii) $n \frac{W_iS_i}{\sum W_iS_i}$ | iv) $\frac{W_iS_i}{\sum W_iS_i}$ |

b) The probability that an item is included in a sample of size  $n$  under simple random sampling with replacement from a population of size  $N$  is

- |                    |                              |
|--------------------|------------------------------|
| i) $\frac{n}{N}$   | ii) $\frac{1}{\binom{N}{n}}$ |
| iii) $\frac{1}{n}$ | iv) $\frac{1}{N}$            |

c) The estimator of population total ( $Y$ ) in case of systematic sampling is given by

- |                                   |                      |
|-----------------------------------|----------------------|
| i) $\bar{y}_{sys}^2$              | ii) $N\bar{y}_{sys}$ |
| iii) $\frac{N-1}{N}\bar{y}_{sys}$ | iv) $\bar{y}_{sys}$  |

P.T.O.

- B) In each of the following, state whether the given statement is true or false: **[1 each]**
- In case of simple random sampling, probability of selecting a specific unit from a population on first draw is greater than probability of selecting it on any other specific draw.
  - In case of SRSWOR, sample mean is an unbiased estimator of population mean.

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

- For a population with linear trend  $y_i = a + b_i$ ,  $i = 1, 2, \dots, N$ . Obtain expression for the variance of the estimator of population mean when stratified random sampling method is used.
- Prove that in case of simple random sampling with replacement (SRSWR), sample mean square is an unbiased estimator of population variance.
- Obtain the formula for the sample size under SRSWOR so as to achieve the predetermined precision in the estimation of population proportion of a certain attribute.

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

- In case of simple random sampling without replacement procedure (SRSWOR), derive an expression for the variance of the estimator of population mean.
- What is stratified random sampling. Derive an expression for the variance of an unbiased estimator of the population mean.
- A population of size 1000 is divided into 4 strata with sizes and standard deviations as follows:

| Stratum No | Stratum Size ( $N_i$ ) | Standard Deviation ( $S_i$ ) |
|------------|------------------------|------------------------------|
| 1          | 300                    | 6                            |
| 2          | 200                    | 4                            |
| 3          | 500                    | 9                            |

Determine the sample sizes under proportional allocation and Neyman's allocation if the total sample size is 150.

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

- a) i) State the expression for the variance of the estimator of the population mean in case of Neyman allocation and proportional allocation in stratified random sampling and compare them. [5]
- ii) Define ratio estimator of population mean. State the expression for the bias and standard error of the estimator of the population mean.[5]
- b) i) With Usual notations prove that systematic sampling is more efficient than SRSWOR if  $\rho \leq -\frac{1}{N-1}$ , where  $\rho$  is intra-class correlation coefficient. [5]
- ii) Write a note on sampling and non sampling errors. [5]



Total No. of Questions : 4]

SEAT No. :

PA-2409

[Total No. of Pages : 3

[5901]-568

T.Y.B.Sc.

STATISTICS (Principal)

ST - 364 : Introduction to Survival Analysis

(CBCS 2019 Pattern) (Semester - VI) (Paper - IV) (36174)

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 scientific calculator is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following.

[1 each]

A) Choose the correct alternative:

a) The hazard rate of an exponential distribution with parameter  $\lambda$  is

i)  $\frac{1}{\lambda}$

ii)  $\lambda t$

iii)  $\lambda$

iv)  $\lambda^2$

b) Let a component has failure rate  $r(t) = 8$ , then cumulative hazard rate of the component is

i)  $8t$

ii)  $\frac{t}{8}$

iii)  $4t$

iv)  $8t^2$

c) In a certain clinic doctor uses two independent instruments for diagnosis. Let lifetime distribution of first instrument follow a weibull ( $\alpha = 2, \beta = 1$ ) distribution and another instrument follow a weibull ( $\alpha = 4, \beta = 1$ ) distribution. Among the two instruments which instruments will be preferred by the doctor?

i) Second instrument

ii) Both instrument

iii) First instrument

iv) Insufficient information to decide

P.T.O.

B) In each of the following cases state whether the given statement is true or false. **[1 each]**

- a) The successive difference in order statistics is called as spacings.
- b) Weibull ( $\alpha = 2, \beta = 2.5$ ) distribution is the member of DFR class.

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

- a) Explain in brief the Kaplan - Meier estimator of survival function.
- b) Show that, if a lifetime distribution  $F(\cdot)$  belongs to decreasing failure rate (DFR) class of lifetime distributions then it belongs to increasing mean residual life (IMRL) class of lifetime distribution i.e.,  $DFR \Rightarrow IMRL$ .
- c) Suppose 20 items from an exponential distribution are put on life test and observed for 150 hours. During the period 15 items fail with the following life times.

3, 19, 23, 26, 27, 37, 38, 41, 45, 58, 84, 90, 99, 109, 138.

Identify the type of censoring used in the experiment. Also find M.L.E. of the parameter of an exponential distribution and M.L.E. of average lifetimes of the items.

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

- a) Explain delta method. Hence, derive the green woods formula for variance of an actuarial estimator.
- b) Obtain hazard rate for the Lehman family of life distribution.
- c) Define no ageing. Prove that, no ageing is characterized by  $\psi_f(t) = t$  for  $0 \leq t \leq 1$  where  $\psi_f(t)$  is scale TTT transform of the random variable T.

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

**[10 each]**

- a) i) If  $T_1, T_2, \dots, T_n$  are independent with  $T_i \rightarrow \exp(\lambda_i)$  for  $i = 1, 2, \dots, n$  and  $T = \min \{T_1, T_2, \dots, T_n\}$  then prove that  $T \rightarrow \exp\left(\sum_{i=1}^n \lambda_i\right)$  [4]
- ii) Explain the following terms with illustrations. [6]
- 1) Time censoring.
  - 2) Right random censoring.
  - 3) Left random censoring.
- b) i) State non parametric estimator of survival function. Hence, show that estimator is unbiased as well consistent estimator of survival function. [4]
- ii) Define spacing and normalized spacing. Hence, derive the distribution of spacing and normalized spacing. [6]



Total No. of Questions : 4]

SEAT No. :

PA-2410

[Total No. of Pages : 2

[5901]-569

T.Y.B.Sc.

STATISTICS (Principal)

ST 365 (A) : Actuarial Statistics

(2019 Pattern) (Semester - VI) (CBCS) (Paper - V) (36175)

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 scientific calculator is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following.

[1 each]

A) Choose the correct alternative in each of the following.

- a) For constant force of mortality  $\mu$  and constant force of interest  $\delta$ , the nat single premium for the unit benefit whole life insurance is

i)  $\frac{\mu}{\mu + 2\delta}$

ii)  $\frac{\delta}{\mu + \delta}$

iii)  $\frac{\mu}{\mu + \delta}$

iv)  $\frac{\delta}{2\mu + \delta}$

- b) Force of interest  $\delta_t$  is defined as

i)  $\log(1 + i)$

ii)  $\log(1 - i)$

iii)  $\log \frac{i}{(1 - i)}$

iv)  $\log(1 + v)$

- c) If  $w$  is the limiting age then

i)  $S(w) > S(0)$

ii)  $S(w) = 0$

iii)  $S(w) = 1$

iv)  $S(w) = \infty$

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

- a) Premiums are always paid in arrears.
- b) The minimum acceptable premium that an insurer would like to charge is smaller than expected loss.

P.T.O.



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

- a) Define the Curtate future life time random variable. Hence, obtain its probability mass function.
- b) Suppose life length random variable  $X$  has a survival function,  
$$F(x) = 1 - \frac{x}{100} \text{ if } 0 \leq x \leq 80. \text{ Find } {}_{2/3}q_4.$$
- c) For the uniform distribution over  $(0, 80)$ , find the force of mortality and comment on it.

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

- a) Discuss the two types of risk in Insurance Business.
- b) Write short note on:
  - i)  $n$  - year temporary life annuity due
  - ii) a whole life annuity due
- c) For  $n$  - year temporary discrete life annuity due, define the present value random variable and show that actuarial present value of this annuity is

$$\sum_{k=0}^{n-1} v^k {}_kP_x.$$

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

- a)
  - i) State the relation between nominal rate of interest, effective rate of interest and force of interest. Suppose force of interest per annum is 0.06. Find  $d$ ,  $v$  and  $i^{(2)}$ .
  - ii) Under appropriate assumptions to be stated, on the utility function of both insured and insurer, show that  $G \geq \mu$  and  $H \geq \mu$  where  $\mu$  is the expected loss for both parties,  $G$  is maximum amount the insurer is willing to pay and  $H$  is the minimum acceptable amount to the insurer.

[5+5]

- b)
  - i) What will be the yearly equal installment amount for repaying the loan amount \$ 1,00,000 taken for the period of 10 years with  $i = 0.12$ , when each installment is paid at the end of the year?
  - ii) In case of fully discrete premiums, state the formula for annual benefit premium for  $n$ -year term insurance. Also, state the loss random variable for whole life insurance when unit benefit is to be paid at the end of policy year of death.

[5+5]



Total No. of Questions : 4]

SEAT No. :

PA-2411

[Total No. of Pages : 3

[5901]-570

T.Y.B.Sc.

STATISTICS (Principal)

ST 365 (B) : Operations Research - II

(CBCS 2019 Pattern) (Semester - VI) (Paper - V) (36176)

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 calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following.

[1 each]

A) Choose the correct alternative in each of the following.

- a) Few numbers of items that costs 70% of the money value of consumption in ABC analysis of inventory are
  - i) A class items
  - ii) B class items
  - iii) C class items
  - iv) AB class items
- b) Which one of the following is an example of sudden failure?
  - i) Bearings
  - ii) Automobile tyres
  - iii) Light bulbs
  - iv) Piston
- c) Coefficient of optimism ( $\alpha$ ) in decision theory always lies between,
  - i)  $-1$  and  $+1$
  - ii)  $-\infty$  and  $+\infty$
  - iii)  $0$  and  $1$
  - iv)  $0$  and  $+\infty$

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

- a) In sequencing problems, the time required to shift the jobs from one machine to another machine is negligible.
- b) If there are only two strategies, the payoff matrix has a saddle point.

P.T.O.

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

**[5 each]**

- Write a short note on VED analysis of inventory theory.
- There are five jobs, each of which must go through the two machines P and Q in the order PQ. Processing times of these machines are given below (in minutes):

| Job       | 1 | 2 | 3 | 4 | 5  |
|-----------|---|---|---|---|----|
| Machine P | 5 | 1 | 9 | 3 | 10 |
| Machine Q | 2 | 6 | 7 | 8 | 4  |

Determine a sequence for the five jobs that will minimize the total elapsed time. Also calculate total idle time.

- Discuss in detail the Laplace criterion under uncertainty.

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

**[5 each]**

- Derive an expression for replacement policy for items whose running cost increases with time as a discrete variable and value of money remains constant during a period.
- Reduce the following game into  $2 \times 2$  matrix by dominance principle.

| Player A       | Player B       |                |                |                |
|----------------|----------------|----------------|----------------|----------------|
|                | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> |
| A <sub>1</sub> | 3              | 2              | 4              | 0              |
| A <sub>2</sub> | 3              | 4              | 2              | 4              |
| A <sub>3</sub> | 4              | 2              | 4              | 0              |
| A <sub>4</sub> | 0              | 4              | 0              | 8              |

- Write a note on decision tree.

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

- a) i) State any four assumptions of the game theory. [4]
- ii) The following matrix gives payoff (in Rs.) of different strategies  $S_1, S_2, S_3$  against  $N_1, N_2, N_3, N_4$ . [6]

| Strategy | States of nature |        |       |       |
|----------|------------------|--------|-------|-------|
|          | $N_1$            | $N_2$  | $N_3$ | $N_4$ |
| $S_1$    | 4000             | -100   | 6000  | 18000 |
| $S_2$    | 20,000           | 5000   | 400   | 0     |
| $S_3$    | 20,000           | 15,000 | -2000 | 1000  |

Indicate the decision taken under the regret criterion and Hurwicz criterion if the coefficient of optimism being 0.7.

- b) i) Write a short note on [2 each]
- 1) Decision-making under uncertainty.
  - 2) Gradual failure.
  - 3) Lot size inventory.
  - 4) Sequencing problem.
- ii) For the game with payoff matrix, find the saddle point: [2]

| Player A | Player B |       |       |
|----------|----------|-------|-------|
|          | $B_1$    | $B_2$ | $B_3$ |
| $A_1$    | -1       | 2     | -2    |
| $A_2$    | 6        | 4     | -6    |



Total No. of Questions : 4]

SEAT No. :

PA-2412

[Total No. of Pages : 3

**[5901]-571**  
**T.Y. B.Sc.**  
**STATISTICS (Principal)**  
**ST - 366 (A) : Stochastic Processes**  
**(2019 Pattern) (Semester - VI) (Paper - VI) (36177)**

*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 scientific calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

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

**[1 each]**

A) Choose the correct alternative in each of the following:

- a) Let  $\{x_n, n \geq 1\}$  be a Markov chain (M.C.). If the transition probability is independent of  $n$ , then the Markov chain is said to be
  - i) finite
  - ii) homogeneous
  - iii) Non-homogeneous
  - iv) reducible
  
- b) A state  $i$  of Markov chain is said to be persistent if
  - i) it is aperiodic
  - ii) it is ergodic
  - iii) return to state  $i$  is certain
  - iv) return to state  $i$  is uncertain
  
- c) Poisson process is a stochastic process having type
  - i) Continuous time, continuous state space stochastic process
  - ii) Discrete time, continuous state space stochastic process
  - iii) Discrete time, Discrete state space stochastic process
  - iv) Continuous time, discrete state space stochastic process

**P.T.O.**

- B) State whether each of the following is TRUE or False: [1 each]
- In a finite irreducible Markov Chain, all states are null recurrent.
  - A null persistent and aperiodic state is called ergodic state.

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

- Explain types of stochastic processes with suitable illustration.
- A housewife buys 3 kinds of cereals, A, B and C. She never buys the same cereal in successive weeks. If she buys cereal A, the next week she buys cereal B. However, if she buys B or C, the next week she is 3 times as likely to buy A as the other cereal. In long run, how often she buys each of the three cereals?
- State and prove additive property of Poisson Process.

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

- State and prove Chapman-Kolmogorov equation for Markov Chain.
- Explain Ehrenfest Chain Model.
- If  $\{N_1(t), t \geq 0\}$  and  $\{N_2(t), t \geq 0\}$  are two independent Poisson process with parameter  $\lambda_1$  and  $\lambda_2$  respectively, then show that

$$P[N_1(t) = k / (N_1(t) + N_2(t) = n)] = \binom{n}{k} p^k q^{n-k}, \quad \text{where } p = \frac{\lambda_1}{\lambda_1 + \lambda_2} \quad \text{and}$$

$$q = \frac{\lambda_2}{\lambda_1 + \lambda_2}$$

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

- i) Consider a Markov Chain  $\{X_n, n \geq 0\}$  with  $S = \{0, 1\}$  with one step

$$\text{tpm. } P = \begin{bmatrix} 1-d & \alpha \\ \beta & 1-\beta \end{bmatrix}$$

Find the Stationary distribution for given Markov Chain.

- ii) Let  $\{X_n, n \geq 0\}$  be a Markov Chain With three states  $S = \{0, 1, 2\}$  and one step transition probability matrix P as

$$P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

and initial distribution  $P(X_0 = i) = \frac{1}{3}$  for  $i = 0, 1, 2$

Compute :

1)  $P(X_2 = 1 | X_0 = 0)$

2)  $P(X_2 = 2, X_1 = 1 | X_0 = 2)$

3)  $P(X_2 = 2, X_1 = 0, X_0 = 1)$  **[4+6]**

- b) i) Let  $\{x_n, n \geq 0\}$  be a Markov Chain with four states 0, 1, 2, 3 and one step transition probability matrix P as

$$P = \begin{matrix} & \begin{matrix} 0 & 1 & 2 & 3 \end{matrix} \\ \begin{matrix} 0 \\ 1 \\ 2 \\ 3 \end{matrix} & \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1/3 & 0 & 2/3 & 0 \end{bmatrix} \end{matrix}$$

Show the Markov chain is recurrent and periodic with period 3.

