

Total No. of Questions : 4]

SEAT No. :

P4980

[Total No. of Pages : 3

[5822]-701

T.Y. B.Sc.

MATHEMATICS

DSE - 4A : MT 361 : Complex Analysis

(CBCS) (2019 Pattern) (Semester - VI) (36111)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Attempt any FIVE of the following :

[5 × 1 = 5]

- a) Is $f(z) = z$ an analytic function? Justify.
- b) Find the principal value of $(i)^i$.
- c) State Cauchy Riemann equations in polar form.
- d) Find the residue at $z = 0$ of the function

$$f(z) = \frac{1}{z(z+1)}$$

- e) Show that $z(t) = e^{it}$, $t \in [0, \Pi]$ is a smooth arc.
- f) Evaluate $\int_C e^z dz$, where C is the unit circle $|z| = 1$.
- g) Find the Taylor series of $\frac{1}{1+z}$, when $|z| < 1$.

Q2) A) Attempt any ONE of the following :

[5]

- i) If a function $f(z) = u(x,y) + i v(x,y)$ is analytic in a domain D then show that v is harmonic conjugate of u in D.
- ii) If a function $f(z)$ is continuous and nonzero at a point z_0 , then show that $f(z) \neq 0$ throughout some neighborhood of that point.

P.T.O.

B) Attempt any ONE of the following : [5]

i) Show that

a) $\log e = 1 + 2n\pi i$ ($n = 0, \pm 1, \pm 2, \pm 3, \dots$)

b) $\log i = \left(2n + \frac{1}{2}\right)\pi i$ ($n = 0, \pm 1, \pm 2, \pm 3, \dots$)

ii) Find all roots of the equation $\sin z = \cos h4$ by equating real and imaginary parts of $\sin z$ and $\cos h4$.

Q3) A) Attempt any ONE of the following. [5]

i) Suppose that a function f is analytic inside and on a positively oriented circle C_R , centred at Z_0 and with radius R . If M_R denoter the maximum value of $|f(z)|$ on C_R , then prove that

$$|f^n(z_0)| \leq \frac{n!M_R}{R^n} \quad (n = 1, 2, 3, \dots)$$

ii) If f is analytic function at a point, then prove that its derivatives of all orders are also analytic functions at that point.

B) Attempt any ONE of the following. [5]

i) Evaluate $\int_c f(z) dz$, where $f(z)$ is defined by means of the equation

$$f(z) = \begin{cases} 1, & \text{when } y < 0 \\ 4y, & \text{when } y > 0 \end{cases}$$

and C is the arc from $z = -1 - i$ to $z = 1 + i$ along the curve $y = x^3$.

ii) Show that, when $z \neq 0$

a) $\frac{e^z}{z^2} = \frac{1}{z^2} + \frac{1}{z} + \frac{1}{2!} + \frac{z}{3!} + \frac{z^2}{4!} + \dots$

b) $\frac{\sin(z^2)}{z^4} = \frac{1}{z^2} - \frac{z^2}{3!} + \frac{z^6}{5!} - \frac{z^{10}}{7!} + \dots$

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

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

- ii) If $f(z)$ is piecewise continuous function on a contour C , then prove

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

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

B) Attempt any ONE of the following : [5]

- i) Evaluate the integral,

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

where, C is positively oriented circle $|z|=4$.

- ii) Give two Laurent series expansions in powers of z for the function

$$f(z) = \frac{1}{z^2(1-z)}$$

and specify the regions in which those expansions are valid.



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P4981

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[5822]-702

T.Y. B.Sc.

MATHEMATICS

DSE - 4B : MT 362 : Real Analysis - II

(2019 Pattern) (Semester - VI) (CBCS) (36112)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Attempt any FIVE of the following :

[5 × 1 = 5]

- a) If set A contains 10 elements then what will be the measures of Set A.
- b) Explain why the measure of set of rational numbers is zero.
- c) Give an example of a sequence of functions which is pointwise convergent but not uniformly convergent.
- d) Show that the improper integral $I = \int_1^{\infty} \frac{1}{x} dx$ is divergent.
- e) If $\lim_{n \rightarrow \infty} x^n = L$ ($0 \leq x < 1$) then what will be the value of L? Why?
- f) Explain minimum one difference between pointwise convergence and uniform convergence.
- g) Explain two types of improper integrals with an example.

Q2) a) Attempt any One of the following :

[5]

- i) If $f(x)$ is continuous on the closed interval $[a, b]$ and

$$F(x) = \int_a^x f(t) dt \quad (a \leq x \leq b) \text{ then show that } F'(x) = f(x) \quad (a \leq x \leq b).$$

- ii) Show that if $f(x)$ is Riemann integrable on $[a, b]$ then $|f(x)|$ is Riemann integrable on $[a, b]$.

P.T.O.

- b) Attempt any One of the following : [5]
- If A is not of measure zero, if $B \subset A$ and if B is of measure zero then prove that $A - B$ is not of measure zero.
 - Show that every countable subset of \mathbb{R} has measure zero.

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

- 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 $R [a, b]$.
- If $\sum_{k=1}^{\infty} a_k(x)$ is series of riemann integrable functions defined on $[a, b]$ which converges uniformly to $f(x)$ on $[a, b]$. Then show that

$$\int_a^b f(x)dx = \sum_{k=1}^{\infty} \int_a^b a_k(x) dx.$$

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

- Show that $\sum_{n=1}^{\infty} x^n e^{-nx}$ is uniformly convergent on $0 \leq x \leq 10$.
- 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]

- Show that the integral $I = \int_a^b \frac{1}{(x-a)^\mu} \mu$ is convergent if and only if $\mu < 1$.
- State and prove Abel's test of convergence for improper integral.

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

- Show that the improper integral $I = \int_0^1 \frac{1}{\sqrt{1-x^2}} dx$ is convergent.
- Show that the improper integral $\int_0^1 \frac{\sin(1/x)}{\sqrt{x}} dx$ is convergent.



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SEAT No. :

P4982

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[5822]-703

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

MATHEMATICS

MT363 - 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) Describe all units in the ring $R = \mathbb{Z}[i]$.
- b) Give an example to show that a factor ring of an Integral domain may have divisors of zero.
- c) Find all maximal ideal of \mathbb{Z}_8 .
- d) Show that the matrix $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is divisor of zero in $M_2(\mathbb{Z})$.
- e) Find all zero of $x^2 + 2x + 3$ in \mathbb{Z}_6 .
- f) Find the characteristic of $2\mathbb{Z}$ and \mathbb{Z}_2 .
- g) List all zero divisors in the ring \mathbb{Z}_{18} .

Q2) a) Attempt any one of the following :

[5]

- i) Prove that an element 'a' in a field F is a zero of $f(x) \in F[x]$ if and only if $(x - a)$ is factor of $f(x)$ in $F[x]$.
- ii) Let D be Euclidean domain with Euclidean norm v . If a and b are associates in D, then show that $v(a) = v(b)$.

b) Attempt any one of the following :

[5]

- i) Obtain quotient and remainder when $f(x) = x^4 - 3x^3 + 2x^2 + 4x - 1$ is divided by $g(x) = x^2 - 2x + 3$ in the ring $\mathbb{Z}_5[x]$.
- ii) Show that the mapping $\phi: \mathbb{Z}_{10} \rightarrow \mathbb{Z}_{10}$ defined by $\phi(x) = 2x \forall x \in \mathbb{Z}_{10}$ is not a ring homomorphism.

P.T.O.

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

- i) An ideal $\langle p \rangle$ in a PID is maximal if and only if p is an irreducible.
- ii) Every maximal ideal in a commutative ring R with unity is a prime ideal.

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

- i) Consider $\alpha = 7 + 2i$ and $\beta = 3 - 4i$ in $\mathbb{Z}[i]$ Find σ and ρ in $\mathbb{Z}[i]$ such that $\alpha = \beta\sigma + \rho$ with $N(\rho) < N(\beta)$.
- ii) The polynomial $x^3 + 2x^2 + 2x + 1$ can be factored into linear factor in $\mathbb{Z}_7[x]$ find this factorization.

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

- i) Show that the polynomial

$$\phi_p(x) = \frac{x^p - 1}{x - 1} = x^{p-1} + x^{p-2} + \dots + x + 1$$

is irreducible over ϕ for any prime p .

- ii) Prove that if p is prime in an Integral domain D , then p is an irreducible.

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

- i) State whether the given function v is a Euclidean norm for the given Integral domain
 - I) $v(a) = a^2$ for non zero $a \in \phi$
 - II) $v(a) = 50$ for non zero $a \in \phi$
- ii) Describe all ring homomorphism of \mathbb{Z} in to $\mathbb{Z} \times \mathbb{Z}$.



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SEAT No. :

P4983

[Total No. of Pages : 3

[5822]-704

T.Y. B.Sc.

MATHEMATICS

MT 364 : Partial Differential Equations

(2019 Pattern) (CBCS) (Semester - VI) (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) Write two sets of parametric equations for the spherical surface $x^2 + y^2 + z^2 = r^2$.
- b) What are the direction cosines of the normal to the surface $f(x(s), y(s), z(s)) = 0$ at a point $p(x, y, z)$?
- c) Eliminate the constants from the equation $z = (a + x)(b + y)$.
- d) Write the form of Lagrange's equation for n independent variables.
- e) When the linear differential operator $F(D, D')$ is said to be reducible?
- f) Using Leibnitz's theorem write r^{th} derivative of the product $e^{ax}\phi$. ($D^r(e^{ax}\phi)$).
- g) Classify the equation

$$(n-1)^2 \frac{\partial^2 z}{\partial x^2} - y^{2n} \frac{\partial^2 z}{\partial y^2} = n y^{2n-1} \frac{\partial z}{\partial y}$$

Q2) a) Attempt any one of the following :

[5]

- i) Prove that a pfaffian differential equation in two variables always possesses an integrating factor.
- ii) If \bar{x} is a vector such that $\bar{x} \cdot \text{curl } \bar{x} = 0$ and μ is an arbitrary function of x, y and z then prove that $(\mu \bar{x}) \cdot (\text{curl}(\mu \bar{x})) = 0$.