- ii) Consider a game of “Ladder Climbing”. There are 5 levels in the game, Level 1 is the lowest (bottom) and level 5 is the highest (top). A player starts at the bottom. Each time, a fair coin is tossed if it turns up head, the player moves up one run. If tails, the player moves down to very bottom, Once at top level, the player moves to very bottom if a tails turns up and stays at the top if head turns up. Find the transition probability matrix. **[7+3]**



Total No. of Questions : 4]

SEAT No. :

PA-2413

[Total No. of Pages : 2

[5901]-572

T.Y. B.Sc.

STATISTICS (Principal)

ST - 366 (B) : Reliability Theory and Applications

(CBCS 2019 Pattern) (Semester - VI) (Paper - VI) (36178)

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 calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

[1 each]

A) Choose the correct alternative in each of the following:

i) For coherent structure  $\phi$  of  $n$  components

- a)  $\prod x_i = \phi(\underline{x}) = \prod x_i$       b)  $\prod x_i \leq \phi(\underline{x}) \leq \prod x_i$   
c)  $\prod x_i \leq \prod x_i \leq \phi(\underline{x})$       d)  $\prod x_i \leq \phi(\underline{x}) \leq \prod x_i$

ii) Number of minimal path sets for  $k$  out of  $n$  system are:

- a)  $n$       b) 1  
c)  $2^n$       d)  ${}^n C_k$

iii) Reliability of parallel system of 2 i.i.d. components is : 0.84 then reliability of each component will be

- a) 0.6      b) 0.4  
c) 0.7      d) 0.9

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

- i) Reliability of certain system with 3 components is  $2^3$ .
- ii) The total number of cut vectors in the system of  $n$  - components are  $n$ .

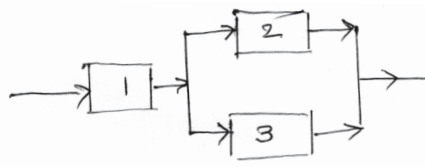
P.T.O.



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

**[5 each]**

- a) Consider the following Reliability Block diagram.



Find

- i) Structure function of the system
  - ii) Minimal path sets
  - iii) Minimal cut sets
- b) Derive the reliability of 2 out of 3 system. Hence or otherwise find the reliability of 2 out of 3 system if the reliability of each component is 0.8.
- c) Define duality of system. Derive the dual system of  $k$  out of  $n$  system.

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

**[5 each]**

- a) Define and explain the following terms:
  - i) Parallel system
  - ii)  $k$  out of  $n$  system
- b) State and derive lifetime of series system of independent components with independent IFR times.
- c) Write a note on ageing and no-ageing. Obtain the hazard function for exponential distribution and hence comment on ageing.

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

- a)
  - i) If each of the two components has independent exponential distribution, find the reliability of system and its expected life where two components are connected in series. **[5]**
  - ii) Draw the reliability block diagram for the following structure functions. **[5]**

$$\phi(\underline{x}) = x_1 [1 - (1 - x_2)(1 - x_3)](1 - x_4)$$

$$\phi(\underline{x}) = 1 - (1 - x_1 x_2)(1 - x_3 x_4)$$
- b)
  - i) If  $X_1, X_2, \dots, X_n$  is random sample from exponential distribution, Find  $100(1 - \alpha)\%$  confidence interval for  $\lambda$  **[5]**
  - ii) Write a short note on: **[5]**
    - a) Relative/structural importance of components.
    - b) Module of coherent system.



Total No. of Questions : 4]

SEAT No. :

PA-2414

[Total No. of Pages : 2

[5901]-573

T.Y.B.Sc.

STATISTICS (Principal)

ST - 366 (C) : Medical Statistics and Clinical Trials  
(2019 Pattern) (Semester - VI) (Paper - VI) (36179)

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 scientific calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following.

[1 each]

A) Choose the correct alternative in each of the following.

a) In epidemiology, logit function of probability  $\pi$  is given by

- |                           |                             |
|---------------------------|-----------------------------|
| i) $\ln [(1 - \pi)/\pi]$  | ii) $\ln [\pi / (1 - \pi)]$ |
| iii) $\ln[\pi (1 - \pi)]$ | iv) $\ln [\pi / (1 + \pi)]$ |

b) The relative risk of an event is always

- i) Positive
- ii) Zero
- iii) Negative
- iv) A number between zero and one

c) The logistic growth graph is called sigmoidal because it is shaped like letter:

- |        |              |
|--------|--------------|
| i) V   | ii) Z        |
| iii) S | iv) $\sigma$ |

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

- a) Correlation does not imply causation.
- b) Humans are used in preclinical trials.

P.T.O.

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

- a) Explain Mc Nemar's test for testing the hypothesis for symmetry of 2X2 contingency table with help of an illustration.
- b) Explain in brief the discoveries in epidemiology made by the following:
  - i) Penicillin
  - ii) Asthma
- c) Derive the equation for sigmoidal growth.

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

- a) Write a short note on 'Parallel design' used in clinical trails.
- b) Define the following terms:
  - i)  $\pm 20\%$  rule for assessment of bioequivalence
  - ii) Washout time
  - iii) Role of FDA
  - iv) Efficacy of drug.
  - v) Relative risk
- c) Write a short note on 'Bioavailability'?

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

- a)
  - i) Explain in brief Phase IV study in clinical trails. **[5]**
  - ii) Explain the role of blinding in clinical trials. **[5]**
- b) i) Consider the following data on vision grades of two eyes of 7477 women factory workers. Grade 1 represent normal vision and Grade 4 is the weakest vision. Using Bowker test, test whether there is any relation between the grade of left eye and right eye. Use 5% level of significance. **[5]**

Vision grades of eyes of women workers.

|           |      |      |      |     |
|-----------|------|------|------|-----|
| Right eye | 1    | 2    | 3    | 4   |
| Left eye  |      |      |      |     |
| 1         | 1520 | 266  | 124  | 66  |
| 2         | 234  | 1512 | 432  | 78  |
| 3         | 117  | 362  | 1772 | 205 |
| 4         | 36   | 82   | 179  | 492 |

- ii) Define survival function and write down interpretation of  $S(x)$ . Also, state the properties of  $S(x)$ . **[5]**

Total No. of Questions: 5]

SEAT No. :

PA-2415

[5901]-574

[Total No. of Pages : 2

T.Y.B.Sc.

GEOGRAPHY

GG 361 : Regional Geography of India-II  
(2019 CBCS Pattern) (Semester-VI) (36181)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.No. 1 is Compulsory.
- 2) Solve any Three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any Five of the following:

[5]

- a) What is zero population growth?
- b) Define the concept of settlement pattern.
- c) Which are the four varieties of coal?
- d) Write the names of any two what producing states in India.
- e) Which are the chief centres producing automobiles?
- f) State classification of roadways in India.

Q2) a) Describe the population growth in India.

[6]

OR

Describe the patterns of rural settlements.

b) Write in brief on importance of roadways in India.

[4]

Q3) a) Describe the distribution and Production of bauxite in India.

[6]

OR

Describe the distribution and Production of hydroelectricity in India.

b) Write in brief on means of communication in India.

[4]

P.T.O.

**Q4)** a) Explain the major types of agriculture. [6]

OR

Explain the distribution of cotton textile industries in India.

b) Write in short on air transport. [4]

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

- a) Population distribution in India
- b) Compact Settlements
- c) Iron ore production
- d) Coal distribution in India
- e) Automobile industries in India
- f) Importance of road transportation



Total No. of Questions : 5]

SEAT No. :

**PA-2416**

[Total No. of Pages : 2

[5901]-575

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

**GEOGRAPHY**

**GG 362 : Geography of Economic Activities - II**

**(CBCS 2019 Pattern) (Semester - VI) (36182)**

*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) Name any two iron ore producing state in India.
- b) Name any two copper Producing countries in the world.
- c) Write two advantages of industrial fishing.
- d) Write two advantages of plantation Agriculture.
- e) What is Hematite?
- f) Write two characteristics of technological industries in India.

**Q2) a) Describe the characteristics of commercial Grain farming. [6]**

OR

Explain the global distribution of Iron ore.

b) Explain the major types of Iron ore. [4]

**Q3) a) Discuss about silicon vally or USA. [6]**

OR

Discuss major IT parks in India.

b) Explain the factors of auto mobile industries development in India. [4]

**Q4) a) Explain the web-based economic activities. [6]**

OR

Explain the use of G.I.S. in economic activities.

b) Discuss the use of web based platform in tourism. [4]

**P.T.O.**

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

**[10]**

- a) Types of agriculture.
- b) Manufacturing based economic activities.
- c) Technology based economic activities.
- d) E-Commerce platforms.
- e) Use of web-based platform in transportation sector.
- f) Distribution of plantation Agriculture.



Total No. of Questions: 5]

SEAT No. :

PA-2417

[Total No. of Pages : 2

[5901]-576

T.Y.B.Sc.

GEOGRAPHY

**GG-363 : TOURISM ACTIVITIES AND MANAGEMENT  
(2019 CBCS Pattern) (Semester-VI) (36183) (Regular)**

*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 5 carry equal marks.*

**Q1)** Solve any Five of the following.

**[5]**

- a) What is MTDC?
- b) What is ITDC?
- c) What is motel?
- d) In Which state 'shimla' is located?
- e) In which state 'Jaisalmer' is located?
- f) Mention any two role of tourist guide in tourism.

**Q2)** a) Explain the tourism as an economic activities.

**[6]**

OR

Explain the importance of tourism mopping.

b) Discuss the role of MTDC.

**[4]**

**Q3)** a) Explain in detail Foreign exchange earning in tourism activities.

**[6]**

OR

Explain the employability of tourism activities.

b) Describe the role of travel agency in tourism.

**[4]**

*P.T.O*



**Q4) a) Describe the educational tour planning. [6]**

**OR**

**“Jaisalmer is the Primedestination in tourism in india” Discuss.**

**b) Describe national tourism Policy of India. [4]**

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

- a) Tourism Product
- b) Promotion of tourism
- c) Travel Agent
- d) Tour Plan
- e) Tourism management.



Total No. of Questions : 5]

SEAT No. :

**PA-2418**

[Total No. of Pages : 2

[5901]-577

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

**GEOGRAPHY**

**GG-364 : Geography of Soil - II**

**(CBCS 2019 Pattern) (Semester - VI) (36184)**

*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 humus.
- b) Mention any two features of black soil.
- c) What is organic colloids?
- d) State any two measures of soil conservation.
- e) Define laterite soil
- f) Mention any two organic matters in soil which rapidly decomposed.

**Q2)** a) Describe the decomposition of soil organic matter.

**[6]**

OR

Explain the various methods of soil conservation.

b) Write the intrazonal classification of the soil.

**[4]**

*P.T.O.*

**Q3) a) Explain the causes of soil degradation. [6]**

OR

Explain in detail about effects of soil degradation.

b) Write the features of red soil. [4]

**Q4) a) Discuss the need of soil conservation. [6]**

OR

Explain in detail about types of soil in India.

b) Write a factors affecting on soil organic matter. [4]

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

a) Types of humus formation.

b) Measures of soil degradation.

c) Alluvial soil.

d) Soil dynamics.

e) Classification of tropical soil.

f) Measures of soil conservation.



Total No. of Questions : 5]

SEAT No. :

**PA-2419**

[Total No. of Pages : 2

**[5901]-578**

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

**GEOGRAPHY**

**GG - 365 : MANAGEMENT OF MAN - MADE DISASTER**

**(CBCS 2019 Pattern) (Semester - VI) (36185)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Question 2 to 5 carry equal marks.*

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

- a) What is physical disaster?
- b) What do you understand by the term chemical disaster?
- c) Define landslides.
- d) Define nuclear hazards.
- e) Write a full form of MIC.
- f) When did the chernobyl disaster occurred?

**Q2)** a) Describe the study of Australian forest fires. **[6]**

OR

Explain the factors responsible to man-made disaster.

b) Write in brief about Industrial chemical accidents. **[4]**

**Q3)** a) Describe in brief the causes and effects of biological hazards. **[6]**

OR

Describe in detail the case study of Bhopal gas tragedy.

b) Discuss causes and effects of main induced landslides. **[4]**

**P.T.O.**

**Q4) a) Discuss the classification of man-made disaster. [6]**

OR

Discuss the causes, effects and managements of corona virus disease.

**b) Explain in brief about the disaster caused by locust swarms. [4]**

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

- a) Desertification
- b) Eutrophication
- c) Soil erosion
- d) Pollution
- e) Physical hazards
- f) Oil spills



Total No. of Questions : 5]

SEAT No. :

PA-2420

[Total No. of Pages : 2

[5901]-579

T.Y.B.Sc.

GEOGRAPHY

GG - 366 : Geoinformatics - II

(2019 CBCS Pattern) (Semester - VI) (36186)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.No. 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

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

- a) Define remote sensing.
- b) Define electromagnetic radiation.
- c) What is scattering?
- d) Define geostationary satellites.
- e) What do you understand by the term flying height in remote sensing.
- f) Define infrared scanners.

**Q2)** a) Discuss in detail about the properties of electromagnetic waves. [6]

OR

Explain in detail the division of electromagnetic spectrum.

b) Discuss in brief about Sun Synchronous Satellites. [4]

**Q3)** a) Write about the various types of photographs obtained from remote sensing. [6]

OR

Explain in detail the concept of central perspective projection.

b) Write in brief about the passive sensor in remote sensing. [4]

P.T.O.

**Q4)** a) Describe in detail the elements of image interpretation. [6]

OR

Describe the orbital characteristics and sensor of INSAT series.

b) Discuss the aerial cameras used in remote sensing. [4]

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

a) Historical development of remote sensing.

b) LANDSAT

c) Application of remote sensing in forestry.

d) ERTS

e) IR color photos

f) Optical mechanical scanners



Total No. of Questions : 5]

SEAT No. :

**PA-2421**

[Total No. of Pages : 2

**[5901]-580**

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

**GEOGRAPHY**

**GG - 3610 : Research Methodology - II (Skill Enhancement Course)  
(CBCS 2019 Pattern) (Semester - VI) (361810)**

*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 primary data.
- b) Write any two demerits of Questionnaire Method.
- c) Write any two main aspects of a questionnaire.
- d) What is research report?
- e) Write any two characteristics of a good research.
- f) Write any two types of research report.

**Q2)** a) Describe the Questionnaire Method. **[6]**

OR

Describe the characteristics of a good questionnaire.

b) Write in brief on 'Merits of Questionnaire Method'. **[4]**

**Q3)** a) Describe various types of research report. **[6]**

OR

Differentiate between research paper and review article.

b) Write the characteristics of good research report writing in short. **[4]**

**P.T.O.**



**Q4) a)** Explain the case study method in detailed. [6]

OR

Explain the structure and organization of research report.

b) Write in short on 'Abstract'. [4]

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

- a) Sources of secondary data.
- b) Research methodology
- c) Syndicated sources
- d) Preliminary page of report
- e) Bibliography
- f) The foot notes



Total No. of Questions : 5]

SEAT No. :

**PA-2422**

[Total No. of Pages : 2

**[5901]-581**

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

**GEOGRAPHY**

**GG - 3611 : Total Station Surveying (Skill Enhancement Course)  
(CBCS 2019 Pattern) (Semester - VI) (361811)**

*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 total station.
- b) Mention the Angles measure in total station.
- c) Mention the formula of Distance measurement in total station.
- d) Mention the types of distance measurement by total station.
- e) What is height of instrument?
- f) What is prism mode in total station surveying.

**Q2)** a) Explain the functions of total station. **[6]**

OR

Describe the repetition angle measurement.

- b) Write about the setting of coordinate value for occupied point. **[4]**

**Q3)** a) Describe the applications of total station. **[6]**

OR

Explain the things which taken into grant before distance measurement by total station.

- b) Write the procedure of measurement of Agricultural form by using total station. **[4]**

*P.T.O.*

**Q4)** a) Describe the procedure of preparation of college campus map by using total station. [6]

OR

Explain the cross profile measurement process using by total station.

b) Write about offset measurement by total station. [4]

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

- a) Relationship of angle and distance in total station.
- b) Measurement of vertical Angle in total station.
- c) Atmospheric corrections in total station.
- d) Prism mode of total station.
- e) Measurements of long profile of the river using by total station.
- f) Setting height of target in total station.

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Total No. of Questions : 5]

SEAT No. :

PA-2423

[Total No. of Pages : 2

[5901]-582

T.Y.B.Sc.

MICROBIOLOGY

MB 361 : Medical Microbiology-II

(CBCS-2019 Pattern) (Semester-VI) (36191) (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) Q.2 to Q.5 carry equal marks.

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

- a) What is hemorrhagic virus?
- b) Pathogenesis of corona virus.
- c) Enlist two antimicrobial agent acting as enzyme inhibitors.
- d) What is aspergillosis?
- e) Enlist routes of administration of drugs.
- f) Enlist antigenic structures of influenza virus.

**Q2)** a) Describe the following any three [6]

- i) Mechanism of action of tetracyclin.
- ii) State primary cell line.
- iii) Penicillin binding protein.
- iv) Mode of action of metronidazole.

b) Explain the mechanism of action of acyclovir. [4]

**Q3)** a) Explain the following any three [6]

- i) Transmission of FMD.
- ii) State active efflux of drug.
- iii) State the mechanism of action of Fluoroquinolones.
- iv) Enlist methods of horizontal gene transfer.

b) Describe the life cycle of Plasmodium. [4]

P.T.O.

- Q4)** a) Discuss the following any three [6]
- i) Morphological characters of cryptococcus.
  - ii) Mode of action of rifamycin.
  - iii) Mechanism of action of anidulafungin.
  - iv) State the symptoms of Aspergillosis.
- b) Describe limiting uptake of drug with example. [4]

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

- a) Human papilloma virus.
- b) Pathogenesis of Histoplasma capsulatum.
- c) Sulfomethaxazole.
- d) Rinderpest virus,
- e) Prophylaxis & chemotherapy of Entamoeba
- f) Encephalitis.



Total No. of Questions : 5]

SEAT No. :

**PA-2424**

[Total No. of Pages : 2

**[5901]-583**

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

**MICROBIOLOGY**

**MB 362 : Immunology - II**

**(2019 Pattern) (CBCS) (Semester - VI) (Paper - II) (36192)**

*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 interleukin with example.
- b) Write name of the class of antibody produced in primary response.
- c) What is systemic anaphylaxis?
- d) Autoantibodies against \_\_\_\_\_ are produced in Myasthenia gravis.
- e) Define hypersensitivity with example.
- f) Microorganism frequently causing infections in CVID is \_\_\_\_\_.

**Q2) a) Describe the following (any three)** **[6]**

- i) Affinity maturation.
- ii) ADCC.
- iii) Contact dermatitis.
- iv) Any two factors contributing autoimmunity.

b) Significance of humoral immune response. **[4]**

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

- Q3) a)** Answer the following any three **[6]**
- i) Explain secondary immune response.
  - ii) Explain any two examples of type III hypersensitivity.
  - iii) Describe central B-cell tolerance.
  - iv) Write name of four drugs used for immunosuppression.
- b) Explain biological functions of cytokines. **[4]**

- Q4) a)** Explain the following any three : **[6]**
- i) Role of cytokines in B-cell activation.
  - ii) Delayed hypersensitivity.
  - iii) Rheumatoid arthritis.
  - iv) Acquired immunodeficiency with one example.
- b) Explain processing and presentation of exogenous antigen. **[4]**

- Q5) Write short note on the following any four **[10]****
- a) Mechanism of CTL - cytotoxicity.
  - b) Immune response against tumor.
  - c) Mechanism of type II hypersensitivity.
  - d) Polyclonal B-cell activation.
  - e) Congenital immunodeficiency.
  - f) Mediators involved in type I hypersensitivity.

**x      x      x**

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2425**

**[5901]-584**

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

**MICROBIOLOGY**

**MB-363 : Metabolism**

**(2019 CBCS Pattern) (Semester-VI) (36193)**

*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 passive transport
- b) State first law of thermodynamics
- c) List any two inhibitors of ETC
- d) Give one example of cyanobacteria
- e) \_\_\_\_\_ produced in liver cells is converted to used in the used cycle
  - i) Glucose
  - ii) Ammonia
  - iii) Glutamate
  - iv) Pyruvate
- f) Name the multienzyme complex used in fatty acid synthesis

**Q2)** a) Attempt the following any three

**[6]**

- i) Describe Diffusion
  - ii) Explain concept of free energy
  - iii) Enlist the steps in beta oxidation of fatty acids
  - iv) What is the role of flavoproteins in ETC
- b) Define high energy compounds. Give the types with suitable examples.[4]

**P.T.O.**



- Q3) a)** Explain the following any three [6]
- i) Reaction catalysed by RUBISCO
  - ii) Entropy
  - iii) Active transport in bacteria
  - iv) Enlist steps in peptidoglycan synthesis
- b) Describe with structures starch degradation. [4]
- Q4) a)** Discuss the following any three. [6]
- i) Structure and function of ATP synthetase
  - ii) Facilitated diffusion
  - iii) Starch synthesis
  - iv) Iron oxidising bacteria
- b) Diagrammatically represent non cyclic photophosphorylation [4]
- Q5) Write short notes on any four of the following. [10]**
- a) Ionophores
  - b) Complexes in mitochondrial ETC
  - c) Second law of thermodynamics
  - d) Photosynthetic apparatus in purple bacteria
  - e) Schematically represent urea cycle
  - f) Group translocation of sugars in bacteria



Total No. of Questions : 5]

SEAT No. :

**PA-2426**

[Total No. of Pages : 2

[5901]-585

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

**MICROBIOLOGY**

**MB-364 : Molecular Biology**

**(2019 CBCS Pattern) (Semester - VI) (36194)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q.No.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Attempt any five of the following.

**[5]**

- a) State Mendel's law of dominance.
- b) What are conditional lethal mutants of bacteriophages?
- c) How is photolyase activated in light repair of damaged DNA?
- d) State the components of cosmids.
- e) Name the gel used in southern blotting.
- f) Which enzyme is used for joining whesive ended DNA fragments.

**Q2) A)** Attempt any three of the following.

**[6]**

- a) State the significance of S-Phase eukaryetic cell cycle.
  - b) State the functions of restriction endonuclease and DNA-ligase in r-DNA technology.
  - c) Define genetic complementation. State any one example of intergenic complementation.
  - d) Enlist any four properties of PBR322.
- B)** Illustrate diagrammatically the use of double linkers in r-DNA technology.[4]

**P.T.O.**

- Q3) A) Attempt any three of the following. [6]**
- a) Enlist the stages of meiosis.
  - b) State any two differences among rI, rII & rIII mutants of T<sub>4</sub> phages.
  - c) Explain the principle of northern blotting.
  - d) Describe host range mutants of T<sub>4</sub> phage.
- B) With suitable diagram, explain DNA damage by U.V. Radiation. [4]**

- Q4) A) Attempt any three of the following. [6]**
- a) What is heterokaryon? State its significance in parasexual cycle.
  - b) Enlist steps in lysogenic cycle of bacteriophages.
  - c) Explain the non-parental ditype (NPD) tetrad in Neurospora Crassa.
  - d) State permissive and non-permissive hosts of Am mutant of T<sub>4</sub> phage.
- B) Explain artificial transformation for transfer of r-DNA into bacterial host.[4]**

- Q5) Write short notes on (any 4): [10]**
- a) Use of tetrad analysis for proving crossing over at four strand stage.
  - b) Significance of cis - trans test.
  - c) DNA damage by alkylation.
  - d) Steps in r-DNA technology.
  - e) Western blotting.
  - f) Traits of pea plant considered in Mendel's experiment.



Total No. of Questions : 5]

SEAT No. :

**PA-2427**

[Total No. of Pages : 2

[5901]-586

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

**MICROBIOLOGY**

**DSEL - MB - 365 : Fermentation Technology - II**

**(CBCS 2019 Pattern) (Semester - VI) (36195)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Solve any five questions from the following.

**[5]**

- a) The fermentation occurring in absence or nearly absence of free water is called \_\_\_\_\_
- b) Enlist any two strains used for large scale production of riboflavin.
- c) Name the attenuated polio vaccine.
- d) Enlist any two microorganisms used in steroid transformation.
- e) Write use of the hop flowers in beer fermentation.
- f) Name any cell line used for production of viral vaccine.

**Q2)** a) Describe the following any three.

**[6]**

- i) Recovery of vitamin B12.
- ii) Steroid transformation.
- iii) Process parameters of glutamic acid production.
- iv) Semisynthetic penicillin.

b) Explain the three stages during streptomycin fermentation.

**[4]**

**P.T.O.**

- Q3) a)** Explain the following any three. [6]
- i) Raw materials used for biorthanol production.
  - ii) Cheese ripening.
  - iii) Wine defects.
  - iv) Malting process.
- b) With help of flow sheet explain large scale production of amylase. [4]

- Q4) a)** Discuss the following any three. [6]
- i) Steps in yoghurt production.
  - ii) Media for protease production.
  - iii) Production of probiotics with respect to production strains.
  - iv) Production of lactic acid with respect to production strains.
- b) Explain production of lysine with respect to production strain, process and recovery. [4]

- Q5) Write short notes on any four of the following. [10]**
- a) Biosurfactant.
  - b) Swiss cheese.
  - c) Tetances toxoid.
  - d) Lagering process.
  - e) Baker's yeast.
  - f) By products of ethanol fermentation.



Total No. of Questions : 5]

SEAT No. :

PA-2428

[Total No. of Pages : 2

**[5901]-587**  
**T.Y.B.Sc.**  
**MICROBIOLOGY**  
**MB - 366 : Food Microbiology**  
**(2019 CBCS Pattern) (Semester - VI) (36196)**

*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) Black rot of onion is caused by \_\_\_\_\_
- b) Spray drying is used in preservation of \_\_\_\_\_
  - i) Jams.
  - ii) Pickles.
  - iii) Ice cream.
  - iv) Milk powder.
- c) Define TDP.
- d) What are prebiotics?
- e) State the role of ISO in food industry.
- f) What are food grade preservatives?

**Q2) a) Describe the following Any three. [6]**

- i) Spoilage of fruits.
- ii) Organoleptic properties of food.
- iii) Changes in food preservation by dehydration.
- iv) Extrinsic factors of food.

b) What is tetrapak technology? Mention its advantages. [4]

*P.T.O.*

- Q3) a)** Explain the following. Any three. [6]
- i) What is effect of high temperature in food preservation?
  - ii) Contamination of salad dressings.
  - iii) Aflatoxins.
  - iv) Intermediate moisture foods.
- b) Explain the process of Dehydro freezing and dehydro canning. [4]

- Q4) a)** Discuss the following. Any three. [6]
- i) Health effects of fermented foods.
  - ii) Texture defects in foods.
  - iii) Canning.
  - iv) Relative Humidity of food.
- b) Explain the methods of pasteurization. [4]

- Q5) Write short notes on any four. [10]**
- a) Spoilage of sea food.
  - b) Safety & risk of probiotics.
  - c) Justify 'Milk is a perishable food'.
  - d) Classification of foods based on shelf life.
  - e) Role of water activity affecting growth of microorganisms.
  - f) Botulism through food.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2429**

**[5901]-588**  
**T.Y. B.Sc.**  
**MICROBIOLOGY**  
**Skill Based Elective Course**  
**MB - 3610 : Waste Management**  
**(CBCS 2019 Pattern) (Semester - VI) (361910) (Paper - III)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) Define total solids.
- b) Enlist methods of collection of waste water.
- c) Enlist microorganisms in aerobic waste water treatment.
- d) What is compost?
- e) What is biomedical waste?
- f) Define BOD.

**Q2)** a) Describe the following any three: **[6]**

- i) The need for treatment of waste water.
- ii) Significance of screen and grit chamber.
- iii) Steps involved in biogas production.
- iv) Characterization of e - waste.

b) Describe any one method for solid waste management. **[4]**

**Q3)** a) Explain the following Any three. **[6]**

- i) Working of rotating biological contractors.
- ii) Role of microorganisms in tricking filters.
- iii) Activated sludge process.
- iv) Characterization of dairy waste.

b) Describe anaerobic digestion process of waste water. **[4]**

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



- Q4)** a) Discuss the following Any three. [6]
- i) Total volatile solids
  - ii) Fluidized bed reactor
  - iii) COD
  - iv) Vermicomposting
- b) Describe the by-products of municipal solid waste treatment. [4]

- Q5)** Write short notes on any four of the following. [10]
- a) Total suspended solids
  - b) Aerated lagoons
  - c) Leachate refused derived fuel
  - d) pH and electrical conductivity of waste water
  - e) Sewarage system
  - f) Indicator microbes in waste water.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PA-2430**

**[5901]-589**  
**T.Y. B.Sc.**  
**MICROBIOLOGY**  
**MB 3611 : Nano - Biotechnology**  
**(CBCS 2019 Pattern) (Semester - VI) (361911)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) \_\_\_\_\_ is metallic nanoparticle.
- b) \_\_\_\_\_ technique is used for characterization of nanomaterials.
- c) Write any two applications of nanoparticles.
- d) Write any two examples of non-metallic nanoparticles.
- e) Write two names of micro organisms used for nanoparticle synthesis.
- f) Define nanoscale bioassemblies.

**Q2)** a) Describe the following any three: **[6]**

- i) Protein nanofibre
- ii) X-ray diffraction technique for characterization of nanoparticles.
- iii) Biosynthesis of oxide nanoparticles by microorganisms.
- iv) Peptide nanoparticles.

b) Explain use of nanomaterials in waste water treatment. **[4]**

*P.T.O.*

- Q3) a)** Explain the following any three. [6]
- i) Microbial synthesis of gold nanoparticles.
  - ii) Biomedical applications of bioassemblies.
  - iii) Use of FTIR in nano technology.
  - iv) Bio imaging of nanoparticles.

- b) Explain two applications of liposomes in detail. [4]

- Q4) a)** Discuss the following any three. [6]
- i) Non-magnetic nanoparticle synthesis by microorganisms.
  - ii) Use of UV - visible spectroscopy for characterization of nanoparticles.
  - iii) Bio synthesis of sulfide nanoparticles by microorganisms.
  - iv) Use of DLS technique for characterization of nanoparticles.

- b) Explain extracellular synthesis of nanoparticles by microorganisms. [4]

- Q5)** Write short notes on any four of the following. [10]
- a) Nano particles as antimicrobial agent
  - b) Drug delivery by nanoparticles
  - c) TEM for nanoparticles characterization
  - d) XPS technique
  - e) Nanofibres
  - f) Peptide nanoparticles



Total No. of Questions : 5]

SEAT No. :

PA-2431

[Total No. of Pages : 2

[5901]-590

**T.Y. B.Sc. (Nanoscience and Nanotechnology)**

**N.S. - 361 : POLYMER HETEROSTRUCTURE AND THEIR  
APPLICATIONS**

**(2019 Pattern) (Semester - VI) (Paper - 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) *Question 2 to 5 carry equal marks.*
- 4) *Draw neat and labelled diagram wherever necessary.*
- 5) *Figures to the right indicate full marks.*

**Q1)** Attempt any Five of the following:

**[5]**

- a) Define Heterojunction.
- b) Give any two methods for physical/chemical characterization.
- c) Define Ex.Situ polymerisation.
- d) Which process used to by preparation of Silica nanoparticles?
- e) Which treatment is used to remove residual naked metal-oxide particles?
- f) What is the pickering reagents?

**Q2) a)** Attempt any One of the following:

**[6]**

- i) Write a note on HOST-Polymer characterization.
  - ii) Explain in detail 'Ander-Son's Affinity rule'.
- b) Explain synthesis of Heterostructures by In-Situ polymerisation using metals. **[4]**

**P.T.O.**

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

- i) Application of Lasers.
- ii) State and explain p-p and n-n Heterojunction.

b) Distinguish between Ex-Situ polymerization and In-Situ polymerisation. [4]

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

- i) Give characterization of Heterostructure by Ex-Situ polymerization using metals.
- ii) Explain in detail applications of Heterostructure.

b) Define photocatalytic activity? Explain how photocatalytic activities of BiOI/TiO<sub>2</sub> Heterostructure were evaluated? [4]

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

- a) Laser.
- b) Organic Solar Cell.
- c) In-Situ polymerization.
- d) Pickering emulsion.
- e) Characterisation techniques.
- f) Transistor applications.



Total No. of Questions: 5]

SEAT No. :

PA-2432

[Total No. of Pages : 2

[5901]-591

T.Y.B.Sc (Nanoscience and Nanotechnology)

NANOSCIAND NAMOTECH

NS-362: Functional Nanomaterials

(2019 Pattern) (Semester-VI) (Paper-II) (36262) (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) Draw neat and labelled diagram wherever necessary.
- 4) Figures to the right indicates full marks.

Q1) Solve any Five of the following [5]

- a) Define Ereciton?
- b) Define nanocrystals.
- c) From which group compound of water is insouble?
- d) Which layers are generally referred as basal planes?
- e) Which solutions are used in yarn specific density.
- f) Draw the flowchart to calculate ACF?