P.T.O.

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

i) Find the integral curve of the equations

$$\frac{dx}{x+z} = \frac{dy}{y} = \frac{dz}{z+y^2}$$

ii) Verify that the differential equation

$$y(y+z) dx + z(x+z) dy + y(y-x) dz = 0$$

is integrable and find its primitive

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

i) Prove that, the general solution of the Linear partial differential equation $Pp + Qq = R$ is $F(u,v) = 0$, where F is an arbitrary function and $u(x, y, z) = c_1$, $v(x, y, z) = c_2$ form a solution of the equation

$$\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$$

ii) Reduce the partial differential equation

$$Rr + Ss + Tt + f(x, y, z, p, q) = 0$$

to a canonical form.

b) Attempt any ONE of the following. [5]

i) If u is function of x, y and z which satisfies the partial differential equation

$$(y-z)\frac{\partial u}{\partial x} + (z-x)\frac{\partial u}{\partial y} + (x-y)\frac{\partial u}{\partial z} = 0$$

then show that u contains x, y and z only in combination of $x+y+z$ and $x^2+y^2+z^2$.

ii) Reduce the equation

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

to canonical form. Hence evaluate it.

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

- i) If u is the complimentary function and z_1 is a particular integral of a linear partial differential equation then prove that $u + z_1$ is general solution of the equation.
- ii) If $\beta_r D^1 + \gamma_r$ is a factor of $f(D, D')$ and $\phi_r(\xi)$ is an arbitrary function of the single variable ξ and if $\alpha_r \neq 0$ then prove that

$$u_r = e^{-\left(\frac{\gamma_r y}{\beta_r}\right)} \cdot \phi_r(\beta_r x)$$

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

- i) Verify that the partial differential equation

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

is satisfied by $z = \frac{1}{x} \phi(y-x) + \phi'(y-x)$

where ϕ is arbitrary function.

- ii) Find the particular integral of the equation

$$(D^2 - D^1) z = 2y - x^2$$



Total No. of Questions : 4]

SEAT No. :

P4984

[Total No. of Pages : 4

[5822]-705

T.Y. B.Sc.

MATHEMATICS

(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) Figure to the right indicate full marks.

Q1) Attempt any five of the following :

[5 × 1 = 5]

- a) Define the term zero sum game.
- b) What do you mean by saddle point?
- c) What are the type of failure in the replacement problem?
- d) In a game of matching coins, player A wins Rs 2 if there are two heads, nothing there are two tails and losses Rs 1 when there is one head and one tail. Determine the pay - off matrix.
- e) Draw the network diagram for the following relationship.

Event :	1	2,3	4	5	6	7
Preceded by :	Startevent	1	2,3	3	4,5	5,6
- f) Is $x = 1$, minimum point of $f(x) = x^2 - 2x$?
- g) How to represent critical path on the network.

Q2) a) Attempt any one of the following :

[5]

- i) There are 5-Jobs each of which must go through the two - machines in the order M_1, M_2 processing time are given below

Job	1	2	3	4	5
Machine M_1	5	1	9	3	10
Machine M_2	2	6	7	8	4

Determine a sequence of Job also determine idle time and total elapsed time.

P.T.O.

- ii) An electromechanical equipment has a purchase price of Rs. 7000. Its running cost per year and resale value per year given below.

Year	1	2	3	4	5	6	7
Running cost (Rs)	2000	2100	2300	2600	3000	3500	4100
Resale value (Rs)	4000	3000	2200	1600	1400	700	700

Determine at what age is its replacement due?

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

- i) A firm wishes to know when to replace their machines, whose cost price is Rs. 12,200, the scrapped value is only Rs. 200. The maintenance costs are found from experience to be as follows :

Year (n)	1	2	3	4	5	6	7	8
Maintenance Cost in Rs.	200	500	800	1200	1800	2500	3200	4800

Determine the replacement period.

- ii) Using dominance rule, find the strategies for player A and B in the following game. Also obtain the value of game.

		B			
		I	II	III	IV
A	I	19	6	7	5
	II	7	3	14	6
	III	12	8	18	4
	IV	8	7	13	-1

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

- i) Find the optimal sequence that minimize the total elapsed time (in hrs). Also determine the idle time and total elapsed time

Task	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	2	9	3	8	11

- ii) Find the maximum or minimum of the function

$$f(x) = x_1^2 + x_2^2 + x_3^2 - 4x_1 - 8x_2 - 12x_3.$$

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

i) Solve the following game by using dominance rule

	B ₁	B ₂
A ₁	9	2
A ₂	8	6
A ₃	4	4

ii) Solve the following game by graphical method

	B ₁	B ₂	B ₃
A ₁	1	3	11
A ₂	8	5	2

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

i) Draw the network diagram for the following relationship.

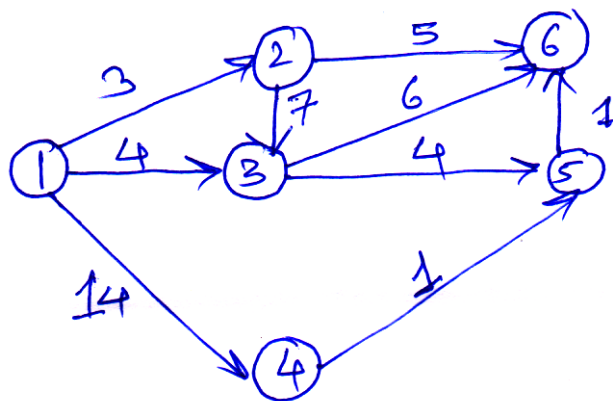
A < D, E; B, D < F; C < G; B < H; F, G < I; G < H.

ii) Examine the following function for extreme points.

$$f(x_1, x_2) = 3x_1^2 + x_2^2 - 10$$

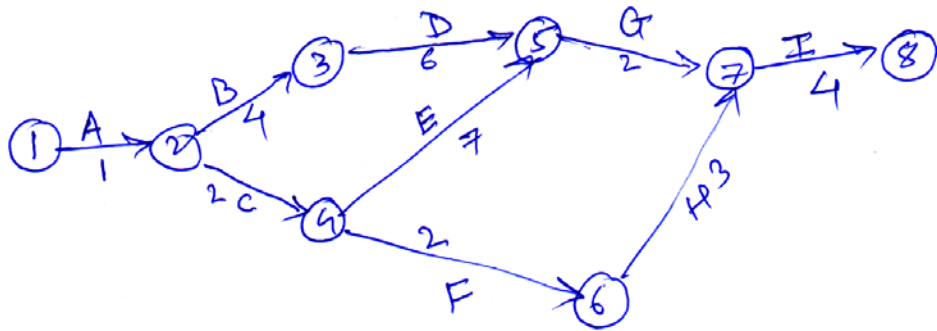
b) Attempt any one of the following : [5]

i) Determine the project completion time and critical path for the following network project.



- ii) A project is represented by the following network and time estimate are given below :

Task	A	B	C	D	E	F	G	H	I
t_o	1	2	1	3	2	3	4	6	2
t_m	2	2	3	4	3	5	5	7	4
t_p	3	3	5	5	4	7	6	8	6



Determine the critical path and project completion time.



Total No. of Questions : 4]

SEAT No. :

P4985

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[5822]-706

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) State Hamilton's equations of motion.
- b) Define generalized momenta of the system.
- c) State the principal of least action.
- d) Define canonical transformations.
- e) Define poisson brackets.
- f) State the physical significance of the Hamiltonian H.
- g) State atleast one advantage of the Lagrange's equations of motion over Newton's equations of motion.

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

- i) Show that Lagrange's equations of motion are invariant under Galilean transformation.
- ii) A particle of mass m is projected with initial velocity u at an angle α with the horizontal. Use Lagrange's equations of motion of the projectile to find the equation of the projectile.

P.T.O.

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

i) The position of a particle of mass m is given by the Cartesian co-ordinates (x, y, z) . Assuming a potential energy function

$$V = \frac{1}{2}k(x^2 + y^2 + z^2)$$

and a constraint described by the equation

$$2\dot{x} + 3\dot{y} + 4\dot{z} + 5 = 0$$

Find the differential equations of the motion.

ii) Derive the equations of motion of Atwood's machine using Lagrangian.

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

i) Show that if a given co-ordinate is cyclic in Lagrangian. Then it is also cyclic in Hamiltonian.

ii) State the Lagrangian and Hamiltonian of the system and explain physical significance of Hamiltonian of the system.

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

i) If a particle is moving in a plane under the central force and r, θ are polar co-ordinates of the position of the particle at any time t . Then using Hamilton's equations of motion. Show that

$$m\ddot{r} = \frac{mv_{\theta}^2}{r} + F(r)$$

where F is the central force and v_{θ} is linear velocity of the particle which has mass M .

ii) State the meaning of operators

$$\Delta, \delta, \nabla$$

Show that $\Delta q_j = \delta q_j + \dot{q}_j \Delta t$. for any generalized co-ordinate q_j

$$\text{Also show that } \Delta f = \delta f + \frac{df}{dt} \Delta t$$

for any function $f = f(q_j, \dot{q}_j, t)$

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

i) Show that the transformations

$$P = \frac{1}{2}(P^2 + q^2), Q = \tan^{-1}\left(\frac{q}{p}\right) \text{ are canonical.}$$

ii) Explain virtual work and D'Alembert's principle.

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

i) Derive the equations of motion of a particle whose potential energy is given by

$$V(r) = -\int f(r) dr$$

ii) Derive equations of motion of a particle moving in a plane using Hamilton's equations of motion, in terms of Cartesian co-ordinates.



Total No. of Questions : 4]

SEAT No. :

P4986

[Total No. of Pages : 3

[5822]-707

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) Explain the term Excise tax.
- b) Explain the term : states for a matrix of returns.
- c) Write the expressions for Revenue R(q) for any firm and profit function for any firm.
- d) If $q^D(p) = 70 - 4p$, find the range of values of p for which demand is inelastic.
- e) State the third principle of economics for a small efficient firm.
- f) What is meant by Arbitrage portfolio for a matrix of returns?
- g) Write down explicit formulae for the final value C(P) of an amount P invested at 5% annual interest for 10 years, if there is no annual withdrawal.

Q2) a) Attempt any one of the following :

[5]

- i) Show that the present value of an annuity of I for N years, given the fixed rate r, is

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

- ii) Prove that, at the breakeven point for an efficient small firm, the derivative of average cost is zero.

P.T.O.

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

- i) Determine whether the Cobweb model predicts stable or unstable equilibrium for the market if $q^S(p) = 0.05p - 4$, $q^D(p) = 20 - 0.1p$.
- ii) Integration Incorporated is a monopoly with cost function $C(q) = 100 + 80q - 50q^2 + 0.5q^3$ and the demand set $D = \{(q, p) / 2p + q^2 - 20q = 100\}$. Sketch the graph of the profit function for $q > 0$. Find the level of production which maximizes the firms profit, if the upper limit on its output is (I) 30 (II) 50

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

- i) Suppose that $q^S(p) = bp - q$ and $q^D(p) = c - dp$ where $a, b, c, d > 0$.

I) Show that the equilibrium price is $p^* = \frac{c+a}{b+d}$.

II) If an excise tax of T units ($T \neq 0$) is imposed, find the resulting market price and show that it is strictly less than $p^* + T$

- ii) Show that the present value of an annuity of I for N years, given the fixed rate r, is $P = \frac{I}{1+r} + \frac{I}{(1+r)^2} + \dots + \frac{I}{(1+r)^N}$

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

- i) Suppose demand set $D = \{(q, p) / q + p = 24\}$ and supply set $S = \{(q, p) / 2q + 18 = p\}$. Write down the recurrence equations which determine the sequence P_t of prices, assuming that the suppliers operate according to the Cobweb model with $p_0 = 23$. Find p_1, p_2, p_3, p_4 .
- ii) Suppose that demand set $D = \{(q, p) / q + 5p = 40\}$ and supply set $S = \{(q, p) / 2q - 15p = -20\}$. Suppose now that the government imposes tax of T per unit, show that the new equilibrium point will be $(20 - 3T, 4 + \frac{3}{5}T)$.

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

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

$$R = \begin{bmatrix} 1.05 & 0.95 \\ 1.05 & 1.05 \\ 1.37 & 1.42 \end{bmatrix}, \text{ Show that the Portfolio } Y = (500 \ 10,000 \ 1000)$$

is riskless portfolio. Find an arbitrage portfolio. Which electron might an investor prefer for portfolio $Z = (1000 \ -2000 \ 1000)$.

ii) Find startup and breakeven point for a small efficient firm with cost function $c(q) = 800 + 70q - 12q^2 + q^3$.

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

i) Suppose that Quality Widgets Limited is an efficient small firm with cost function $c(q) = q^3 - 10q^2 + 100q + 196$ and suppose also that maximum level of weekly production is $L = 10$. Show that (I) at breakeven, the derivative of average cost is Zero (II) at startup, the derivative of average variable cost is zero.

ii) Find the maximum and minimum values of the function $f(x) = x^3 - 8x^2 + 16x - 1$. On the interval $[0, 2]$



Total No. of Questions : 4]

SEAT No. :

P4988

[Total No. of Pages : 3

[5822]-709

T.Y. B.Sc.

MATHEMATICS

**DSE-6B-MT-366(B) : Computational Geometry
(2019 Pattern) (CBCS) (Semester - VI) (36116 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) Attempt any five of the following :

[5 × 1 = 5]

- a) If a square with sides 3cm is reflected through y-axis, then what is the area of transformed figure?
- b) If a line L is transformed to the line L* using a transformation matrix $[T] = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and slope of L* is $\frac{2}{3}$, find the slope of line L.
- c) Write down the transformation matrix through the yz plane.
- d) Define : Isometric projection.
- e) Write parametric equation of Bézier curve with control points B_0 , B_1 and B_2 .
- f) Write the transformation matrix required to create front view of the object.
- g) Write the parametric equation of circle $x^2 + y^2 = r^2$, $r > 0$.

P.T.O.

- Q2) a)** Attempt any one of the following : **[5]**
- i) Derive the transformation matrix for rotation about origin through an angle θ .
 - ii) Write an algorithm for reflection through the line $y = mx + k$.
- b)** Attempt any one of the following : **[5]**
- i) If an unit square $A[0, 0], B[1, 0], C[1, 1], D[0, 1]$ is transformed to $A^*[0, 0], B^*[2, 3], C^*[8, 4], D^*[6, 1]$ under the transformation matrix $[T]_{2 \times 2}$, then find $[T]$.
 - ii) Find the combined transformation matrix for following sequence of transformations :
 - a) Reflection through x-axis.
 - b) Rotation about origin through angle 270° .
 - c) Scaling in x any y co-ordinate by factors 2 and -1 units respectively.

Further apply it on point $p[3, -2]$.
- Q3) a)** Attempt any one of the following : **[5]**
- i) Obtain the concatenated matrix of Axonometric projection by following sequence of transformations :
 - a) Rotation about y-axis through an angle ϕ .
 - b) Rotation about x-axis through * an angle θ .
 - c) Orthographic projection on $z = 0$ plane.
 - ii) Write an algorithm for rotation about an axis parallel to z-axis.
- b)** Attempt any one of the following : **[5]**
- i) Develop the cavalier and cabinate projection for $\alpha = 120^\circ$ of the object $X = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 0 & 1 & 2 & 1 \end{bmatrix}$.
 - ii) Write transformation matrix for reflection through the plane $y = 4$.

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

- i) State general parametric equation of Bézier curve and also obtain matrix representation of Bézier cubic curve.
- ii) Derive iterative formula to generate uniformly spaced n points on the circumference of a circle with centre is origin and radius r .

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

- i) Find the first derivative of curve at $t = 0.3$ if $B_0[2 \ 1]$, $B_1[4 \ 4]$, $B_2[5 \ 3]$, $B_3[5 \ 1]$ are vertices of Bézier polygon. Also determine the value at point $t = 0.7$ of the Bézier curve.
- ii) The plane $x + 2y + 2z = 0$ is to be rotated so that it coincides with $z = 0$ plane. Determine the required angles of rotations about the x-axis and y-axis?



Total No. of Questions : 4]

SEAT No. :

P4989

[Total No. of Pages : 2

[5822]-710

T.Y. B.Sc.

MATHEMATICS

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 uncountable set which is of measure zero.
- b) True or false? If G is an open subset of $[a, b]$ and $|G| = 0$, then $G = \phi$.
- c) Does there exist a nonmeasurable function on $[a, b]$?
- d) Give an example of measurable partition of $[0, 1]$ whose components are not intervals.
- e) Let $f(x) = 1$ $x \in [0, 4]$ and E is set of rationals in $[0, 4]$. Evaluate $\int_E f$.
- f) If $f(x) = x^2 - 1$, $x \in [-2, 2]$ then find $\bar{f}(x)$.
- g) Let $f(x) = \frac{1}{\sqrt[3]{x}}$, $0 < x \leq 1$. Find $\int_0^1 f(x)$.

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

- i) If E_1, E_2 are measurable subsets of $[a, b]$ then prove that $E_1 \cup E_2$ and $E_1 \cap E_2$ are measurable, and $mE_1 + mE_2 = m(E_1 \cup E_2) + m(E_1 \cap E_2)$.
- ii) Let $E_1, E_2 \subseteq [a, b]$ such that $m(E_1 \Delta E_2) = 0$ and E_1 is measurable then prove that E_2 is measurable.

P.T.O.

- b) Attempt any one of the following : [5]
- i) Show that the subset E of $[a, b]$ is measurable if and only if its characteristic function χ_E is measurable.
 - ii) If G is an open subset of \mathbb{R}^1 and f is measurable function on $[a, b]$, prove that $f^{-1}(G)$ is measurable subset of $[a, b]$.

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

- i) If $f(x) = \frac{1}{x}, (0 < x < 1), f(0) = 5$ and $f(1) = 7$ then prove that f is measurable function on $[0, 1]$.
- ii) If F is a closed subset of \mathbb{R}^1 and if f is measurable function on $[a, b]$, prove that $f^{-1}(F)$ is measurable subset of $[a, b]$.

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

- i) If f, g are measurable functions on $[a, b]$, then prove that fg is measurable function on $[a, b]$.
- ii) Let f be bounded function on $[a, b]$ and P, Q be measurable partitions of $[a, b]$, then prove that $L[f; Q] \leq U[f; P]$.