Q2) a) Write down any one of the following. [6]

- i) Write down the synthesis of inorganic semiconductor nanoparticles and nanowires.
  - ii) Write down the synthesis of semiconductor nanocrystals in organic solvents?
- b) Write down the aqueous synthesis of semiconductor nanocrystals. [4]

Q3) a) Write down any one of the following. [6]

- i) Explain the structure of Boron-Nitride nanotubes.
  - ii) Explain the structural, Elemental and Electrical Properties of Boron-nitride nanotubes.
- b) Write down the Laser - Assisted method. [4]

P.T.O.

**Q4) a) Write down any one of the following. [6]**

- i) Write down the Nano composite fiber and their structural applications.
- ii) Explain the Nanofabric Production.

**b) Explain the Electrospinning Process. [4]**

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

- a) Write short note on LBL assembly with semiconductor nanoparticles.
- b) Write a short note on Laser.
- c) Write a short note on Ball - milling and annealing.
- d) Write down the key processing parameters.
- e) Write a short note on Nanofiber yarns Preparation.
- f) Write down the synthesis method of Boron-Nitride nanotubes.



Total No. of Questions : 5]

SEAT No. :

**PA-2433**

[Total No. of Pages : 2

**[5901]-592**

**T.Y. B.Sc. (Nano Science and Nano Technology)**

**NS - 363 : APPLICATIONS OF NANO - BIOTECHNOLOGY**

**(2019 Pattern) (Semester - VI) (Paper - III) (36263)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) What is a use of bone - Allografts.
- b) Write the size of quantum dots.
- c) Define the term elastomers.
- d) What are nano-capsules?
- e) Write the use of DNA sensors.
- f) Define Bio-sensor.

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

- i) With the help of diagram describe biological motors flagella.
- ii) Describe the use of nanotechnology in hepatitis infection.

b) Write short account on Biosensors. **[4]**

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

- i) With the help of diagram describe the bacterio-rhodospin.
- ii) What are nano-capsules? Write the uses of nano-capsules in various fields.

b) Write about carbon-nanotubes (CNT). **[4]**

**P.T.O.**



- Q4)** a) Attempt any one of the following. [6]
- i) What are Transducer? Explain optical Transducers.
  - ii) What are Biomaterials? List various uses of Biomaterial in nanotechnology.
- b) Explain Micelle formation and its use. [4]

- Q5)** Write short note on any Four of the following. [10]
- a) Self assembly.
  - b) Quantum dots.
  - c) Various applications of Gold nano particles.
  - d) Intelligent pills.
  - e) Nano - Emulsions
  - f) Nano- array.



Total No. of Questions : 5]

SEAT No. :

PA-2434

[Total No. of Pages : 2

[5901]-593

**T.Y.B.Sc. (Nanoscience and Nanaotechnology)**

**NS-364 : NANO ELECTRONICS**

**(2019 Pattern) (Semester - VI) (Paper - IV) (36264)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three question from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*
- 4) *Draw neat & labelled diagram wherever necessary.*
- 5) *Figures to the right indicate full marks.*

**Q1)** Attempt any FIVE of the following.

**[5]**

- a) State Moore's first law.
- b) Enlist the different lithography techniques.
- c) What is mean by epitaxial growth?
- d) Define opto electronic devices.
- e) Give classification of CVD techniques by physical characteristics of vapor.
- f) What is mean by photomask?

**Q2)** a) Attempt any ONE of the following.

**[6]**

- i) With neat labeled diagram explain multi-level metallization process.
  - ii) Explain evaporation & sputtering techniques for metal film.
- b) Explain atoms - up approach.

**[4]**

**P.T.O.**

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

i) State & explain any two oxidation techniques in VLSI & ULSI.

ii) Explain high-k & low-k dielectrics for ULSI.

**b)** Explain system integration limits. **[4]**

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

i) Define etching process. Also explain wet chemical etching technique.

ii) What is lithography? Explain E-beam lithography technique.

**b)** Give the applications of single electron transistors. **[4]**

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

a) Vertical MOSFETs.

b) Nanoimprint lithography.

c) Solid state diffusion.

d) Molecular electronics.

e) Staircase transport of electron

f) Stencil lithography.



Total No. of Questions : 5]

SEAT No. :

**PA-2435**

[Total No. of Pages : 2

[5901]-594

**T.Y.B.Sc. (Nano Science and Nanotechnology)**

**NS-365 : ENERGY STORAGE DEVICES AND APPLICATIONS**

**(2019 Pattern) (Semester - VI) (Paper - V) (36265)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question No.1 is compulsory.*
- 2) *Solve the any three questions from Q.2 to Q.5.*
- 3) *Draw neat and labelled diagrams wherever necessary.*
- 4) *Figures to the right indicates full marks.*

**Q1)** Attempt any five of the following.

**[5]**

- a) What is energy storage?
- b) Which of the energy stored in Accumulator?
- c) What is primary battery?
- d) What is separator?
- e) Define ultracapacitor?
- f) What is steam accumulator?

**Q2)** a) Attempt any one of the following.

**[6]**

- i) What is non-renewable resources? Explain its different types.
- ii) Explain the functional nanomaterials for efficient energy storage devices.

b) Explain any four need of energy storage.

**[4]**

**P.T.O.**

- Q3) a)** Attempt any one of the following. **[6]**
- i) Explain the working of battery.
  - ii) Explain types of secondary battery.
- b) Explain applications of primary battery. **[4]**

- Q4) a)** Attempt any one of the following. **[6]**
- i) Explain the properties of supercapacitor.
  - ii) Explain sensible heat storage.
- b) Explain latent heat storage. **[4]**

- Q5)** Attempt any four of the following. **[10]**
- a) Explain Electro chemical pseudocapacitor.
  - b) Explain Hybrid capacitor.
  - c) Explain Nuclear energy.
  - d) Explain Nuclear fusion.
  - e) Explain chemical energy storage.
  - f) Explain electrical energy storage.



Total No. of Questions : 5]

SEAT No. :

**PA-2436**

[Total No. of Pages : 2

**[5901]-595**

**T.Y.B.Sc. (Nanoscience and Nanotechnology)**

**NS - 366 : PHOTOCATALYSIS FOR ENVIRONMENTAL**

**POLLUTION CONTROL**

**(2019 Pattern) (Semester - VI) (Paper - VI) (36266) (Elective - II)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) State law of mass action.
- b) Define photocatalysis.
- c) What is P-type semiconductor?
- d) Explain 2nd law of photochemistry.
- e) Define Autocatalysis.
- f) Give the photophysical process in electronical excited state.

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

- i) Explain photocatalyst surface and active species.
- ii) Write short note on 'Environmental Remediation'?

b) Explain principle of light over solid'. **[4]**

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

- i) What is Adsorption Isotherm, Explain any two adsorption isotherm.
- ii) Explain transistor as an amplifire.

b) Write a note on solar spectrum analysis. **[4]**

**P.T.O.**

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

i) State and explain Inhibition.

ii) Explain properties of good photocatalyst.

b) Explain Lock and key model. [4]

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

a) Photocatalysis.

b) Catalytic Reactions.

c) Optoelectronic applicaitons.

d) Chemisorption.

e) Principle light over solid.

f) Photocatalytic applications.



Total No. of Questions : 5]

SEAT No. :

PA-2437

[Total No. of Pages : 2

[5901]-596

T.Y. B.Sc.

NANOSCIENCE & NANO TECHNOLOGY

NS - 3610 : Data Analysis and Computer Applications

(2019 CBCS Pattern) (Semester - VI) (362610)

Time : 2 Hours ]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.
- 4) Figures to the right indicate full marks.

Q1) Attempt any five of the following.

[5]

- a) Define the term 'population'.
- b) What is mean by qualitative data?
- c) Write down two types of statistics.
- d) What is Range?
- e) Which function is used in MS-Excel to find mean?
- f) Write regression model  $y$  on  $x$ .

Q2) a) Attempt any one of the following.

[6]

- i) Find measures of central tendency for following data.

|       |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|
| $X_i$ | 20  | 30  | 40  | 50  | 60  |
| $f_i$ | 100 | 150 | 110 | 120 | 130 |

- ii) Find variance and standard deviation for following data.

|       |    |    |    |    |    |    |
|-------|----|----|----|----|----|----|
| $X_i$ | 15 | 11 | 13 | 16 | 14 | 7  |
| $f_i$ | 5  | 7  | 9  | 10 | 12 | 15 |

- b) Write short note on measures of central tendency.

[4]

P.T.O.



**Q3) a)** Attempt any one of the following. [6]  
i) Write down the procedure to find Median of the frequency distribution  $(x_i, f_i)$ .

ii) Find correlation coefficient between  $x$  and  $y$  given that,  $n = 25$ ,  
 $\sum x_i = 75$ ,  $\sum y_i = 100$ ,  $\sum x_i^2 = 250$ ,  $\sum y_i^2 = 500$ , and  $\sum x_i y_i = 325$ .

b) Write short note on Regression. [4]

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

i) Explain merits and Demerits of Scatter diagram.

ii) Write short note on 'Correlation'.

b) Write procedure to find mean of Frequency distribution in MS-Excel. [4]

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

a) Write the formula for covariance between  $X$  and  $Y$ .

b) What are the types of correlation.

c) What is probability when you throw a die 10 times it will come up 'six' 4 times?

d) Suppose  $X \sim N(\mu = 5, \delta^2 = 16)$  then find probability that  $P(X > 3)$ .

e) Write the probability mass function (pmf) of binomial distribution.

f) Explain the term sample.



Total No. of Questions : 5]

SEAT No. :

**PA-2438**

[Total No. of Pages : 2

**[5901]-597**

**T.Y. B.Sc. (Nanoscience and Nanotechnology)  
NS - 3611 : RENEWABLE ENERGY AND ENERGY  
HARVESTING  
(2019 Pattern) (Semester - VI) (362611)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Draw the neat and labelled diagram wherever necessary.*
- 4) *Figure to the right indicates full marks.*

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

- a) Define Accumulator?
- b) What is energy storage?
- c) Define solar pond?
- d) Define solar distillation?
- e) Define wind?
- f) Define Hydropower?

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

- i) Explain construction and working of salt gradient solar ponds?
- ii) Explain description of a basin - type solar still.

b) Explain the principle of photovoltaic solar cell. **[4]**

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

- i) Explain construction and working of Horizontal axis wind Turbines.
- ii) Explain wind energy conversion.

b) Write down advantages and disadvantages of vertical axis wind turbines? **[4]**

**P.T.O.**

- Q4)** a) Attempt any one of the following [6]
- i) Explain open cycle ocean thermal Electric conversion system.
  - ii) Explain Hybrid cycle ocean thermal electric conversion system.

- b) Explain the mechemical equipment of hydropower plant. [4]

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

- a) Explain I-V characteristics of solar cell.
- b) What is photovoltaic effect?
- c) Define power coefficient?
- d) Explain Thwait's slot.
- e) Explain Bio-fouling.
- f) Explain power channel.



Total No. of Questions : 5]

SEAT No. :

PA-2439

[Total No. of Pages : 2

[5901]-598

T.Y. B.Sc. (Electronic Science)

EL-361 : MODERN COMMUNICATION SYSTEMS

(2019 Pattern CBCS) (Semester - VI) (Paper-I) (Regular) (36221)

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.

Q1) Attempt any FIVE of the following: [5]

- a) Define FSK.
- b) What do you mean by sampling of a signal?
- c) What is a cellular phone?
- d) What is quantization?
- e) What is geosynchronous satellite?
- f) State the function of encoder in PCM transmitter.

Q2) Attempt the following:

- a) i) State merits of ASK technique. [2]
- ii) Explain the working of satellite transponder with the help of its block diagram. [4]
- b) Describe cellular phone system with a neat block diagram. [4]

Q3) Attempt the following:

- a) i) In M-ary encoding system determine the number of necessary bits to produce 8 conditions. [2]
- ii) Explain the operation of PCM transmitter with the help of a block diagram. [4]
- b) Explain the concept of cell splitting in mobile communication. [4]

P.T.O.

**Q4)** Attempt the following:

- a) i) Why is quantization required in PCM? [2]
- ii) Distinguish between FDM and TDM systems. [4]
- b) Explain the satellite system downlink model. [4]

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

- a) What is Nyquist bandwidth? Give the relation between Nyquist bandwidth and the bit rate.
- b) Define cell and cluster in cellular phone system.
- c) Describe in brief the satellite system parameter Equivalent Noise Temperature.
- d) For a system with signal-to-noise ratio of 1000 (30dB) and a bandwidth of 2700Hz, find the shannon limit for information capacity.
- e) Compare GSM and CDMA. Write at least three points.
- f) Describe in brief the satellite system parameter Effective Isotropic Radiated Power.



Total No. of Questions : 5]

SEAT No. :

**PA-2440**

[Total No. of Pages : 2

**[5901]-599**

**T.Y. B.Sc. (Electronic Science)**

**EL - 362 : EMBEDDED SYSTEM DESIGN USING  
MICROCONTROLLERS**

**(2019 CBCS Pattern) (Semester - VI) (Paper - II) (36222) (Regular)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q. No. 1 is compulsory.*
- 2) *Attempt any 3 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 any two advantages of an embedded systems.
- b) How many ports PIC16F887 has?
- c) What is the address of Interrupt Vector in program memory of PIC 16F887?
- d) How many banks the data memory of PIC16F887 has?
- e) What do you mean by 'PINSELS = 0X00000000i.
- f) Write any two elements of automotive embedded systems.

**Q2)** Attempt the following.

- a)
  - i) Give the 32-bit format of status register of ARM. **[2]**
  - ii) Explain any one purpose of embedded system. **[4]**
- b) Write a note on washing machine. **[4]**

**Q3)** Attempt the following.

- a)
  - i) Draw interfacing diagram of Stepper Motor with PIC16F887. **[2]**
  - ii) Write PIC C program to display character 'y' on LCD. **[4]**
- b) Explain working of solid state relay. **[4]**

**P.T.O.**

**Q4)** Attempt the following.

- a) i) Write short note on general purpose register file. [2]
- ii) Write ARM C program to toggle PO.15 to PO.22 pins of ARM. [4]
- b) Explain any two elements of ARM architecture in detail. [4]

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

- a) What is an embedded system? Give any two example of it.
- b) Explain any two elements of embedded system design.
- c) Draw the interfacing diagram of 4×4 keyboard matrix with PIC 16F 887.
- d) Write AVR C program to read POPTA and load its complement to PORTD, continuously.
- e) Draw interfacing diagram of common cathode seven segment display with PIC16F 887.
- f) Write instructions used for logical AND OR operation between register and file register with example.



Total No. of Questions: 5]

SEAT No. :

PA-2441

[Total No. of Pages : 2

[5901]-600

T.Y.B.Sc

ELECTRONIC SCIENCE

EL-363 : Industrial Electronics

(CBCS 2019 Pattern) (Semester-VI) (Paper-III) (36223)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Draw the symbol of DIAC and TRIAC.
- b) State the names of parts of DC motor.
- c) What do you mean by Inverter.
- d) State the types of UPS.
- e) State the disadvantages of Electric vehicles.
- f) What do you mean by hybrid vehicle.

**Q2)** Attempt the following.

- a) i) With the help of diagram explain di/dt protection at SCR. [2]  
ii) Explain the working of DC motor with suitable diagram. [4]
- b) What do you mean by PHEV? State its advantages and disadvantages. [4]

**Q3)** Attempt the following.

- a) i) State the advantages of AC motor over DC motor. [2]  
ii) Draw the circuit diagram of Half wave controlled rectifier with Resistive load and sketch the wave forms across the load Resister and SCR for  $\alpha = 90$  degree. [4]
- b) What kind of batteries are used in electric vehicle? Draw the circuit diagram of battery charger. [4]

P.T.O



**Q4)** Attempt the following.

- a) i) What do you mean by Trickle charging? [2]
- ii) Explain the working of SCR using two transistors and draw its I-V characteristics. [4]
- b) Draw the circuit diagram of single phase cycloconverter and Explain it with neat output diagram. [4]

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

- a) Draw the construction of power BJT and I-V characteristics.
- b) What do you mean by PUT and state its applications.
- c) What do you mean by SMPS and state various schemes of SMPS.
- d) Write a short note on Induction heating.
- e) With the help of circuit diagram explain speed control of DC motor.
- f) Write a short note on AC motor and explain MMF.



Total No. of Questions : 5]

SEAT No. :

PA-2442

[Total No. of Pages : 2

[5901]-601

T.Y. B.Sc.

**ELECTRONIC SCIENCE**

**EL-364 : Manufacturing Processes for Electronics**

**(2019 Pattern) (CBCS) (Semester - VI) (Paper - IV) (36224)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1) Attempt any five of the following :**

**[5]**

- a) Define passive component.
- b) What is purpose of solder mask.
- c) What do you mean by silk mass screen.
- d) State three types of PCBS based on their layers.
- e) What is full form of SMT.
- f) Define lithography process.

**Q2) Attempt the following :**

- a) i) State different types of laminates used in PCBS. **[2]**  
ii) Explain construction of Air core inductor with diagram. **[4]**
- b) Draw symbol of step up and step down transformer. Explain two differences. **[4]**

**Q3) Attempt the following :**

- a) i) Explain MOSFET based fabrication technology. **[2]**  
ii) What is difference between single double and multilayer PCB. **[4]**
- b) Explain etching process and material used for etching in PCB manufacturing process. **[4]**

**P.T.O.**

**Q4) Attempt the following :**

- a) i) How image transferred is done while designing PCB layout. [2]
- ii) Explain MOSFET IC fabrication technology with neat diagram. [4]
- b) Explain construction of transistor and its working principle. [4]

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

- a) State the classification of capacitors based on dielectric material.
- b) Explain modern :
  - i) Platers
  - ii) Etchers
- c) Sketch and indicate importance element of multilayer PCB.
- d) List various techniques of testing of SMT assembled board.
- e) What is difference between through hole and surface mount soldering.



Total No. of Questions : 5]

SEAT No. :

PA-2443

[Total No. of Pages : 2

[5901]-602

T.Y. B.Sc.

ELECTRONIC SCIENCE

EL 365 : Process Control Systems

(2019 Pattern) (Semester - VI) (Paper-V) (CBCS) (36225)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) Define Resolution.
- b) Define Multichannel Data Acquisition System.
- c) What is discrete - state control process.
- d) What is meant by primary sensing element.
- e) Which factors are specifying the dynamic response.
- f) Define sinusoidal transfer function.

**Q2)** a) Attempt the following. **[10]**

- i) Write applications of measurement system. **[2]**
- ii) Explain derivative control mode. **[4]**
- b) Write limitations of process control. **[4]**

**Q3)** Attempt the following. **[10]**

- a) i) Explain error in control system. **[2]**
- ii) Write difference between single 4 multichannel Data Acquisition system. **[4]**
- b) What is static characteristics? Mention its type & Explain it. **[4]**

**P.T.O.**

**Q4) Attempt the following. [10]**

- a) i) What is the need for a controller. [2]
- ii) Draw block diagram of single channel data acquisition system. And write advantages of that. [4]
- b) Write applications of derivative control mode. [4]

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

- a) What is control system? Explain open loop system.
- b) State applications of measurement systems.
- c) Write advantages of process control.
- d) Why derivative controller is not used in control system.
- e) Explain errors in control system parameters.
- f) What are the advantages of proportional integral.



Total No. of Questions : 5]

SEAT No. :

PA-2444

[Total No. of Pages : 2

[5901]-603

T.Y. B.Sc. (Electronic Science) (Semester - VI)

EL- 366(A) : PLC SCADA

(2019 Pattern) (CBCS) (Paper-VI) (36226A)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Attempt any five of the following.

[5]

- a) What is full form of PLC?
- b) What does SCADA means?
- c) What is full form of DCS?
- d) What does RTU means?
- e) What is Full form of LAN?
- f) Is it justifiable "SCADA is process".

Q2) a) i) Give any two applications of PLC.

[2]

ii) Explain the role of PLC in automation.

[4]

b) Justify A/D converter and D/A converter is important in PLC.

[4]

Q3) a) i) List any two types of PLC Based on wideness of use.

[2]

ii) List any four wiring techniques use in PLC.

[4]

b) Give the list of any Eight advantages of PLC.

[4]

Q4) a) i) Give the definition of PLC.

[2]

ii) What are the four function of SCADA system.

[4]

b) Explain RTU

[4]

P.T.O.

**Q5)** Write short notes on any four of following.

**[10]**

- a) IEC60870 protocol.
- b) Block diagram of SCADA system.
- c) Input and output devices attache to PLC.
- d) SCADA Generations.
- e) Limitations of SCADA.
- f) SCADA security.



Total No. of Questions : 5]

SEAT No. :

PA-2445

[Total No. of Pages : 2

[5901]-604

T.Y. BSc. (Electronic Science)

EL - 366(B) : SENSORS AND SYSTEMS

(2019 Pattern) (Semester - VI) (CBCS)

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 Question 5 carry equal marks.

Q1) Solve any five of the following.

[5]

- a) Define the term gauge factor of strain gauge.
- b) State the law on which thermocouple working depends.
- c) What are the characteristics of instrumentation amplifier?
- d) State the name of actuator used to turn on and off Ac motor pump.
- e) Define actuator.
- f) State the importance of sensors in healthcare.

Q2) Attempt the following.

- a) i) Draw the circuit diagram of bridge amplifier using RTD and write the equation for output voltage. [2]
- ii) What is a bimetallic thermometer? State its working principle highlighting its advantages and limitations? [4]
- b) Draw the block diagram of multichannel data acquisition system and explain. [4]

Q3) Attempt the following.

- a) i) State advantages of servomotor over DC motor. [2]
- ii) How solenoid is used to control the flow? Explain it with the help of diagram. [4]
- b) Draw the block diagram of intelligent smart sensor and explain various blocks. [4]

P.T.O.



**Q4)** Attempt the following:

- a) i) State the names of power controlled devices used to control rpm of AC motor. [2]
- ii) Draw block diagram of instrumentation amplifier using 3-op-amp and derive the equation for output voltage. [4]
- b) With the help of neat diagram explain the working of DC motor. [4]

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

- a) State the formula for NTC thermistor to calculate the resistance at given temperature ( $R_T$ ) along with details.
- b) Define the term range and bandwidth of sensor.
- c) State the role of ADC and readout unit in data acquisition system.
- d) State the names of sensors used in multichannel data a acquisition system used for sensing.
  - i) Light
  - ii) Load
  - iii) Temperature
  - iv) Vibration sensor
- e) Draw the block diagram of water level controller and explain the working.
- f) Draw and explain block diagram of green house for controlling humidity, soil moisture and temperature.



Total No. of Questions : 5]

SEAT No. :

PA-2446

[Total No. of Pages : 2

[5901]-605

T.Y. B.Sc.

**ELSEC - 361 : ELECTRONIC SCIENCE**

**Design and Fabrication of PCB (362210)**

**(2019 Pattern) (CBCS) (Semester - VI) (Paper-X)**

*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 full form of SMD?
- b) What is gerber file?
- c) Mention the use of component outline.
- d) What is pad stacks?
- e) Give the purpose of heat sink.
- f) What is auto routing?

**Q2)** Attempt the following.

- a) i) Explain the meaning of schematic capture. **[2]**  
ii) Explain in short PCB track size calculation by giving the formula. **[4]**
- b) List any four advantages of PCB. **[4]**

**Q3)** Attempt the following.

- a) i) Give the definitions of a) foot print b) Vias **[2]**  
ii) Explain in short TMH technology for placing of components. **[4]**
- b) Write a short note on electrical properties of laminates. **[4]**

**Q4)** Attempt the following:

- a) i) Give the reason of majority of PCB's are green. **[2]**  
ii) Explain in short FR-4 epoxy glass material. **[4]**
- b) Explain interconnection technique in multilayer PCB. **[4]**

**P.T.O.**

**Q5)** Attempt the following. (Any four)

**[10]**

- a) Write a short note on components of PCB.
- b) Explain double sided PCB board with PTH.
- c) Explain the purpose of white PCB solder mask.
- d) Explain process of etching in short.
- e) Write in short method of drilling.
- f) Write a short note on prototype designing.
- g) What is outline in PCB?



Total No. of Questions : 5]

SEAT No. :

PA-2447

[Total No. of Pages : 2

[5901]-606

T.Y. B.Sc. (Electronic Science)

ELSEC - 362 : MOBILE APPLICATION DEVELOPMENT  
(362211) (2019 Pattern) (Semester - VI) (CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Attempt any three questions for Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

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

- a) Name the operating system which is open source, developed by Google and launches in 2008 for mobile application development.
- b) What is Android version number for Honey comb?
- c) What is the purpose to use Android Emulator?
- d) "Java and Ada language are used to develop various types of Applications in Eclipse" justify.
- e) Which Android version has release date unconfirmed at the time of writing?
- f) Which file defines the user interface for activity?

Q2) a) i) What is role of AVD? [2]

ii) Compare the android version code & android version name attributes the Android Manifest.xml file. [4]

b) What are the four layers of Android operating system. [4]

Q3) a) i) What will happen if you have two or more activities with the same intent filter action name? [2]

ii) Why we use different colors and different images as a display button while designing of mobile application? [4]

b) What is importance of Scroll view and Screen orientation while designing mobile application? [4]

P.T.O.

- Q4)** a) i) Give the names of two location based services. [2]  
ii) List any two importance of Display map in mobile Application. [4]  
b) What is role of progress Bar view? Give any two examples. [4]

**Q5)** Write short notes on any four of the following. [4×2.5=10]

- a) Mobile application Interface Designing.
- b) Features of Android OS
- c) Various Buttons.
- d) Various views.
- e) Five needs of Mobile Application.
- f) Android devices in the Market.



Total No. of Questions : 5]

SEAT No. :

PA-2448

[Total No. of Pages : 2

[5901] - 607

T.Y. B.Sc.

PSYCHOLOGY

Personality Theories

(2019 Pattern) (Semester - VI) (Paper - I) (36201)

*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)** Write the following in One or Two Sentences (Any Five) :

**[5]**

- a) Define Ego.
- b) Define Personality.
- c) What is Self Actualization?
- d) What is a trait?
- e) What is Psychoticism?
- f) What is self concept?

**Q2)** a) Explain Erikson's theory of personality.

**[6]**

OR

Explain Freud's Psychoanalytic approach of Personality.

- b) Compare Humanistic and Behavioristic approaches of personality.

**[4]**

**P.T.O.**

**Q3) a)** Discuss Kelley's personal construct theory. [6]

OR

Explain Bandura's Social Cognitive theory.

b) Discuss the role of culture specified by Allport. [4]

**Q4) a)** Explain Adler's theory of Personality. [6]

OR

Explain Jung's theory of Personality.

b) Explain the concept of Functional Equivalence in Allport's theory. [4]

**Q5) Write short notes (Any Four) :** [10]

- a) Determinants of Personality.
- b) Role of birth order on personality development.
- c) Personal dispositions.
- d) Becoming One's self.
- e) Schemata.
- f) Characteristics of good personality theory.



Total No. of Questions : 5]

SEAT No. :

PA-2449

[Total No. of Pages : 2

[5901] - 608

T.Y. B.Sc.

PSYCHOLOGY

Psychopathology - II

(2019 Pattern) (Semester - VI) (Paper - II) (36202)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

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

**Q1)** Answer the following in one or two Sentences (**Any Five**) : **[5]**

- a) What is personality disorder?
- b) What is drug dependence?
- c) State the types of communication disorder.
- d) What is Binge Eating disorder?
- e) What is Insomnia?
- f) State the types of Cluster C personality disorders.

**Q2)** a) Explain in detail ADHD, its causes and symptoms. **[6]**

OR

Explain paranoid personality disorder, Schizoid and Schizotypal personality disorders in detail.

- b) Compare Dependent and Avoidant personality disorders. **[4]**

**P.T.O.**



**Q3) a)** Explain in detail Addiction disorders. [6]

OR

Explain causes & treatment of Communication disorders.

b) Compare Anorexia Nervosa with Bulimia. [4]

**Q4) a)** Explain sleep-wake disorders with the treatment. [6]

OR

Explain Autism spectrum disorder.

b) Compare Alcohol abuse and Alcohol dependence. [4]

**Q5) Write short notes (Any Four) :** [10]

a) Psychoactive drugs.

b) Pica disorder.

c) Drug abuse.

d) Narcolepsy.

e) OCD.

f) Withdrawal symptoms.



Total No. of Questions : 5]

SEAT No. :

PA-2450

[Total No. of Pages : 2

[5901] - 609

T.Y. B.Sc.

PSYCHOLOGY

36203 : Educational Psychology

(2019 Pattern) (Semester - VI) (Paper - III)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

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

**Q1)** Answer the following in **one or two** sentences (**Any 5**) :

**[5]**

- a) What is learning?
- b) What is Cognition?
- c) Define Educational Psychology.
- d) What is observational learning?
- e) Who proposed theory of cognitive development?
- f) What is experiential learning?

**Q2)** a) Discuss in detail the nature and scope of Educational Psychology. **[6]**

OR

Discuss the importance of Behavioral perspective in learning.

- b) Justify the importance of culture in the overall development. **[4]**

**P.T.O.**

**Q3) a)** Explain the role of motivation in teaching and learning. [6]

OR

Discuss the classroom management in detail.

b) How the classroom environment can be maintained? [4]

**Q4) a)** Explain the process of language development. [6]

OR

Discuss the history of Educational Psychology.

b) Analyse the meaning of Individual differences. [4]

**Q5) Write short notes (Any Four) :** [10]

- a) Participative learning.
- b) Importance of Educational Psychology.
- c) Role of gender in development.
- d) Social development.
- e) Constructivistic view of learning.
- f) Classroom assessment.



Total No. of Questions : 5]

SEAT No. :

PA-2451

[Total No. of Pages : 2

[5901] - 610

T.Y. B.Sc.

PSYCHOLOGY

Human Resource Management

(2019 Pattern) (Semester - VI) (Paper - IV)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

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

**Q1)** Solve **Any Five** of the following :

**[5]**

- a) Name the Policies of HRM.
- b) State the types of interview.
- c) What is appraisal?
- d) What is employee training?
- e) Define remuneration.
- f) Name any two theories of employee remuneration.

**Q2)** a) Explain in detail job evaluation method.

**[6]**

OR

Describe the need of assessment Centres in employees training and development.

- b) Critically evaluate the scope of training program.

**[4]**

**P.T.O.**

**Q3) a)** Discuss the functions of HRM. [6]

OR

Explain the importance of token economy as a method of incentives.

b) Elaborate the various skills required in human resources management. [4]

**Q4) a)** Describe the various usages of training and development programs. [6]

OR

Explain the one theory of employee remuneration.

b) Analyze the employee selection & evaluation process. [4]

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

- a) Biographical information.
- b) Techniques in human resource planning.
- c) Process of training & development.
- d) Letter of recommendation.
- e) Types of Incentive.
- f) Objectives of HRM.



Total No. of Questions : 5]

SEAT No. :

PA-2452

[Total No. of Pages : 2

[5901] - 611

T.Y. B.Sc.

PSYCHOLOGY

Rehabilitation Psychology

(2019 Pattern) (Semester - VI) (Paper - V) (36205)

*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)** Solve **Any Five** of the following :

**[5]**

- a) What is a impairment?
- b) Define rehabilitation.
- c) State the stages of behavioral rehab program.
- d) What is Stigma?
- e) State the full form TA.
- f) Define Psychotherapy.

**Q2)** a) Describe the principles and assessment of rehabilitation.

**[6]**

OR

Explain the goals and objectives of rehabilitation.

b) Differentiate the individual and group Counseling.

**[4]**

**P.T.O.**

**Q3) a)** Discuss the Non-residential rehabilitation programmes. [6]

OR

Describe the assessment and evaluation of quality of life.

b) Analyze the transactional analysis approach in rehabilitation. [4]

**Q4) a)** Explain the Community based rehabilitation program. [6]

OR

Describe the role of discrimination & cultural factors in Mental illness.

b) Analyze the effectiveness of hospital based rehabilitation. [4]

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

- a) Roles of Electric.
- b) Sheltered workshop.
- c) Impact of disability on Community.
- d) Psychiatric disorder.
- e) Therapeutic Communities.
- f) Vocational training units.



Total No. of Questions : 5]

SEAT No. :

PA-2453

[Total No. of Pages : 2

**[5901]-612**  
**T.Y. B.Sc.**  
**PSYCHOLOGY**  
**Psychotherapies**  
**(2019 Pattern) (Semester - VI) (Paper - VI) (36206)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) What is Psychotherapy?
- b) State the full form of TA.
- c) Who was the founder of cognitive therapy.
- d) Define assertiveness.
- e) What is token economy?
- f) State the full form of REBI.