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

- i) If f is bounded function in $L[a, b]$ and g is bounded function on $[a, b]$ such that $f(x) = g(x)$ almost everywhere on $[a, b]$ then prove that $g \in L[a, b]$ and $\int_a^b g = \int_a^b f$.
- ii) Let f be measurable function on $[a, b]$. Then prove that $f \in L[a, b]$ if and only if $|f| \in L[a, b]$ moreover show that if $f \in L[a, b]$ then

$$\left| \int_a^b f \right| \leq \int_a^b |f|.$$

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

- i) If $f(x) = \log\left(\frac{1}{x}\right), (0 < x \leq 1)$, then find 2f .
- ii) If $f(x) = \frac{1}{2} + \sin x, (0 \leq x \leq 2\pi)$, then find f^+ and f^- .



Total No. of Questions : 5]

SEAT No. :

P4990

[Total No. of Pages : 2

[5822]-711

T.Y. B.Sc.

PHYSICS

PHY - 361 : Solid State Physics
(2019 Pattern) (Paper - I) (Semester - VI) (36121)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Solve any FIVE of following :

[5]

- a) Define the co-ordination number.
- b) Define the reciprocal lattice.
- c) Define mean free path.
- d) Why semiconductors are insulator at 0° k temperature.
- e) An insulator has an optical absorption only for wavelength shorter than 1800Å°. Find the gap of forbidden energy for this insulator.
(Given : $h = 6.62 \times 10^{-34}$ J/s, $C = 3 \times 10^8$ m/sec)
- f) The distance between planes in face centred cubic is $2A^\circ$ determine atomic diameter.

Q2) Solve the following :

- a) Describe powder method for the determination of crystal structure. **[6]**
- b) A FCC crystal has an atomic radius $1.246A^\circ$. What are d_{200} , d_{220} and d_{111} spacing? **[4]**

P.T.O.

Q3) Solve the following :

- a) On the basis of band theory distinguish between insulator, semiconductor and metal. [6]
- b) A BCC crystal is used to measure the wavelength of some x-rays. The Bragg angle for first order reflection from (1, 1, 0) plane is 20.2° . What is the wavelength? The lattice parameter of the crystal is 3.15Å . [4]

Q4) Solve the following :

- a) Obtain Langevin formula for paramagnetic susceptibility. [6]
- b) In a Hall effect experiment on Zinc, a potential of $4.5\ \mu\text{V}$ is developed across a foil of thickness 0.02mm when a current of 1.5A is passed in a direction perpendicular to a magnetic field of 2.0T

Calculate i) The Hall coefficient for zinc

ii) The electron density

(Given :- charge on electron $e = 1.6 \times 10^{-19}$) [4]

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

- a) Distinguish between crystalline solid and amorphous solid.
- b) What are Miller indices of the plane? How are they determined?
- c) State application of X-ray diffraction.
- d) State the limitation of classical free electron theory.
- e) Write a note on Neel Temperature.
- f) Describe critical magnetic field of superconductor.



Total No. of Questions : 5]

SEAT No. :

P4991

[Total No. of Pages : 2

[5822]-712

T.Y. B.Sc.

PHYSICS

PHY - 362 : Quantum Mechanics

(2019 Pattern) (Semester - VI) (Paper - II) (36122)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) What is wave particle duality?
- b) Define eigen value and eigen function.
- c) Find the lowest energy of an electron confined to move in one dimensional potential box of 1 \AA . (Given : $m = 9.11 \times 10^{-31} \text{ kg}$, $\hbar = 1.054 \times 10^{-34} \text{ J. sec}$, $1\text{eV} = 1.6 \times 10^{-19} \text{ J}$)
- d) What is rigid rotator?
- e) Write the Schrodinger's time independent equation in spherical polar coordinate system.
- f) Define parity and parity operator.

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

- i) What is matter waves? Obtain expression for their wavelength.**[3]**
 - ii) Obtain equation of continuity. **[3]**
 - iii) State and prove Ehrenfest theorem. **[3]**
- b) Discuss potential barrier qualitatively for $E < V$. **[4]**

P.T.O.

- Q3)** a) Solve any two of the following : [6]
- What is uncertainty principle? Write different forms of uncertainty principle. [3]
 - Give the requirements of wave function. [3]
 - State four applications of tunneling effect. [3]
- b) Normalise the wave function [4]

$$\psi(x) = A e^{\frac{-x^2}{2a^2} + ikx}$$

The range of x is from $-\infty$ to $+\infty$.

- Q4)** a) Solve any two of the following : [6]
- What is the energy of gamma radiation having a wavelength 1 \AA . [3]
 - Normalise the wave function

$$\psi(x) = \frac{1 + ix}{1 + ix^2} \text{ for the range } -\infty < x < \infty. \quad [3]$$

- Find the current density if the wave function is $\psi(x) = A e^{ikx}$. [3]
- b) Determine the parity for the following functions $e^{-\alpha r}$, $\cos \theta \cdot e^{-\alpha r}$ and $\cos \theta \cdot e^{-\alpha r} \cdot e^{i\phi}$. [4]

- Q5)** Solve any four of the following : [10]
- a) By mathematical induction show that [2½]

$$[x^n, p] = i\hbar n x^{n-1}$$

- b) A small object of mass $1 \mu\text{g}$ is confined to move between 2 rigid walls separated by a distance of 1 mm . Calculate the minimum speed of the object. [2½]
- c) The wave function of the free particle in the range $-\infty$ to $+\infty$ is given by [2½]

$$\psi(x) = e^{\frac{-\alpha x^2}{2}}$$

Normalise the wave function and find the value of A .

- Write expression for zero point energy in case of the particle in infinitely deep potential well. [2½]
- Write short note on expectation values. [2½]
- Discuss two phenomena where classical physics fails to explain the phenomena. [2½]



Total No. of Questions : 5]

SEAT No. :

P4992

[Total No. of Pages : 2

[5822]-713

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) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 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) Give name of two particles obeying Bose-Einstein statistics.
- b) State statistical ensemble.
- c) Define mean free path.
- d) State condition of normalisation in probability distribution.
- e) Calculate the number of collisions per second of molecules of a gas having mean free path 1.876×10^{-7} m and average speed 511 m/s.
- f) If $p=q=\frac{1}{2}$ and number of possibilities $N = 500$. Find mean value of n_2 .

Q2) Answer the following questions.

- a) Explain principle and working of Joule-Thomson effect. **[6]**
- b) Derive an expression of Maxwell - Boltzmann distribution to find average number of particles in r^{th} state, \bar{n}_r . **[4]**

P.T.O.

Q3) Answer the following questions.

- a) Attempt the following. [6]
- Explain basic postulates of statistical mechanics.
 - Derive an expression of mean value of x using Gaussian probability distribution function,

$$P(x)dx = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

- b) Calculate the change in boiling point of water when the pressure is increased by 1 atmosphere. Boiling point of water is 373K. Change in specific volume of water is 1.67 m³/kg. (Given : latent heat of steam = 2.268×10⁶J/kg) [4]

Q4) Answer the following questions.

- a) Attempt the following. [6]
- Derive an expression of mean energy \bar{E} in canonical ensemble.
 - Explain binomial distribution function using random walk problem.
- b) A system of two states in thermal equilibrium with energy difference

$(E_2 - E_1) 5.52 \times 10^{-14}$ erg occur with relative probability $\frac{p_1}{p_2} = e^2$ erg/deg.

Calculate temperature of thermodynamic system. (Given $k = 1.38 \times 10^{-16}$ erg/deg). [4]

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

- Explain thermodynamic potential.
- Derive an expression of mean value of displacement m , where $m = n_1 - n_2$ and n_1, n_2 are number of steps to right and left direction respectively.
- Distinguish between accessible and inaccessible microstates.
- How fermions differ from bosons.
- Two six faced dice, each marked 1 to 6 are thrown. Find the probability that one of the dice shows even number and other shows odd number.
- Three identical particles are distributed in two cells. Explain total accessible microstates so that no cell is empty.



Total No. of Questions : 5]

SEAT No. :

P4993

[Total No. of Pages : 2

[5822]-714

T.Y. B.Sc.

PHYSICS

PHY - 364 : Nuclear Physics

(2019 Pattern) (Semester - VI) (36124)

Time : 2 Hours]

[Max. Marks : 35

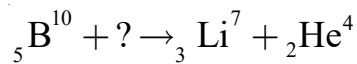
Instructions to the candidates:

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

Q1) Solve any five of the following :

[5]

- a) Define electric Quadrupole moment of nucleus.
- b) What is meant by threshold voltage in G.M. tube?
- c) What are magic numbers?
- d) What is meant by compound Nucleus?
- e) Find the packing-fraction of ${}_{30}^{64}\text{Zn}$, whose mass is 63.9291 a.m.u.
- f) Complete the reaction



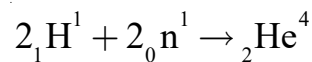
Q2) Answer the following questions :

- a) Describe the principle and working of Linear accelerator. **[6]**
- b) Obtain an expression for mean life in terms of its decay constant and half life. **[4]**

P.T.O.