**Q2)** a) Describe the key concepts of transactional analysis. **[6]**

OR

Explain the key components and effectiveness of cognitive therapy.

b) Illustrate the therapeutic process. **[4]**

**Q3)** a) Explain the various types of psychotherapies. **[6]**

OR

What are the 5 precepts of vipassana? Explain the techniques of vipassana as a psychotherapy.

b) Examine the process and effects of act therapy. **[4]**

**P.T.O.**



**Q4)** a) Describe the objectives and usages of psychotherapy. [6]

OR

Explain the key elements and three steps of systematic desensitization.

b) What are the purposes of dance therapy. [4]

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

a) Application of Multimodal Psychotherapy.

b) History of mindfulness.

c) Goods of family therapy.

d) Advantages of aversive therapy.

e) Types of eastern therapy.

f) Application of psychoanalytic therapy.



Total No. of Questions : 5]

SEAT No. :

PA-2454

[Total No. of Pages : 2

**[5901]-613**  
**T.Y. B.Sc.**  
**PSYCHOLOGY**  
**SEC - I : Basic Therapeutic Skills**  
**(2019 Pattern) (Semester - VI) (362010)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) State the types of communication.
- b) State any two objectives of psychotherapy.
- c) Name the types of empathy.
- d) What is active listening?
- e) State the types of thinking.
- f) Define concreteness.

**Q2)** a) Explain the effective listening skills of therapists. **[6]**

OR

Describe the importance of critical thinking in psychotherapists.

b) What are the concerns related to the therapist client relationship? **[4]**

**Q3)** a) Explain the techniques and factors influences on psychotherapy. **[6]**

OR

Describe the importance of genuineness skill among therapists.

b) Differentiate between reflecting and paraphrasing in counseling. **[4]**

**P.T.O.**

**Q4)** a) Explain the process and components of building rapport with clients. [6]

OR

Describe the various key elements in interpretation skills of therapists.

b) Examine the challenges for setting boundaries in counseling. [4]

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

- a) Therapeutic Skills
- b) Components of empathy
- c) Clarifying questions skills
- d) Advantages of psychotherapy
- e) Communication skills
- f) Immediacy



Total No. of Questions : 5]

SEAT No. :

PA-2455

[Total No. of Pages : 2

**[5901]-614**  
**T.Y. B.Sc.**  
**PSYCHOLOGY**  
**SEC - II : Soft Skills**  
**(2019 Pattern) (Semester - VI) (362011)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) Define Soft Skills.
- b) Define etiquettes.
- c) Define hard skills.
- d) Define manner.
- e) What is Communication?
- f) Define goal setting.

**Q2)** a) Explain the types of soft & hard skills. **[6]**

OR

Describe the various advantages and benefits of active listening.

b) Critically evaluate the formal communication process. **[4]**

**Q3)** a) How the success is affected by soft skills. **[6]**

OR

Describe the steps in successful time management.

b) Elaborate the social setting etiquettes. **[4]**

**P.T.O.**

**Q4)** a) Differentiate between telephone & email etiquettes. [6]

OR

Explain the role of body language in building interpersonal relationship.

b) Explore the process of goal setting. [4]

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

- a) Manners
- b) Nature of soft skills
- c) Benefits of career planning
- d) Office etiquettes
- e) Difficulties in time management
- f) Use of technology in communication



Total No. of Questions : 5]

SEAT No. :

PA-2456

[Total No. of Pages : 2

**[5901]-615**  
**T.Y. B.Sc. (Regular)**  
**ENVIRONMENTAL SCIENCE**  
**EVS - 361 : Aquatic Ecosystem and Management**  
**(2019 Pattern) (Semester - VI) (Paper - 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) *Question 2 to 5 carry equal marks.*

**Q1)** Solve **any FIVE** of the following :

**[5 × 1 = 5]**

- a) Define the term : Aquatic Ecosystem Management.
- b) Enlist Ramsar sites of India.
- c) Define : Limiting Factor. And write few examples of it.
- d) Differentiate between Species and Ecosystem biodiversity.
- e) Write the meaning of sustainable management of wetlands.

**Q2)** a) Write in brief about Coral reefs and Climate change.

**[6]**

b) Explain in detail about Estuarine ecosystem.

**[4]**

**Q3)** a) Describe the zonation in Marine Ecosystem.

**[6]**

b) Justify and need to conserve wetlands.

**[4]**

**Q4)** a) Explain the ecological significance of Mangrove vegetation.

**[6]**

b) Discuss the importance of GIS technology in conservation of aquatic resources.

**[4]**

**P.T.O.**

**Q5)** Write short notes on **any FOUR** of the following :

**[10]**

- a) Negative impacts of tourism
- b) Types of communities found in Lotic water ecosystem
- c) Ecosystem services of wetlands
- d) Coral reefs and Climate change
- e) Characteristics of Ecotourism
- f) Coral bleaching



Total No. of Questions : 5]

SEAT No. :

PA-2457

[Total No. of Pages : 2

**[5901]-616**  
**T.Y. B.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**EVS - 362 : Nature CONSERVATION**  
**(2019 Pattern) (Semester - VI) (36242)**

*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 × 1 = 5]**

- a) Define Nature conservation.
- b) What is mean by Biosphere reserve?
- c) What do you mean by wildlife sanctuaries?
- d) What are the sacred groves?
- e) What does mean by seed bank.
- f) What is mean by community reserve?

**Q2)** a) What are various objectives of Nature Conservation?

**[6]**

b) Write any four challenges in nature conservation.

**[4]**

**Q3)** a) What are the functions of CPCB?

**[6]**

b) Describe in-situ conservation.

**[4]**

**Q4)** a) Describe in detail about principles of ex-situ conservation.

**[6]**

b) Explain role of IUCN in nature conservation.

**[4]**

**P.T.O.**



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

**[10]**

- a) Explain concept of National park
- b) Cryopreservation
- c) Write short note on crocodile project
- d) Write note on MOEFCC
- e) Whaling mission-Explain in short
- f) Importance of NGO in nature conservation



Total No. of Questions : 5]

SEAT No. :

PA-2458

[Total No. of Pages : 2

[5901]-617

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 363: Air and Noise Quality

(2019 Pattern) (Semester - VI) (36243) (Paper - III)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions from 2 to 5 carries equal marks.*

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

- a) Define the term Atmosphere.
- b) Enlist causes of Global warming.
- c) Full form of AQI.
- d) Enlist any 2 control measures of Noise Pollution.
- e) Write down the effects of particulate matter on human health.
- f) Define the term Sound Pressure.

**Q2)** a) Write short note on Status of Air Pollution in India. **[6]**

b) Write short note on outdoor and Indoor Noise propagation. **[4]**

**Q3)** a) Write short note on various Air Pollution control equipments used to control particulate pollutant in Industries. **[6]**

b) Explain in detail Noise Instrumentation and Monitoring procedure. **[4]**

*P.T.O.*

**Q4)** a) Write short note on - Acid Rain. [6]

b) Explain in detail effects of Noise Pollution on human health. [4]

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

a) Noise Indices.

b) El-Nino and La-Nina phenomena.

c) Composition of Atmosphere.

d) Effect of Air pollution on plants.

e) Annoyance rating scheme.

f) Fabric filters.



Total No. of Questions : 5]

SEAT No. :

PA-2459

[Total No. of Pages : 2

[5901]-618

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS 364: Issues in Environmental Science

(2019 Pattern) (Semester - VI) (Paper - 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) *Figures to the right indicate full marks.*

**Q1)** Attempt any FIVE of the following :

**[5 × 1 = 5]**

- a) Which soil is called alkaline soil?
- b) Define the types of conservation of biodiversity.
- c) Write two types of pastoralism.
- d) Who started Appiko movement?
- e) What are the types of soil erosion.
- f) Which are the common urban pollutants.

**Q2)** Attempt the following :

- a) What are the salient features and importance of salient valley movement. **[6]**
- b) Briefly explain the reasons of energy crisis. **[4]**

*P.T.O.*

**Q3)** Attempt the following :

- a) What are the major threats of biodiversity. [6]
- b) Briefly explain the Bhopal gas tragedy. [4]

**Q4)** Attempt the following :

- a) What are reasons of desertification. Add a note on its control measures.[6]
- b) Explain the methods used for solid waste disposal. [4]

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

- a) Indoor air pollution.
- b) Ecofeminism.
- c) Biodiversity.
- d) Tehri dam conflict.
- e) Food crisis.



Total No. of Questions : 5]

SEAT No. :

PA-2460

[Total No. of Pages : 2

**[5901]-619**

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

**ENVIRONMENTAL SCIENCE**

**EVS 365: Environmental Governance EMS, EIA & ISO 14000**

**(2019 Pattern) (Semester - VI) (36245) (Paper - V)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Question No.2 to Question No.5.*
- 3) *Question No. 2 to Question No. 5 carry equal marks.*

**Q1)** Attempt any FIVE of the following :

**[5 × 1 = 5]**

- a) Define: Environmental Audit.
- b) What is ISO-14000 Series?
- c) What is the need of Environmental Policy?
- d) What is EMS?
- e) Define: Environmental Economics.
- f) Write the full form of ISO.

**Q2)** Answer the following :

- a) Define Environmental Audit. What are the types, objectives and benefits of Environmental Audit? **[6]**
- b) What are the challenges of Environmental Governance in India? **[4]**

**P.T.O.**

**Q3)** Answer the following :

- a) What is ISO 14000 family of Standards? Discuss functions of EMS. Explain benefits of ISO14001. [6]
- b) Write in short about role of Public Participation in EIA. [4]

**Q4)** Answer the following :

- a) What are the advantages and disadvantages of Life Cycle Assessment?[6]
- b) What are the requirements of Environmental Impact Assessment studies? [4]

**Q5)** Write a short note on **Any Five** of the following : [5 × 2 = 10]

- a) Stages of Environment Audit.
- b) Advantages of EIA.
- c) Importance of 'Check' in PDCA cycle.
- d) Different methods of Data Collection.
- e) Two drinking water quality standards in India.
- f) Elements of EMP.



Total No. of Questions : 5]

SEAT No. :

PA-2461

[Total No. of Pages : 2

[5901]-620

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS - 366 : Environmental Biotechnology - II

(2019 Pattern) (Semester - VI) (36248)

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 × 1 = 5]

- a) Which enzyme is used for bioremediation?
- b) Define bioaugmentation.
- c) Which plant is used for Rhizofiltration?
- d) What are Xenobiotics found in?
- e) What Kind of pH is most suitable for bioleaching?
- f) What is anaerobic digestion pH range.

Q2) Attempt the following :

[10]

- a) What are the various types of microbial remediation? [6]
- b) What biotechnology is used to treat waste materials? [4]

Q3) Attempt the following :

[10]

- a) Explain in detail plankton community as indicator of water pollution. [6]
- b) Which factors affecting on phytoremediation. [4]

P.T.O.



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

a) What makes a plant good for phytoremediation? **[6]**

b) Write any 4 applications of biosensors in environmental monitoring. **[4]**

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

a) UASB

b) E-coli

c) 4 Advantages of bioleaching

d) Xenobiotic in environment

e) Biosensor

f) Enlist the name of plants used to purify wastewater.



Total No. of Questions : 5]

SEAT No. :

**PA-2462**

[Total No. of Pages : 2

**[5901]-621**

**T.Y. B.Sc. (Environmental Science)  
EVS - 3613 : SOLID WASTE MANAGEMENT  
(2019 Pattern) (Semester - VI) (Paper - 1) (362410)**

*Time : 2 Hours ]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q.1 is compulsory.*
- 2) *All questions are compulsory.*
- 3) *Figures to the right indicate full marks.*
- 4) *Solve any three questions from Q.2 to Q.5.*
- 5) *Q2 to Q. 5 carry equal marks.*

**Q1)** Attempt any Five of the following.

**[5×1=5]**

- a) Define solid waste.
- b) What is mining of solid waste.
- c) Define Land fill disposal.
- d) Write any two unit name of primary treatment of effluent.
- e) What is 3R principle?
- f) Define RDF?

**Q2)** Attempt the following.

- a) How does sanitary land fill prevent pollution. **[6]**
- b) What are the main sources of solid waste. **[4]**

**Q3)** Attempt the following.

- a) What are the impact of solid waste on surrounding environment. **[6]**
- b) Sketch neat labelled diagramme of STP or ETP. **[4]**

**P.T.O.**

**Q4)** Attempt the following.

- a) Explain various methods used for Sludge disposal. [6]
- b) Why the solid waste management - is important in cities. [4]

**Q5)** Attempt the following short notes. [10]

- a) Incineration of solid waste
- b) Composting
- c) Vermi composting
- d) Collection methods of solid waste
- e) Bio medical waste
- f) E-waste



Total No. of Questions : 5]

SEAT No. :

**PA-2463**

[Total No. of Pages : 2

**[5901]-622**  
**T.Y. B.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**EVS - 3614 : Urban Ecosystem**  
**(2019 Pattern) (Semester - VI) (Paper - I) (362411)**

*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) *Q2 to Q. 5 carry equal marks.*
- 4) *Figures to the right indicates full marks.*

**Q1)** Attempt any FIVE of the following.

**[5×1=5]**

- a) What are the common problems of urbanization?
- b) What are the main sources of urban pollution?
- c) Give two names of green spaces.
- d) What is impact of urbanization on mid life?
- e) What is urban slum.
- f) Define green belt area.

**Q2)** Attempt the following.

- a) How pollution in urban area affect - economy? **[6]**
- b) What are the main causes of depletion of water resources? **[4]**

**Q3)** Attempt the following.

- a) What are the challenges in urban environment management? **[6]**
- b) What is urban sprawl and its impact? **[4]**

**P.T.O.**

**Q4)** Attempt the following

- a) Explain the importance of green construction material. [6]
- b) What are the challenges to rapid growth in urban areas. [4]

**Q5)** Attempt the following.

[10]

- a) Poverty and slum
- b) Green space
- c) Bio fuels
- d) Geothermal energy
- e) Aims of smart city
- f) Eco labelling



Total No. of Questions : 4]

SEAT No. :

**PA-2464**

[Total No. of Pages : 1

[5901]-623

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

**DEFENCE AND STRATEGIC STUDIES**

**DS - 601 : Armed Forces and Disaster Management**

**(2019 Pattern) (Semester - VI) (36231) (Regular)**

*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 National Security.
- b) Define Disaster.
- c) State the Meaning of Disaster Management.
- d) What is the meaning of Local Civil Administration?
- e) State the role of the Armed Forces in Rescue Operations.

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

**[10]**

- a) Disaster Management.
- b) Armed Forces.
- c) Relief Camps.

**Q3)** Attempt the following questions (any two).

**[10]**

- a) Explain the role of NDRF and Armed Forces.
- b) Explain the Conceptual framework of India's National security.
- c) State the role of civil society in Tackling security challenges on Disaster.

**Q4)** Answer in details (any one).

**[10]**

- a) Explain the role of Armed Forces in training the civil population to manage the Disasters.
- b) Explain the role of Armed Forces in training the Volunteer Organizations to manage the Disasters.



Total No. of Questions : 4]

SEAT No. :

**PA-2465**

[Total No. of Pages : 1

**[5901]-624**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS 602 : United Nation Organization - II**

**(2019 Pattern) (Semester - VI) (Regular) (36232)**

*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 UN Peacekeeping operations.
- b) Define International law.
- c) Define Collective security.
- d) State the Function of the UN.
- e) Define Arms control.

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

- a) Member state.
- b) Main Bodies
- c) UDHR

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

- a) UN Role in the International Conflicts.
- b) Role of the UN for maintaining peace.
- c) State the Future Threats in Globalization.

**Q4) Answer in details (any one) [10]**

- a) Explain the role of UN secretary.
- b) What is sustainable development.



Total No. of Questions : 4]

SEAT No. :

**PA-2466**

[Total No. of Pages : 1

**[5901]-625**

**T.Y.B.Sc. (Defence and Strategic Studies)  
DS 603 : INTERNATIONAL RELATION PART - II  
(2019 Pattern) (Semester - VI) (36233)**

*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 Realism.
- b) Define Nation State.
- c) State the Function of Nonalignment.
- d) State the meaning of International relation.
- e) State the Function of Nonalignment.

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

- a) Normative Approaches
- b) Defence
- c) Security

**Q3) Attempt of following questions (any two) [10]**

- a) Explain the Emerging Theories in International relation.
- b) Explain the role of the Economic and Social Council.
- c) Explain the Scientific Approaches in International Relations.

**Q4) Answer in details (any one) [10]**

- a) Explain the Traditional Approaches in International Relations.
- b) Explain the Critical Theories of International Relations.





Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**PA-2467**

[5901]-626

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

**DEFENCE AND STRATEGIC STUDIES**

**DS 604 : Counter Terrorism**

**(2019 Pattern) (Semester - VI) (36234)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1)** Define the following questions.

**[5×1=5]**

- a) Define counter Terrorism.
- b) Define paramilitary.
- c) Define terrorism.
- d) State the role of media in counter Terrorism.
- e) State the role of law enforcement mechanisms.

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

**[10]**

- a) Counter Terrorism.
- b) International Community.
- c) Military.

**P.T.O.**

**Q3)** Attempt the following questions (any two).

**[10]**

- a) Explain the Counter Terrorism in North East India.
- b) Explain the government policy regarding counter Terrorism.
- c) State the Role of paramilitary in Counter Terrorism.

**Q4)** Answer in details (any one):

**[10]**

- a) Explain the Role of Military in Counter Terrorism.
- b) Explain the Counter Terrorism in Jammu and Kashmir.



Total No. of Questions : 4]

SEAT No. :

**PA-2468**

[Total No. of Pages : 4

[5901]-627

**T.Y.B.Sc. (Defence and Strategic Studies)**  
**DS - 606(A) : MAJOR GLOBAL CONFLICT - II**  
**(2019 Pattern) (Semester - VI) (36236A)**

*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.

**[5×1=5]**

- a) What is the issue with the US and Iran?
- b) Define Conflict.
- c) Define Global.
- d) Define Neighbors.
- e) Define Environment.

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

**[10]**

- a) Galwan Valley Conflict.
- b) Global Warming.
- c) Iran US Nuclear Deal.

**P.T.O.**

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

- a) State the Iran USA Conflict historical background.
- b) Explain the Indian role of the Indian Ocean.
- c) State the Chinese Conflict with Neighbors Power Projection.

**Q4) Answer in details (any one): [10]**

- a) Describe Role of UN in Environmental Issues.
- b) Explain the Chinese Maritime disputes with Vietnam.



Total No. of Questions : 4]

**PA-2468**

[5901]-627

**T.Y.B.Sc. (Defence and Strategic Studies )**  
**DS-606(B) : REGIONAL SECURITY SYSTEM - II**  
**(2019 Pattern) (Semester - VI) (36236B)**

*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.

**[1×5=5]**

- a) Define SCO.
- b) Define Regional Security.
- c) Define Security.
- d) How many countries are in Quad?
- e) Define BRICS.

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

**[10]**

- a) BIMSTEC
- b) SCO
- c) BRICS

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

- a) State the Origin of QUAD.
- b) State the Development of BIMSTEC.
- c) Explain the Role of BRICS.

**Q4) Answer in details (any one):** **[10]**

- a) State the Origin and Development of BIMSTEC.
- b) Explain the structure, Objectives of QUAD.



Total No. of Questions :4]

SEAT No. :

**PA-2469**

[Total No. of Pages :2

**[5901] - 628**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS-607 (A) : India's Maritime Security - II**

**(2019 Pattern) (Semester - VI) (36237A)**

*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.

**[5×1=5]**

- a) Define Maritime.
- b) Define Security.
- c) Define Defence.
- d) Define Environment.
- e) Define Naval Strategies.

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

**[10]**

- a) Maritime Security.
- b) Maritime Strategy.
- c) Indian Ocean.

**Q3)** Attempt the following questions (any two).

**[10]**

- a) Explain the Marathas Naval Strategy with special reference to Kanhoji Angre.
- b) Explain the Maritime Security Strategy under British-Indian Era.
- c) Explain the Naval Strategy of the USA.

**Q4)** Answer in details (any one)

**[10]**

- a) Describe in detail the Maritime Security Strategy under Indian Navy in 1971 war.
- b) Describe in detail the Strategic Culture of the Indian Ocean.



**P.T.O.**

Total No. of Questions :4]

**PA-2469**

**[5901] - 628**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS-607 (B) : Peace and Conflict Studies - II**

**(2019 Pattern) (Semester - VI) (36237 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. **[5×1=5]**

- a) Define conflict.
- b) Define peace.
- c) Define conflict management.
- d) How can conflict be managed successfully?
- e) Define Security.

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

- a) Goals of Peace
- b) Conflicts Management
- c) Measures of Peace Building

**Q3)** Attempt the following questions (any two) **[10]**

- a) State the meaning and concept of Peace.
- b) State the Nature and Impact of Conflict.
- c) Explain the Outcomes of Conflict.

**Q4)** Answer in details (any one) **[10]**

- a) Explain the Conceptual Analysis and nature of the study.
- b) State the U.N. System: Methods of Pacific Settlements of Disputes.





Total No. of Questions :4]

SEAT No. :

**PA-2470**

[Total No. of Pages :2

**[5901] - 629**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS-608 (A) : Indian Military History (1947-2020)**

**(2019 Pattern) (Semester - VI) (36238 A)**

*Time : 2 Hours]*

*[Max. Marks :35*

*Instructions to the candidates:*

- 1) *All question are compulsory.*
- 2) *Figures to the right indicatie full marks.*

**Q1)** Define the following questions.

**[5×1=5]**

- a) Define Military.
- b) Define History.
- c) Define Military History.
- d) Define Defence.
- e) Define Security.

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

**[10]**

- a) Indo-Pak War of 1947.
- b) India-China War of 1962.
- c) Indo-Pak War of 1965.

**Q3)** Attempt the following questions (any two)

**[10]**

- a) Explain the Effect of 1947 Indo-Pak War.
- b) Explain the Causes of 1962 India-China War.
- c) Explain the Effect of 1965 Indo-Pak War.

**Q4)** Answer in details (any one)

**[10]**

- a) Explain in detail the Effect of the 1962 war.
- b) Explain in detail the Effect of the 1971 war.



**P.T.O.**

Total No. of Questions :4]

**PA-2470**

**[5901] - 629**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS-608 (B) : British Indian Military History**

**(2019 Pattern) (Semester - VI) (36238 B)**

*Time : 2 Hours]*

*[Max. Marks :35*

*Instructions to the candidates:*

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

**Q1)** Define the following questions.

**[5×1=5]**

- a) Define History.
- b) Define Nationalism.
- c) Define Swadeshi Movements.
- d) Define Security.
- e) Define Gandhian Nationalism.

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

**[10]**

- a) The First Anglo-Maratha War (1775-1782)
- b) The Second Anglo-Maratha War (1803-1805)
- c) The Third Anglo-Maratha War (1817-1819)

**Q3)** Attempt the following questions (any two)

**[10]**

- a) Explain the Revolutionary Movements in India.
- b) Explain the Social Impact-Social and Religious reform movements.
- c) State the Impact of the rule of East India company.

**Q4)** Answer in details (any one)

**[10]**

- a) Explain in detail the Consequences of the 1857 revolt.
- b) Explain in detail the Intellectual foundations of Gandhian Nationalism.



Total No. of Questions : 4]

SEAT No. :

PA-2471

[Total No. of Pages :2

[5901]-630

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 609(A) : Cold War and Post Cold War (1945-1991)

(2019 Pattern) (Semester - VI) (36239A)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1)** Define the following questions.

**[5×1=5]**

- a) Define war.
- b) Define the Cold War.
- c) Define Post Cold War.
- d) Define Defence.
- e) Define Security.

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

**[10]**

- a) War
- b) Cold War
- c) Post Cold War

**Q3)** Attempt the following questions (any two)

**[10]**

- a) Explain the Meaning and Concept of the Cold war.
- b) Explain the Causes of the Cold War.
- c) State the Economic Impact of the Cold War.

**Q4)** Answer in details. (any one)

**[10]**

- a) Explain in detail the First Phase of the Cold War 1946-1953.
- b) Explain in detail the Third Phase of the Cold War 1963-1989.

ॐ ॐ ॐ

**P.T.O.**

Total No. of Questions : 4]

**PA-2471**

**[5901]-630**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS - 609(B) : India's Defence Policy  
(2019 Pattern) (Semester - VI) (36239B)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1)** Define the following questions.

**[5×1=5]**

- a) Define Policy
- b) Define Defence Policy
- c) Define Defence Collaboration
- d) Define Defence
- e) Define Security

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

**[10]**

- a) SAGAR
- b) Defence Collaboration
- c) Make in India

**Q3)** Attempt the following questions (any two)

**[10]**

- a) Explain the Meaning and Concept Defence Policy.
- b) Explain India's Defence Policy from 1947-1962.
- c) State the Principles of Defence Policy.

**Q4)** Answer in details (any one)

**[10]**

- a) Explain in detail India's Defence Policy from 1999 till date.
- b) Explain in detail India's Defence Policy from 1962-1999.



Total No. of Questions : 4]

SEAT No. :

**PA-2472**

[Total No. of Pages : 1

**[5901]-631**

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

**DEFENCE AND STRATEGIC STUDIES**

**DS 610 : Introduction to Cyber Security/Information Security  
(2019 Pattern) (Semester-VI) (362310)**

*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 media.
- b) Define cyber.
- c) Define information.
- d) State the concept of vulnerability.
- e) Define threat modeling.

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

- a) Security Password
- b) Cyber security
- c) Transmission media

**Q3) Attempt the following questions (any two) [10]**

- a) Explain the types of networking.
- b) Explain the meaning and concept of a secure network.
- c) Describe basic communication systems.

**Q4) Answer in details (any one) [10]**

- a) Explain in detail how to identify Cyber threats.
- b) Explain in detail Basics of threat and vulnerability.



Total No. of Questions : 4]

SEAT No. :

**PA-2473**

[Total No. of Pages : 1

**[5901]-632**

**T.Y.B.Sc. (Defence and Strategic Studies)  
DS - 611 : HUMAN RIGHTS AND INDIA  
(2019 Pattern) (Semester - VI) (362311)**

*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) Write the concept of sarvodaya.
- c) Define fundamental rights.
- d) State the role of the national human right commission.
- e) What is the protection of child rights?

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

- a) Charter of Indian Rights.
- b) National Commission for Women.
- c) National Minorities Commission.

**Q3)** Attempt of following questions (any two) **[10]**

- a) Explain the basic human rights duties.
- b) State the role of Maharashtra State human right commission.
- c) State the role of national commission for scheduled caste and scheduled tribes.

**Q4)** Answer in details (any one) **[10]**

- a) Explain the concept and meaning of Sarvodaya.
- b) Explain in detail the judicial organs of India.



Total No. of Questions : 5]

SEAT No. :

PA-2474

[Total No. of Pages : 2

[5901]-633

**T.Y.B.Sc. (Vocational)  
BIOTECHNOLOGY**

**VBT - 321 : Biotechnology in Agriculture and Environment  
(2019 Pattern) (Semester - VI) (Paper - V) (36571)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q.1 is compulsory.*
- 2) *Solve any three from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*

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

- a) Name the selective medium used for culturing Azotobacter.
- b) Define phytoremediation.
- c) What are recalcitrants?
- d) Define bioremediation.
- e) Enlist any two types of biosensors.
- f) Define biofuels.

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

- i) Give the applications of biosensors.
- ii) Describe the process of biodegradations of 2, 4-D.
- iii) What are the advantages of biopesticides?

b) Write short notes any one of the following: **[4]**

- i) Golden rice
- ii) Phosphate Solubilizers

**Q3)** Write short note an any one of the following:- **[6]**

- a) i) Phytovolatilization

OR

- ii) Process of biogas production.

b) Explain bioventing method of bioremediation in detail. **[4]**

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

- a) i) Write a short note on composting method of bioremediation.
- ii) Give the applications of phytoremediation. Name the most important micro-organism involved in production of ethand.
- iii) Define the terms - gas ahal nd bioethanal name the most important Micro-Organisam involved in production of ethanal.
- iv) Define biosensors. Explain the components of biosensors in detail.
- b) Give any three features of Rhizobium. Give the advantages of Rhizobium as biofertilizer. [4]

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

- a) Nitrogenase enzyme.
- b) Properties of an ideal biopesticide.
- c) Applications of bioremediation.
- d) Nitrogen fixation.
- e) PNP.
- f) Features of Flavrsavr tomato.





Total No. of Questions : 5]

SEAT No. :

PA-2475

[Total No. of Pages : 2

[5901]-634

T.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

VBT - 322 : Bioentrepreneurship & Biotechnology for Health  
(CBCS 2019 Pattern) (Semester - VI) (Paper - VI) (36572)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any 3 from Q.2 to Q.5
- 3) Q.2 to Q.5 carry equal marks.
- 4) Draw neat labelled diagrams wherever necessary.

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

- a) Give any two functions of IBC.
- b) Define Nanoparticles.
- c) Give any one application of Biotechnology in Healthcare.
- d) What is project formulation?
- e) Give any one criteria for new product selection.
- f) What are therapeutic Enzymes.

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

- i) Describe the advancements in the field of biotechnology in recent years.
- ii) Comment on different criterias for selection of new product or services and their role in business development.
- iii) What is the role of FDA as Government regulatory authority.

b) Answer any one. [4]

- i) Give brief introduction to Genomic medicine and give its applications.
- ii) Explain the concept of Tissue engineering in Regenerative medicine.

P.T.O.

**Q3) Answer the following questions (Any two). [6]**

- a) i) What is the role of project report and project formulation in promoting entrepreneurship?
- ii) Explain the composition and regulatory functions of IAEC?
- iii) Comment on market survey as a tool in entrepreneurship.
- b) Answer any one:- [4]
- i) What are nanobiochemical devices? Give their applications in nanomedicine.
- ii) Comment on the role of enzymes in enzyme therapy.

**Q4) Answer the following (Any two): [6]**

- a) i) Explain in detail various types of entrepreneurs.
- ii) What are the criterias put forward by various organisations in promoting Entrepreneurships.
- iii) Comment on the advancements in diagnosis in healthcare.
- b) Answer Any one:- [4]
- i) What are stemcells? Comment on their characteristics and properties.
- ii) Comment and concept and importance of entrepreneurship.

**Q5) Write short notes on (any four):- [10]**

- a) Skills and Attributes of Entrepreneur.
- b) Biosensors.
- c) Partnership Development.
- d) Personalized medicine.
- f) ICICI as funding organisation.



Total No. of Questions : 5]

SEAT No. :

**PA-2476**

[Total No. of Pages : 2

**[5901]-635**

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

**SEED TECHNOLOGY**

**ST - 3.4 : Seed Farm Management Processing & Storage  
(CBCS 2019 Pattern) (Semester - VI) (36891) (2 Credits) (Paper - V)**

*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) *Questions 2 to Q.5 carry equal marks.*

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

- a) Define seed.
- b) In-list any 2 objective of seed farm management.
- c) Define farm business.
- d) Define seed processing.
- e) Define seed treatment.
- f) Define seed storage.
- g) Define seed marketing.

**Q2) Attempt the following questions.**

- a) Give the scope & objective of seed farm management. [6]
- b) Farm Management V/S Agriculture economics. [4]

**Q3) Attempt the following questions.**

- a) Draw the layout of seed processing plant & explain it detail. [6]
- b) Compare the general farming & specialized farming. [4]

**P.T.O.**

**Q4)** Attempt the following questions.

- a) Explain the various steps in seed processing. [6]
- b) Give the basic flow pattern in seed processing plant [4]

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

- a) An Introduced the farm management.
- b) In-list types of layouts.
- c) Conditioning.
- d) In-list bagging methods.
- e) In-list storage containers.
- f) In-list the factors which are affecting the seed storages.
- g) Write a note on panogen seed treter.



Total No. of Questions : 5]

SEAT No. :

**PA-2477**

[Total No. of Pages : 2

**[5901]-636**

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

**SEED TECHNOLOGY**

**S.T - 3.5 : Biotechnology and Intellectual Property Rights  
(CBCS 2019 Pattern) (Semester - VI) (Paper - VI) (2 Credits) (36892)**

*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) *Questions 2 to 5 carry equal marks.*

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

- a) Define Biotechnology.
- b) What is Totipotency?
- c) What is plasmid?
- d) What is Patent?
- e) What is artificial seed.
- f) Define plant tissue culture.