Q3) Answer the following questions :

- a) Write important experimental properties of deuteron. [6]
b) Calculate the energy released during the following fusion reaction. [4]



Given :

$$\text{Mass of } {}_1\text{H}^1 \rightarrow 1.00814 \text{ a.m.u.}$$

$$\text{Mass of } {}_0\text{n}^1 \rightarrow 1.00898 \text{ a.m.u.}$$

$$\text{Mass of } {}_2\text{He}^4 \rightarrow 4.003424 \text{ a.m.u.}$$

Q4) Answer the following questions :

- a) Sketch the packing fraction curve and explain it. [6]
b) What should be the R.F. frequency for cyclotron, if $B = 1500$ gauss is used for the cyclotron. [4]

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

- a) Write a note on saturation and short range forces.
b) Write any three assumptions of liquid drop model.
c) Write any three limitations of shell model.
d) Write any three essential components of nuclear reactor.
e) Energy released for fission of U^{235} atom is 200MeV . Calculate the energy released during the fission of 1 gm of U^{235} . Number of atoms in 235 gm of Uranium is 6.023×10^{23} .
f) The count rate of Geiger-Muller counter for the radiation of a radioactive material of half life of 30 minutes decreases to 5 per second after 2 hours. What was the initial count rate?



Total No. of Questions : 5]

SEAT No. :

P4994

[Total No. of Pages : 4

[5822] - 715

T.Y.B.Sc.

PHYSICS

PHY - 365 (A) : Electronics - II

(2019 Pattern) (Semester - VI) (36125A)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Question 1 is compulsory.*
- 2) *Solve any 3 questions from Q2 to Q5.*
- 3) *Question 2 to Q5 carries equal marks.*
- 4) *Figures to right indicate full marks.*
- 5) *Draw neat circuit diagrams or symbols whenever necessary.*

Q1) Solve any five of the following :

[5]

- a) In which class of amplifier, cross-over distortion is present?
- b) What is a formula for modulation Index?
- c) What is a state in astable multivibrator?
- d) What will be the value of $A \cdot \bar{A}$?
- e) What is 3-bit counter?
- f) Define amplification factor.

Q2) Answer the following questions :

[6]

- a) Explain construction and working of JFET.
- b) Explain smps with block diagram.

[4]

Q3) Answer the following questions :

- a) Explain serial in parallel out (SIPO) shift register with diagram.
- b) Explain 7-segment display with diagram.

[6]

[4]

P.T.O.

Q4) Attempt the following questions :

- a) Explain Op-Amp as an integrator. [6]
- b) What is k-map? Draw k-map for 3-variables. [4]

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

- a) Draw pin configuration of IC78XX. Write its special features.
- b) What is trip point? Explain.
- c) Explain SOP with diagram.
- d) Write a short note on D-Flip Flop.
- e) Draw logic diagram & Truth table for full adder.
- f) Why CE configuration is mostly used in general electronic circuit.



Total No. of Questions : 5]

P4994

[5822] - 715

T.Y.B.Sc.

PHYSICS

**PHY - 365 (B) : Advanced Electronics
(2019 Pattern) (Semester - VI) (36125B)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

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

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

- a) Which material is used to construct RTD & thermistors?
- b) Draw ideal characteristics of high pass filter.
- c) A gas in a closed volume has a pressure of 120 psi at 20°C. What will be pressure at 100°C?
- d) Write any two performance parameters of DAC.
- e) What is motion sensor?
- f) What is quadratic approximation of Resistance of RTD?

Q2) Answer the following questions.

- a) With circuit diagram explain how instrumentation amplifier is used for thermocouple signal conditioning. **[6]**

OR

Explain the working of priority encoder with block diagram & truth table.

- b) The Wheaston bridge has $R_1 = 1000\Omega$, $R_2 = 842\Omega$ and $R_3 = 500\Omega$. Find the value of R_4 in the bridge at the null condition. **[4]**

Q3) Answer the following questions.

- a) Explain with circuit diagram op-amp as integrator. [6]

OR

Explain 2 to 4 line decoder with diagram.

- b) What is working principle of photoconductive cell? Which material used in it? [4]

Q4) Answer the following questions.

- a) Explain R-2R ladder type DAC with neat circuit diagram. [6]

OR

Explain broadband pyrometer.

- b) What is process control? Explain it with an example. [4]

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

- a) Process control basic elements.
- b) Process control using ON/OFF controller.
- c) Op-amp as temperature sensor.
- d) Optoisolator
- e) Principle of positive feedback in laser generation.
- f) Process LAG



Total No. of Questions : 5]

SEAT No. :

P4995

[Total No. of Pages : 2

[5822]-716

T.Y. B.Sc.

PHYSICS

PHY - 366 (P) : Medical Electronics

(2019 Pattern) (Semester - VI) (Elective - II) (36126 P)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) What is resting potential?
- b) State the principle of temperature sensor.
- c) What is the basic function of bio-amplifier?
- d) What is systolic pressure?
- e) How to calculate mean blood pressure?
- f) Which is the typical range of measurement of bio-potential.

Q2) Answer the following questions :

- a) Explain the physiological system of Human body. **[6]**
- b) What is sensor? Describe inductive sensor used for biomedical applications. **[4]**

Q3) Answer the following questions :

- a) Describe in detail construction & working of instrumentation amplifier. **[6]**
- b) Describe indirect measurement of blood pressure with suitable diagram. **[4]**

P.T.O.

Q4) Answer the following questions.

- a) What is resting potential? Derive an expression for Nernst equation. Where symbols have their usual meanings. [6]
- b) Describe Silver-Silver chloride electrode interface. [4]

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

- a) Isolation amplifier.
- b) Laser Doppler blood flow meter.
- c) Significance of heart sound.
- d) Piezoelectric sensor.
- e) Phonocardiography.
- f) ECG.



Total No. of Questions : 5]

SEAT No. :

P4996

[Total No. of Pages : 2

[5822]-717

T.Y. B.Sc.

PHYSICS

PHY - 366 Q : Physics of Nanomaterials

(2019 Pattern) (Semester - VI) (Elective - II) (Paper - VI) (36126Q)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to Q. 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*

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

- a) Write two applications of nanomaterials in electronics and IT.
- b) Write any two applications of x-ray diffraction technique.
- c) What are carbon nanotubes?
- d) What are the advantages of electrochemical method?
- e) What do you meant by thermal stress?
- f) Define nanotechnology.

Q2) Answer the following questions.

- a) Explain various challenges in nanotechnology. **[6]**
- b) Write the applications of nanomaterials in cosmetic products. **[4]**

Q3) Answer the following questions.

- a) Describe synthesis of nanomaterials using sol-gel method with suitable diagram. **[6]**
- b) Explain Energy Dispersive Spectroscopy (EDS) technique. **[4]**

P.T.O.

Q4) Answer the following questions.

- a) Explain quantum dots with neat diagram. Also explain its various applications. [6]
- b) What is the significance of nanosize materials? [4]

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

- a) What are the advantages of electrochemical method?
- b) Write Bragg's law and Scherrer formula.
- c) State various applications of carbon nanotubes.
- d) State any three applications of nanomaterials.
- e) State Beer-Lambert's law for absorptance, transmittance and reflectance.
- f) Draw schematic diagram of SEM.



Total No. of Questions : 5]

SEAT No. :

P4997

[Total No. of Pages : 2

[5822]-718

T.Y. B.Sc.

PHYSICS

PHY-366(R) : Microcontrollers (Paper - VI)

(2019 Pattern) (CBCS) (Elective - II) (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 Logtables or electronic calculators are allowed.*

Q1) Attempt any five of the following :

[5 × 1 = 5]

- a) What is the size of stack pointer (sp) in 8051 microcontroller?
- b) Define the term 'band rate'.
- c) Give the two examples / instructions of Arithmetic instructions group of 8051 microcontroller.
- d) Upon 'Power Up', which register bank is used in 8051 microcontroller?
- e) How (-29) is represented in 8051 microcontroller?
- f) If crystal frequency is 12MHz, then find the period of timer clock.

Q2) a) Attempt any two of the following :

[2 × 3 = 6]

- i) Draw PSW register format of 8051 microcontroller and explain the PSW-7 and PSW-6 bits of it.
 - ii) Explain any three addressing modes of 8051 microcontroller assembly programming with suitable one example.
 - iii) Define, simplex, Half duplex and full duplex.
- b) Explain with neat diagram, the internal RAM structure of 8051 microcontroller. **[4]**

P.T.O.

- Q3) a)** Attempt any two of the following : **[2 × 3 = 6]**
- i) What is A and B register in 8051 microcontroller? How they are used in multiplication and division operation?
 - ii) Explain the any three interrupts used in 8051 microcontroller.
 - iii) Write an 8051 assembly language program to add two 16 bit numbers C600H and 0230H.
- b)** Explain the meaning of following instructions : **[4]**
- i) SWAP A
 - ii) ADD A, R5
 - iii) DEC R2
 - iv) XCH A, R1

- Q4) a)** Attempt any two of the following : **[2 × 3 = 6]**
- i) Draw the block diagram of architecture of 8051 microcontroller.
 - ii) Write an assembly language program to add first ten natural numbers.
 - iii) How 8051 microcontroller is interfaced using RS-232 standard?
- b)** Explain the different logical instructions of 8051 microcontroller, with suitable examples. **[4]**

- Q5)** Attempt any four of the following : **[4 × 2.5 = 10]**
- a) Write short note on Timers/counter of 8051 microcontroller.
 - b) Explain the meaning of assembler directives with three suitable examples.
 - c) Write a short note on serial port of 8051 microcontroller.
 - d) Explain the functions of Data pointer (DPTR) and program counter (PC) register of 8051 microcontroller.
 - e) Explain the difference between Microprocessor and Microcontroller.



Total No. of Questions : 5]

SEAT No. :

P4998

[Total No. of Pages : 2

[5822]-719

T.Y. B.Sc.

PHYSICS

PHY-366(S) : Lasers (Paper - VI)

(2019 Pattern) (Semester - 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) What are characteristics of Laser?
- b) What is pumping?
- c) Define round trip gain.
- d) State any one example of homogeneous broadening.
- e) Calculate the wavelength of CO₂ beam having energy difference between two states as 0.117 eV.
- f) Calculate intensity of He-Ne Laser beam having emissive power 1mW and wavelength 6328Å.