**Q2) Attempt the following questions.**

- a) Explain Embryogenesis. [6]
- b) Give the scope of Biotechnology. [4]

**Q3) Attempt the following questions.**

- a) Explain embryo culture. [6]
- b) Give details of Plant tissue culture medium. [4]

**P.T.O.**

**Q4)** Attempt the following questions.

- a) Explain Caulogenesis. **[6]**
- b) Give the applications of plant tissue culture. **[4]**

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

- a) Sterilization technique.
- b) Application of plant tissue culture.
- c) Transgenic crop
- d) Branches of Biotechnology.
- e) Benefits of synthetic seed.
- f) Southern blotting.



Total No. of Questions : 5]

SEAT No. :

**PA-2478**

[Total No. of Pages : 2

**[5901]-637**

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

**INDUSTRIAL MICROBIOLOGY**

**IMB - 365 : Bio-Entrepreneurship and IPR**

**(CBCS 2019 Pattern) (Semester - VI) (36825) (Paper - V)**

*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) *Questions 2 to 5 carry equal marks.*

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

- a) What are two features of entrepreneur?
- b) State importance of Commerical Banks.
- c) What is meant by angel investment?
- d) State an example of entrepreneurship barrier?
- e) What is WIPO?
- f) State importance of trademarks.

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

- a) Describe process of starting start up? [6]

OR

Describe one theory of Intellectual Property Right? [6]

- b) Write note on Joint Stock Company. [4]

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

- a) Explain concept of Sole Proprietership. [6]

OR

Explain concept of financial value of Intellectual Property Rights. [6]

- b) Write note on Commerical Banks. [4]

**P.T.O.**

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

a) Discuss merits and demerits of partnership. [6]

OR

Discuss impact of patenting on intellectual property rights. [6]

b) Write note on agreement between WIPO and WTO. [4]

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

a) Role of MIDC

b) Angel Investors

c) Marketing Mix

d) Need for protection of Intellectual property

e) Function of WIPO

f) Types of Intellectual property.





Total No. of Questions : 5]

SEAT No. :

PA-2479

[Total No. of Pages : 2

[5901]-638

T.Y.B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

IMB - 366 : Recombinant DNA Technology

(CBCS 2019 Pattern) (Semester - VI) (Paper- VI) (36826)

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) Questions 2 to 5 carry equal marks.

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

- a) Diagrammatically represent-structure of deoxynucleotide triphosphate.
- b) Draw the vector map for pUC18.
- c) What is the importance of Microarray?
- d) State the recognition sequence and site for BamH1.
- e) Complete the sentence: sanger sequencing is also known as.
- f) State the importance of Reverse Transcriptase in RDT.

**Q2)** Solve the following:

- a) Elaborate the process of Blue-White Screening. [6]

OR

Describe the process of sanger sequencing. [6]

- b) Explain diagrammatically the site-directed mutagenesis. [4]

**Q3)** Solve the following:

- a) Explain the process of DNA fingerprinting. [6]

OR

Elaborate the concept of DNA polymorphism. [6]

- b) Write a note on site-directed mutagenesis. [4]

P.T.O.

**Q4)** Solve the following:

- a) Describe the impact of recombinant DNA technology on Human Genome Project. [6]

OR

Discuss the impact of DNA Sequencing in forensic science. [6]

- b) Write a note on screening of transformants using Replica plate technique. [4]

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

- a) Advances in genomics & proteomics.  
b) YAC vector.  
c) Development of Humulin  
d) Action of Restriction endonuclease.  
e) Construction of cDNA Library.  
f) Amniocentesis.



Total No. of Questions : 5]

SEAT No. :

**PA-2480**

[Total No. of Pages : 2

**[5901]-639**

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

**INDUSTRIAL MICROBIOLOGY**

**IMB - 3610 : Introduction to Bioinformatics**

**(CBCS 2019 Pattern) (Semester - VI) (368210) (Paper -V)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) Write the full form of BLAST.
- b) Give an example of a search engine used in bioinformatics.
- c) What is meant by sequence alignment?
- d) State an example of a Genomic database.
- e) What is meant by phylogenetic tree?
- f) What are homologous DNA Sequences?

**Q2)** Solve the following:

- a) Describe the types and importance of sequence alignment. **[6]**

OR

Describe different types of database used bioinformatics.

- b) Write a short note on NCBI. **[4]**

**Q3)** Solve the following:

- a) Explain different applications of Bioinformatics. **[6]**

OR

Explain the process of phylogenetic tree building.

- b) Enlist and describe different data submission tools. **[4]**

**P.T.O.**

**Q4)** Solve the following:

- a) Discuss impact of bioinformatics in modern science. [6]

OR

Discuss role of bioinformatics in culture dependent approach.

- b) Write short note on scanning matrices for alignment. [4]

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

- a) Pair-wise sequence alignment.
- b) Gene Bank
- c) Multiple sequence alignment
- d) Bioinformatics
- f) Tools for aligning DNA sequences.
- g) Structure databases.



Total No. of Questions : 5]

SEAT No. :

**PA-2481**

[Total No. of Pages : 2

**[5901]-640**

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

**ELECTRONIC EQUIPMENT MAINTENANCE**

**VOC - EEM - 365 : Entrepreneurship Development**

**(CBCS 2019 Pattern) (Semester - VI) (Paper - V) (36811)**

*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 questions 5 carry equal marks.*

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

- a) What is 'Value added tax'?
- b) What is cash flow?
- c) Define the term marketing.
- d) Define the small scale industry.
- e) What is mean by fixed capital?
- f) Define the term "Entrepreneur".

**Q2)** Solve the following:

- a) i) State any four types of entrepreneur. **[2]**  
ii) Explain advantages and disadvantages of joint stock company. **[4]**
- b) Explain the term market segmentation. **[4]**

**Q3)** Solve the following:

- a) i) State first four sequential stages of project formulation. **[2]**  
ii) Discuss payment of wages act. **[4]**
- b) Discuss SWOT analysis. **[4]**

**P.T.O.**

**Q4)** Solve the following:

- a) i) “Innovation is a special tool for entrepreneur”. Comment. [2]
- ii) Explain marketing mix in detail. [4]
- b) Explain the meaning of technical feasibility of a project. [4]

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

- a) Write a short note on angel finance and venture capital.
- b) Explain Breakeven point analysis.
- c) Discuss the functions of District Industry Centre (DIC)
- d) Explain the characteristics of entrepreneur.
- f) Discuss the functions of Human Resource Management in Industry.
- g) Discuss Digital Marketing.



Total No. of Questions : 5]

SEAT No. :

PA-2482

[Total No. of Pages : 2

[5901]-641

T.Y.B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE

VOC - EEM - 366 : Medical Instrumentation

(CBCS 2019 Pattern) (Semester - VI) (Paper - VI) (36812)

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 figures wherever necessary.
- 5) Figures to the right indicate full marks.

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

- a) Give the full form of ECG.
- b) Give the full form of CNS.
- c) What is offset potential.
- d) What is the nature of bioelectric potential.
- e) What is systolic blood pressure?
- f) What acts as a communication network of human body system?

**Q2)** Attempt the following.

- a) Explain in detail the different types of biomedical signals with their sources. [6]

OR

Explain the different types of recorders used in writing systems. [6]

- b) Explain in detail the basic electronic recording system. [4]

**Q3)** Attempt the following.

- a) Explain flame photometer. [6]

OR

What are leakage currents and the type of leakage currents. [6]

- b) Explain the features of alpha and beta waves. [4]

P.T.O.

**Q4)** Attempt the following:

- a) Explain skin contact impedance. [6]

OR

Explain the block diagram of biomedical instrumentation system. [6]

- b) Describe in brief the peripheral nervous system. [4]

**Q5)** Attempt/ Answer in short (Any 4) [10]

- a) State four components of reflex arc.  
b) What are contact potentials.  
c) Explain the types of ECG waveforms.  
d) Write a short note on colorimeter.  
e) Discuss blood cell counter.





Total No. of Questions : 4]

SEAT No. :

PA-3594

[Total No. of Pages : 2

[5901]-701

T.Y. B.Sc.

ELECTRONIC SCIENCE

**EL - 334 : Principles of Semiconductor Devices (Paper - IV)  
(2013 Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All the questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*

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

- a) What is photoelectric effect? [1]
- b) What is rectifying contact? [1]
- c) Define emitter injection efficiency. [1]
- d) What do you mean by 'depletion-mode' transistor? [1]
- e) What will be miller indices for the plane intercepts at (2a, 3b, c). [2]
- f) Draw the energy-band diagram of Insulator, Semiconductor and metal. [2]
- g) What is zener-effect? Show its I-V characteristics curve. [2]
- h) "FET is unipolar device". Comment. [2]

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

- a) Explain SC, BCC and FCC cubic lattices. [4]
- b) What are the basic construction considerations of BJT to avoid recombination in base region? [4]
- c) Discuss the process of development of space charge region. [4]

**P.T.O.**

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

- a) Explain direct and Indirect types of semiconductor. [4]
- b) Explain Avalanche Breakdown Mechanism. [4]
- c) Draw and explain basic MOS capacitor structure. [4]

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

- a) State different types of luminescence. Explain any two in detail. [6]
- b) Draw and explain the coupled-diode model in bipolar junction transistor. [6]
- c) Explain electrical equivalent circuit of MOSFET with suitable diagram. [6]

OR

Attempt all of the following :

- a) Explain the working of Reverse biased P-N junction with neat diagram. [4]
- b) Write a note on 'Switching Cycle' in common emitter configuration transistor. [4]
- c) Explain the different working modes in JFET. [4]



Total No. of Questions : 4]

SEAT No. :

PA-3598

[Total No. of Pages : 3

[5901]-702

T.Y. B.Sc (Principal)

STATISTICS (Paper - IV)

ST - 345 (A) : Reliability and Survival Analysis

(2013 Pattern) (Semester - IV) (CBCS) (917A4)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of statistical tables and calculator is allowed.
- 4) Symbols and abbreviations have their usual meaning.

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

- A) Choose the correct alternative in each of the following: [1 each]
- i) In random censoring the number of uncensored observations and time for which study last are,
    - a) both are not random variable
    - b) both are random variable
    - c) number of complete observations is a random variable but not time for which study last
    - d) number of complete observations is not a random variable but time for which study last is a random variable
  - ii) A structure function  $\phi(\cdot)$  is increasing in each argument and has atleast one relevant component then,
    - a)  $\phi(\underline{0}) = 0$  and  $\phi(\underline{1}) = 1$
    - b)  $\phi(\underline{0}) = 0$  and  $\phi(\underline{1}) = 0$
    - c)  $\phi(\underline{0}) = 1$  and  $\phi(\underline{1}) = 1$
    - d)  $\phi(\underline{0}) = 1$  and  $\phi(\underline{1}) = 0$

P.T.O.

- iii) For k-out-of-n system, the number of minimal path sets and minimal cut sets are,
- $k, n$
  - $n, n$
  - $2^n, k - 1$
  - $n - 1, k$
- iv) Gamma distribution is the member of DFR class when,
- shape parameter  $> 1$
  - shape parameter  $< 1$
  - shape parameter  $= 1$
  - scale parameter  $= 1$
- B) In each of the following cases state whether the given statement is true or false : **[1 each]**
- The each component in the system and its indicator function constitute a module.
  - Exponential distribution does not satisfy the Cauchy functional equation.
- C) Define the following terms : **[1 each]**
- Coherent structure function.
  - Hazard rate.
- D) Attempt each of the following : **[1 each]**
- Find minimal path sets for series system of three components.
  - State failure rate of Lehmann family of life distribution. Hence, discuss its class of life distribution.

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

- Prove that, a lifetime distribution  $F$  is in IFRA iff,  $\bar{F}(\alpha t) \geq \bar{F}(t)^\alpha, 0 < \alpha < 1$  and  $t \geq 0$ .
- For a system having structure function,  $\phi(x) = x_1(x_2 \prod x_3)$ , find the structural importance of each component in the system.

- c) A system consists of four independent components. System functions when both first and fourth component functions or at least one of remaining two components functions. Draw reliability block diagram of this system and hence find its reliability function of the system.

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

- a) Show that, if a lifetime distribution  $F$  belongs to Decreasing Failure Rate (DFR) class of lifetime distributions then it belongs to Increasing Mean Residual Life (IMRL) class of lifetime distributions i.e.,  $DFR \Rightarrow IMRL$ .
- b) Define dual of a structure function. Show that dual of a series system of  $n$  independent components is a parallel system of  $n$  independent components.
- c) Explain in brief the Kaplan-Meier as a non parametric estimator of survival function.

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

- a) i) Write a note on bathtub failure rate. [4]  
 ii) Consider the coherent system with structure function,  $\phi(x) = x_1 x_2 \prod x_2 x_3 \prod x_1 x_3$ . Find reliability function of this system using minimal cut sets given that components are independent and identically distributed Bernoulli random variables each with reliability  $p$ . [6]
- b) i) With usual notations prove that,

$$\bar{F}(t) = \frac{r_H(t)}{r_H(0)} \exp\left\{-\int_0^t r_H(x) dx\right\}$$

Where  $r_H(t)$  be the failure rate function associated with equilibrium distribution function  $H_F(t)$ . [8]

- ii) Find reliability function of  $k$ -out-of- $n$ :G system. [2]



Total No. of Questions : 4]

SEAT No. :

PA-3599

[Total No. of Pages :2

[5901]-703

T.Y. B.Sc.

ZOOLOGY

**ZY - 331 : ANIMAL SYSTEMATICS & DIVERSITY - V**  
**(2013 Pattern) (Semester - III) (Paper - I) (91513)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates :*

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

**Q1)** Attempt the following:

**[10]**

- a) State the biological name of garden lizard.
- b) What is umbilicus?
- c) What is dextral shell?
- d) What is flagella?
- e) Explain the homodont condition of teeth.
- f) What is leuconoid canal system?
- g) Explain pronephros kidney.
- h) Explain columella.
- i) Explain medusa form in Coelenterata
- j) Give the function of radula in Pila.

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

**[10]**

- a) Osphradium in Pila.
- b) Sketch & label heart of calotes.
- c) Describe brain of frog.

*P.T.O.*

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

**[10]**

- a) Types of sperms in Pila.
- b) Accessory respiratory organs in fishes.
- c) Spicules in sponges.

**Q4)** With the help of suitable diagram, describe heart of Pila. Add a note on course of circulation.

**[10]**

OR

With the help of suitable diagram describe central nervous system in calotes.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**PA-3600**

**[5901]-704**

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

**ZOOLOGY**

**Z.Y. - 336(B) : Cell Biology**

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

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

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

**Q1)** Attempt the following:

**[10]**

- a) Define E.Coli Cell.
- b) Define desmosome.
- c) Define phagocytosis.
- d) Define Gz phase.
- e) Define apoptosis.
- f) What is sarcoma?
- g) Define gap junction.
- h) Define ribosome.
- i) What is micro filaments?
- j) What is Lecithins?

**P.T.O.**



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

**[2×5=10]**

- a) Explain Lipid-bilayer model of plasma membrane.
- b) Describe animal cell.
- c) Explain Golgi Complex.

**Q3)** Write short note's on any two of the following:

**[10]**

- a) Passive transport.
- b) Cell ageing.
- c) Somatic mutation theory.

**Q4)** Describe Prophase I of Meiosis, Add a note on Significances of Meiosis.[10]

OR

Describe the structure and function's of E.R. and Lysosomes.



Total No. of Questions : 4]

SEAT No. :

PA-3612

[Total No. of Pages : 2

[5901]-705

T.Y. B.Sc.

ZOOLOGY

**ZY - 346(A) : PUBLIC HEALTH & HYGIENE (915A4)  
(2013 Pattern) (Semester - IV) (Paper - VI) (Elective - II)**

*Time : 2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates :*

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

**Q1) Attempt the following:**

**[10]**

- a) Define health.
- b) Any two methods of food preservation.
- c) Enlist any two natural means of ventilation.
- d) Name the disease caused due to the deficiency of Vit.A.
- e) Name any two methods of purification of water.
- f) What is Refuse?
- g) Define condiments.
- h) State any two emergencies in home.
- i) What is causative agents of Measles?
- j) What is occupational disease?

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

**[10]**

- a) Write the symptoms of the tuberculosis.
- b) Give an account of alcoholic beverages.
- c) Give an account soil borne diseases.

*P.T.O.*

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

**[10]**

- a) Mental hygiene.
- b) Non communicable diseases.
- c) Sanitation.

**Q4) Explain the signs, symptoms, mode of transmission and control measures of Influenza.**

**[10]**

OR

What is sewage? Describe in detail the process of sewage disposal.