Q2) a) Describe the following :

[6]

- i) Describe working of He-Ne Laser.
 - ii) Describe in short how a hologram is generated.
- b) Describe importance of energy level diagram in Laser.

[4]

P.T.O.

- Q3) a)** Explain the following : [6]
- i) Explain how cavity resonance frequency is obtained.
 - ii) Explain how stimulated emission overwhelm the spontaneous emission in condition for Large stimulated emission.
- b) The half width of gain profile of He-Ne Laser material device is 0.002 nm having length of cavity is 12 cm. Calculate emitted - wavelength of Laser in order to single mode of oscillation having refractive index of material is 1. [4]
- Q4) a)** Discuss the following : [6]
- i) Discuss the working of CO₂ gas Laser.
 - ii) Discuss nuclear isotope and nuclear fusion application of Laser.
- b) Fluorescent tube lights emit visible light of wavelengths in the range of 4000Å to 7000Å with an average wavelength of 5500Å. Calculate the coherence length and coherence time. [4]
- Q5) Write short notes on any four of the following :** [10]
- a) Laser beam directionality.
 - b) Population Inversion.
 - c) Optical Resonator.
 - d) In homogeneous broadening.
 - e) Tunable dye Laser.
 - f) Range finder.



Total No. of Questions : 5]

SEAT No. :

P4999

[Total No. of Pages : 2

[5822]-720

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

PHYSICS

**PHY-366(T) : Astronomy and Astrophysics - II
(2019 Pattern) (CBCS) (Elective - I) (36126T)**

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 right indicate equal marks.*
- 5) *Use of calculator and logtable is allowed.*

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

- a) Define one parsec(ps).
- b) What is Wien's law?
- c) What is apparent solar time?
- d) What is basic composition of Interstellar Medium?
- e) List any four orbiting space based telescopes.
- f) Write down different layers of solar atmosphere.

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

- a) Explain butterfly diagram in detail. **[6]**
- b) Write a note on Hubble space telescope. **[4]**

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

- a) Explain Hydrostatic equilibrium of stars. **[6]**
- b) Explain Astronomical co-ordinate system in brief. **[4]**

P.T.O.

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

- a) Explain in detail non optical Astronomy. **[6]**
- b) Write basic structure and properties of Milky was Galaxy. **[4]**

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

- a) Write a short note of solar cycle.
- b) Explain Mean solar time 2 write the equation of time.
- c) State Hubble's law with equation.
- d) Write a short note on Gamma Ray telescope.
- e) Write a short note on Radio Galaxies.



Total No. of Questions : 5]

SEAT No. :

P5000

[Total No. of Pages : 2

[5822]-721

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) *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 right indicate full marks.*
- 5) *Use of calculator and log table allowed.*

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

- a) What is meant by an aerobic digestion?
- b) What is gasifier?
- c) How wind is formed?
- d) Why wind data is important?
- e) What do you mean by an energy management system?
- f) What is energy management system?

Q2) Answer the following questions :

- a) What is thermochemical process? Explain how biomass is gasified by gasifier? **[6]**
- b) Describe various components of wind energy conversion system. **[4]**

Q3) Answer the following questions :

- a) Discuss advantages and disadvantages of tidal Energy. **[6]**
- b) Describe the role of energy Auditors? **[4]**

P.T.O.

Q4) Answer the following questions :

- a) Discuss the case studies on fuel substitution? [6]
- b) Discuss draw backs and challenges of geothermal systems. [4]

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

- a) Wind data.
- b) Biomass.
- c) Need of energy saving.
- d) Downdraft gasifier.
- e) F Tidal Energy.
- f) Construction of biogas plant.



Total No. of Questions : 5]

SEAT No. :

P5001

[Total No. of Pages : 2

[5822]-722

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

PHYSICS

PHY - 366(V) : Acoustics - II (Paper - VI)

(2019 Pattern) (Elective - II) (36126V)

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) *Use of calculator and log-table is allowed.*

Q1) Solve any five of the following :

[5]

- a) What is meant by dynamic range?
- b) What do you mean by variable-Q graphic equalizer?
- c) Give two characteristics of monophonic SRS.
- d) What is a volume-compressor?
- e) What is a squawker?
- f) Give significance of the expression

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

Q2) Answer the following questions :

- a) Give the construction and working principle of a condenser microphone. Draw its equivalent circuit and give the expression for its sensitivity. **[6]**
- b) The cut off frequency of an exponential horn changes at the rate of 1/3 with temperature (°C). Determine length of the horn if the mouth to throat radii are in the ratio 10:1. **[4]**

P.T.O.

Q3) Answer the following questions :

- a) Give the construction and working principle of a carbon microphone. Give the expression for its sensitivity and discuss the constant pressure frequency response. [6]
- b) A condenser microphone constructed with an Aluminum diaphragm of thickness 4×10^{-5} m and having a radius of 10^{-2} m is stretched to a tension of 2×10^4 N/m. If the spacing between the diaphragm and the backing plate is the same as thickness of the diaphragm, determine its sensitivity and dB response. Given that the polarizing voltage is 300V. [4]

Q4) Answer the following questions :

- a) Explain Dolby Noise Reduction. Discuss Dolby NR types A, B, C, SR and S. What is Dolby Atmos. [6]
- b) A cone speaker has a total mass of 1.1×10^{-2} kg. Its mechanical resistance is 0.9 kg/s. Its radiation resistance and reactance are 2.1 kg/s each. Determine the mechanical impedance at 300 Hz, if the stiffness of the cone system is 5.1×10^3 N/m. [4]

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

- a) Weaknesses of ultrasound
- b) Volume expander
- c) WAV file format
- d) Bass-reflex cabinet
- e) NDT
- f) Sensory hearing loss



Total No. of Questions : 5]

SEAT No. :

P5002

[Total No. of Pages : 3

[5822]-723

T.Y. B.Sc.

PHYSICS

(Skill Enhancement Course-III)

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

(2019 Pattern) (Semester - VI) (361210w)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Solve any five of the following.

[5]

- a) Define tuple.
- b) Write advantages of NumPy in python.
- c) What is append function.
- d) What is mean by series? Write it's syntax.
- e) Define Pie-Plot.
- f)

```
>>> list 1 = [1,2,3,4], >>> list 2 = ['a','b','c']
>>> print (list 1[0:2])
>>> print (list 2 [-3:-1])
```

output of program

Q2) a) Attempt Any Two of the following.

[6]

- i) Explain how to create & indexing of list in python. [3]
- ii) Define NumPy create a NumPy array filled with all zeros with 3 rows & 4 columns. [3]
- iii) Write short note on packages [3]

P.T.O.

- b) i) Create the Data frame of 2D using NumPy. [2]
 ii) Write the output of following program [2]
 >>> from math import sqrt
 >>> print sqrt (81)

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

i) What is random module? How to create random integer give its syntax. [3]

ii) Write the output of program [3]

```
If Ser 1 = pd. series (['A','B','C'], index [1,2,3])
    Ser 2 = pd. series (['D','E','F'], index [4,5,6])
    pd. concat ([ser 1, ser 2])
```

iii) What is scatter plot? Give its syntax [3]

b) What is Dictionary? Give it's syntax & find out put of the following program. [4]

```
>>> dict = {'Name': 'omkar', 'Age' = 20, 'Address'= 'Pune'}
>>> Print "dict[Name]= ", dict['Name']
>>> dict ['age'] = 25
>>> print (dict)
```

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

i) If import pandas as pd
 data = ("calories":[420, 380, 390] [3]

"duration": [50, 40, 45])

df = pd. Dataframe [data, index=["day1", "day2", "day3"]

print (df)

Write the output of above program

- ii) What are the advantages of seaborn library. [3]
- iii) What is string? How to create a string in python? [3]
- b) Explain Histogram with their parameter. [4]

Q5) Attempt Any Four of the following. [10]

- a) Write short notes on a Bar plot.
- b) For a given string 'Banboozled' Write a program to obtain following output i) Bamboo ii) Ba iii) ed iv) delzoobma B v) zled
- c) What is pandas library? Give its type with their syntax.
- d) Write short note on count plot.
- e) Write output of following program.

```
>>> data = pd. dataframe ({'col 1':[2,4,6,8,10]
                           'col 2':[3,6,8,7,9], 'col 3':[4,5,6,7,8]})
>>> df ['col 3']
>>> df. loc [1]
>>> df. iloc[:,1:]
```



Total No. of Questions : 5]

SEAT No. :

P5003

[Total No. of Pages : 2

[5822]-724

T.Y. B.Sc.

PHYSICS

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

(2019 Pattern) (CBCS) (Semester - VI) (361210X)

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 logarithm tables and calculator is allowed.*

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

- a) What is photovoltaic effect?
- b) Define solar cell.
- c) What are the main parameters of a solar module.
- d) What is solar tracker?
- e) What is solar radiation?
- f) Define solar const.

Q2) a) Describe the following : [6]

- i) Write a short note on the sun, Earth & Renewable energy.
- ii) Give the difference between pyranometer & Pyrheliometer.

b) Describe on grid solar PV system with suitable neat diagram. [4]

Q3) a) Explain the following : [6]

- i) Explain the concept of aligning the solar array.
- ii) Explain sunshine recorder & its types.

b) Explain components of solar PV system. [4]

P.T.O.

- Q4) a) Discuss the following : [6]**
- i) Discuss the basic comparison between on grid & off grid solar PV system.
 - ii) What is solar cell? Discuss its type with efficiency
- b) Discuss Lux meter & Explain its working principle. [4]**

- Q5) Write short notes on any Four of the following : [10]**
- a) Radiation of the earth surface.
 - b) Need of solar radiation measurement.
 - c) Solar tracking system.
 - d) Building Integrated Photovoltaic system.
 - e) Solar Engineering & Solar Architecture.
 - f) Solar Constant.



Total No. of Questions : 5]

SEAT No. :

P5004

[Total No. of Pages : 2

[5822]-725

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

PHYSICS

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

(2019 Pattern) (CBCS) (361210Y)

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 do you mean by M2M?
- b) What is SCADA?
- c) Define wireless sensor network.
- d) Define Data.
- e) State characteristics of IoT.
- f) List the I/O interfaces used in IoT.

Q2) Answer the following :

a) Explain the logical design of IoT in detail.

[6]

b) What are the operating platforms.

[4]

Q3) Answer the following :

a) Explain M2M communication in detail.

[6]

b) What are the disadvantages of M2M communication.

[4]

P.T.O.

Q4) Answer the following :

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

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

- a) Cloud computing.
- b) Requirements of international standard.
- c) Functions of C#.
- d) Control of flow.
- e) File handling.
- f) Time operations.



Total No. of Questions : 5]

SEAT No. :

P5005

[Total No. of Pages : 2

[5822]-726

T.Y. B.Sc.

PHYSICS

PHY - 3610 (Z) : CALIBRATION TECHNIQUES

(2019 Pattern) (Skill Enhancement Course - III) (Semester -VI)

(361210Z)

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 span and instrument range?
- b) What is different types of calibration?
- c) State principle of Bourdon Tube pressure Guage?
- d) State principle of piezometer pressure Gauge?
- e) What is meant by harmonic distortion?
- f) What is see beck effect?

Q2) Answer the following questions :

- a) What is thermistor? What is NTC and PTC? State their applications. **[6]**
- b) Define calibration. Why it is important? **[4]**

Q3) Answer the following questions :

- a) With the help suitable diagram explain the working of pressure comparator? **[6]**
- b) Explain what are the essential components of a CRT? **[4]**

P.T.O.

Q4) Answer the following questions :

- a) Describe Traceability in calibration. [6]
- b) Explain principle and working of the Resistance temperature detector (RTD). [4]

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

- a) Instrument Identification
- b) Manometer pressure guage
- c) Different scales of Temperature
- d) Diaphragm pressure Guage
- e) Harmonic distortion
- f) Traceability in calibration



Total No. of Questions : 5]

SEAT No. :

P5006

[Total No. of Pages : 2

[5822]-727

T.Y. B.Sc.

PHYSICS

PHY - 3611 (AA) (SEC) : Microcontrollers

(2019 Pattern) (CBCS) (Paper - VIII) (Semester - VI) (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 log table or electronic calculators are allowed.*

Q1) Attempt any five of the following :

[5]

- a) What is the size of Data Pointer (DPTR) in 8051 microcontroller?
- b) What is the function of RST Pin of 8051 microcontroller?
- c) How (-48) is represented in 8051 microcontroller?
- d) If the crystal frequency is 12MHz, find the period of timer clock.
- e) What is the function of TCON register?
- f) Define the term : Assembly language.

Q2) a) Attempt any two of the following :

[2 × 3 = 6]

- i) Explain the role of serial port in 8051 microcontroller.
 - ii) With neat diagram, how LCD is interfaced to 8051 microcontroller?
 - iii) Explain the different arithmetic instructions of 8051 microcontroller
- b) With neat diagram of PSW register explain the use of RSI and RSO bits of it. **[4]**

P.T.O.

- Q3)** a) Attempt any two of the following : **[2 × 3 = 6]**
- i) Write an assembly language program of 8051 microcontroller to add two 16 bit numbers.
 - ii) Explain the different I/O parts of 8051 microcontroller.
 - iii) Give the different internal interrupts of 8051 microcontroller. Also give their vector address.
- b) Explain the different Rotate instructions used in 8051 microcontroller. **[4]**

- Q4)** a) Attempt any two of the following : **[2 × 3 = 6]**
- i) Write an 8051 assembly language program to add first 100 natural numbers.
 - ii) Explain the function of Timer/ Counters in 8051 microcontroller.
 - iii) How (4 × 4) keyboard is interfaced to 8051 microcontroller?
- b) Explain the meaning of following instructions : **[4]**
- i) XCH A, RS
 - ii) SWAP A
 - iii) ADD A, #67H
 - iv) CPL A

- Q5)** Attempt any four of the following : **[2.5 × 4 = 10]**
- a) Write a short note on Special Functions Registers of 8051 microcontroller.
 - b) Explain the use of A and B register in division operation.
 - c) Write a short note on '8051 microcontroller-addressing modes'.
 - d) Write short note on Assembler Directives of 8051 microcontroller.
 - e) Explain the meaning of simplex, half duplex and full duplex.



Total No. of Questions : 5]

SEAT No. :

P5007

[Total No. of Pages : 2

[5822]-728

T.Y. B.Sc.

PHYSICS

PHY - 3611 (AB) : INSTRUMENTATION FOR AGRICULTURE

(Skill Enhancements 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) *Q. 2 to Q. 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator and log-table is allowed.*

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

- a) State any four advantages of remote sensing.
- b) What are physical properties of soil?
- c) What do you mean by fermentation?
- d) What is the aim of Irrigation?
- e) Define leaf area index (LAI).
- f) What are Biosensors?

Q2) Answer the following questions :

- a) What is Anemometer? Explain sonic Anemometer. **[6]**
- b) What is role of Instrumentation in modern agriculture? **[4]**

Q3) Answer the following questions :

- a) Describe auto drip irrigation system with its working. **[6]**
- b) Draw flow diagram of Fermenter and control (Batch Process) and explain it. **[4]**

P.T.O.

Q4) Answer the following questions :

- a) Describe sprinkler irrigation system with its working. [6]
- b) What are different greenhouse parameters? Explain how humidity and soil moisture affects the greenhouse. [4]

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

- a) Rain gauge.
- b) Sensors requirement in agriculture.
- c) SCADA for DAM parameters.
- d) Advantages of greenhouse effect.
- e) Lysimeters.
- f) Upstream and downstream control system.



Total No. of Questions : 5]

SEAT No. :

P5008

[Total No. of Pages : 2

[5822]-729

T.Y. B.Sc.

PHYSICS (Skill Enhancement)

PHY - 3611 (AC) : RADIATION PHYSICS

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Attempt any five :

[5]

- a) What is straggling?
- b) Define excitation.
- c) What is KERMA?
- d) Define one Gray absorbed dose.
- e) State the materials used for shielding.
- f) Write range energy relation.

Q2) Answer the following questions :

- a) Explain construction and working of gas filled detector. **[6]**
- b) Write characteristics of inorganic scintillation detector. **[4]**

Q3) Answer the following questions :

- a) Define : Rontgen, Becquerel, Gray, Sievert, RAD, REM. **[6]**
- b) A GM Counter has a dead time 400 μ s. What is true counting rate 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) Calculate the absorbed dose in air for 1 Rontgen of gamma radiations. Assume that for electrons average energy needed to create one electron pair in air is 33.7eV. [4]

(1 Rontgen = 2.58×10^{-4} C/kg)

Q5) Attempt any four : [10]

- a) What are ionizing and non-ionizing radiations?
- b) Write principle of GM counter.
- c) Give advantages of Semiconductor detector.
- 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. :

P5009

[Total No. of Pages : 2

[5822]-730

T.Y. B.Sc.

PHYSICS

PHY - 3611 (AD) : Photography

Skill Enhancement Course - II

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) What do you meant by angle of view of telezoom lens?
- b) Mention angle of view normal zoom lens.
- c) What do you meant by projection printing.
- d) List the different types of camera lenses.
- e) What do you meant by shutter speed?
- f) What do you meant by wide angle lens?

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

- i) Explain the construction and working of pin hole camera. **[3]**
 - ii) What do you meant by artificial lightning technique? **[3]**
 - iii) List the different types of filters and explain haze filter in brief? **[3]**
- b) Draw neat labelled diagram of B/W enlarger. **[4]**

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

- i) Explain handling methods of camera in brief. **[3]**
 - ii) What do you meant by Aperture and shutter speed? **[3]**
 - iii) Explain in digital camera sensors in brief. **[3]**
- b) Explain fast speed in brief with diagram. **[4]**

P.T.O.

- Q4)** Answer the following questions : **[10]**
- a) Explain sources of light used in artificial photography in detail. **[6]**
 - b) Explain the working of focal plain shutter in detail. **[4]**

- Q5)** Write short notes on any Four of the following : **[10]**
- a) Explain exposure meter in brief. **[2½]**
 - b) Explain types of camera in brief. **[2½]**
 - c) Describe telezoom lens in brief. **[2½]**
 - d) Explain the B/W camera in brief. **[2½]**
 - e) Explain the aperture and shutter speed of camera in brief. **[2½]**
 - f) Describe outdoor techniques in brief. **[2½]**



Total No. of Questions : 5]

SEAT No. :

P5010

[Total No. of Pages : 2

[5822]-731

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) Use of logarithm tables and calculator is allowed.
- 6) Draw neat diagrams wherever necessary.

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

- a) Define concentration cell.
- b) State Steno's Law of constancy of interfacial angles.
- c) What is mass number of an element?
- d) Define binding energy.
- e) Calculate ΔG , if the e.m.f. of the cell, $\text{Zn} | \text{ZnCl}_2 || \text{AgCl} | \text{Ag}$ at 25°C is 1.260 volts.
- f) Obtain Miller indices of a plane for which the intercepts are $\frac{1}{2}$, 1 and ∞ .

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

- i) What are the requirements of a standard cell.
 - ii) Sketch (100), (110) and (111) plane in Simple Cubic Lattice (SCC).
 - iii) Describe the classification of nuclides on the basis of stability.
- b) Derive the Bragg's equation, $n\lambda = 2d \sin\theta$. [4]

P.T.O.

- Q3) a)** Answer any TWO of the following. [6]
- Explain the construction and working of Standard Hydrogen Electrode (SHE).
 - Distinguish between crystalline solid and amorphous solid.
 - What is E.M.F. of a cell? Derive the Nernst equation for the E.M.F. of a cell.
- b)** The E.M.F. of the cell [4]
- $$\ominus\text{Pt} \mid \text{Saturated Calomel} \parallel \text{Weak acid, Quinhydrone} \mid \text{Pt}^{\oplus} \text{ at } 25^{\circ}\text{C}$$
- is 0.292 volt. Calculate pH of the weak acid.
- Given : $E_{\text{Cal (oxidation)}} = -0.242$ volt
 $E_{\text{Quinhydrone (Reduction)}} = 0.70$ volt
- Q4) a)** Answer any TWO of the following. [6]
- What is metal-metal insoluble salt electrode? Explain it with respect to formation of electrode, electrode reaction and expression for electrode potential.
 - Define Radioactivity. Explain Alpha, Beta and Gamma decay with suitable example.
 - Derive Nernst equation for the following cell
- $$\ominus\text{Zn} \mid \text{ZnCl}_2 \parallel \text{CuCl}_2 \mid \text{Cu}^{\oplus}$$
- b)** Calculate the mass defect, binding energy and average binding energy for ${}^{56}_{26}\text{Fe}$ with atomic mass 55.975 a.m.u. [4]
- Given : $m_p = 1.0078$ a.m.u.
 $m_n = 1.0086$ a.m.u.
- Q5)** Write short notes on any FOUR of the following. [10]
- Advantages and disadvantages of fuel cells.
 - Salt bridge
 - Laue method for determination of crystal structure
 - Law of rational indices.
 - Use of traces in structure determination.
 - Ionisation chamber.



Total No. of Questions : 5]

SEAT No. :

P5011

[Total No. of Pages : 2

[5822]-732

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

CHEMISTRY

CH - 602 : Physical Chemistry - III

(2019 Pattern) (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 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 polyethene has an average molecular weight 410000 g/mol. Calculate average degree of polymerisation.
(Given : Molecular weight of monomer = 28 g/mol)
- b) What are ionic solids?
- c) What is meant by Hedrall effect?
- d) Define Van't Hoff's factor.
- 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°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 types of monomer.
 - ii) Derive the relation $\pi = CRT$.
 - iii) Write note on p-type semiconductor.
- b) Discuss the various factors affecting on reactions in solids. **[4]**

P.T.O.

Q3) a) Attempt Any Two : [6]

- i) Explain the nature of plot of fraction of reactant reacted (α) versus time (t) based on an Avrami - Erofeev nucleation model.
 - ii) What is weight average molecular weight? Derive it's equation.
 - iii) Explain the band structures of Ca and diamond.
- b) An aqueous solution containing 1.25 g KCl in 250 ml water was found to freeze at -0.24°C . Calculate Van't Hoff factor and degree of dissociation of the solute. (K_f for 1000 g water is 1.86) [4]

Q4) a) Solve Any Two : [6]

- i) Discuss the preparation of polymers with respect to Addition polymerization and Condensation polymerization.
 - ii) Explain NaCl is an insulator.
 - iii) Derive the integrated rate equation for parabolic rate law. Give the units of parabolic rate constant.
- b) 2.0 g of substance was dissolved in 75.0 g of water. This solution was found to boil at 100.03°C . 0.35 g of same substance in 80 g benzene raised the boiling point of benzene by 0.048°C . What is the molal boiling point elevation constant of benzene if that of water being 0.52 per 1000 g? (Given $\Delta T_b = 0.03$). [4]

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

- a) Beckmann's method.
- b) Prout - Tompkins Equation.
- c) Molecular weight determination by viscosity method.
- d) Thermosetting and thermoplastic polymers.
- e) Cohesive energy in metals.
- f) n-type semiconductors.



Total No. of Questions : 5]

SEAT No. :

P5012

[Total No. of Pages : 2

[5822]-733

T.Y. B.Sc.

CHEMISTRY

CH - 604 : Inorganic Chemistry - II

(CBCS 2019 Pattern) (Semester - VI) (36134)

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) How many bridging carbonyls are present in $\text{Co}_2(\text{CO})_8$.
- b) Give formula of wilkinson's catalyst.
- c) Name the process by which green plants converts atmospheric CO_2 to glucose.
- d) What are solid electrolytes.
- e) What do you mean by degree of polymerisation.
- f) What is the composition of ionic liquids.

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

- i) Find out total number of electrons in the following metal. Carbonyls and state whether they obey 18 electron rule or not.

a) $[\text{V}(\text{CO})_6]$

b) $[\text{Ni}(\text{CO})_4]$

[At. No. of V = 23, Ni = 28]

P.T.O.

- ii) Distinguish between haemoglobin and myoglobin.
- iii) Explain catalytic cycle for hydrogenation of olefins using Wilkinson's catalyst.
- b) Answer the following [4]
- i) Give applications of silicates.
- ii) What are important properties of homogenous catalyst.
- Q3)** a) Answer any two of the following. [6]
- i) What do you mean by C - C bond formation. Discuss it with the example of Heck reaction.
- ii) What are phosphazene? How are they prepared?
- iii) Explain co-precipitation method for the synthesis of inorganic solids.
- b) What are organometallic compounds? Discuss the methods for synthesis of metal carbonyls. [4]
- Q4)** a) Answer any two of the following. [6]
- i) Draw the structures of following metal carbonyls
- a) $\text{Fe}_3(\text{CO})_{12}$ b) $\text{Mn}_2(\text{CO})_{10}$ c) $\text{Ru}(\text{CO})_5$
- ii) Discuss biodiesel synthesis using heteropolyacids as a catalysts.
- iii) Discuss biological role of calcium and magnesium.
- b) What is Fe-S protein? Discuss the general structural features of Fe-S proteins. [4]
- Q5)** Write short notes on any four of the following. [10]
- a) Nitration of ferrocene
- b) Zeolite for catalytic cracking
- c) Importance of catalysis in the synthesis of high value chemicals
- d) Peroxidase and catalase enzymes
- e) Borazine
- f) Applications of ionic liquids.



Total No. of Questions : 5]

SEAT No. :

P5013

[Total No. of Pages : 2

[5822]-734

T.Y. B.Sc.

CHEMISTRY

CH - 605 : Inorganic Chemistry - III

(CBCS) (2019 Pattern) (Semester - VI) (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) *Questions 2 to 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat diagrams whenever necessary.*
- 6) *Use of logarithm tables and calculator is allowed.*

Q1) Solve any five of the following :

[5]

- a) Define Hydraacids with suitable example.
- b) What is polymorphism?
- c) What is ultra sonification?
- d) What is crystal lattice?
- e) What is the general formula of zeolites?
- f) Define chemical toxicology term.

Q2) a) Attempt any two of the following :

[3 × 2 = 6]

- i) How natural zeolites are formed?
- ii) Explain applications of Born-Haber cycle.
- iii) Explain with the help of a block diagram metabolism of cadmium.
- b) i) Why HI is a stronger acid than HF?
- ii) Explain Hexagonal close packing with suitable diagram.

[2 × 2 = 4]

P.T.O.

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

- i) What are the limitations of Arrhenius theory?
- ii) Distinguish between Amorphous & crystalline solids.
- iii) Explain plasma Jet synthesis of nanoparticles.

b) i) 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 SNa = $+108.7 \text{ kJ mole}^{-1}$

III) Heat of Ionisation = $I_{\text{Na}} = +493.8 \text{ kJ mole}^{-1}$

IV) Heat of dissociation = $\frac{1}{2}DF_2 = +153.0 \text{ kJ mole}^{-1}$

V) Electron affinity = $EAF = -332.6 \text{ kJ mole}^{-1}$

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

- i) Explain the role of zeolite in adsorption & separation.
- ii) State Born Lande equation for calculation of lattice energy & explain its conclusions.
- iii) Define acids & bases according to Lewis concept & what are the advantages of this theory.

b) i) What is meant by Manamata disease?

ii) Classify the following species into Arrhenius acids & bases

I) HCl II) NaOH III) H_2SO_4 IV) $Ca(OH)_2$

[4]

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

- a) Biochemical effects of lead.
- b) Cryochemical synthesis for nanoparticles.
- c) Classification of zeolites.
- d) Draw any three structures of unit cell with example.
- e) Stoichiometric defects.
- f) Strength of oxyacids.



Total No. of Questions : 5]

SEAT No. :

P5014

[Total No. of Pages : 5

[5822]-735

T.Y. B.Sc.

CHEMISTRY

CH - 607 : Organic Chemistry - II

(CBCS 2019 Pattern) (Paper-II) (Semester - VI) (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) *Questions 2 to 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat diagram wherever necessary.*

Q1) Attempt Any Five of the following.

[5]

- a) What is spectroscopy?
- b) How many sets of protons are present in ethanol.
- c) Calculate the fundamental modes of vibrations in CO₂.
- d) Draw chair conformation of trans decalin.
- e) Define auxochrome.
- f) What is coupling constant?

Q2) a) Attempt Any Two of the following.

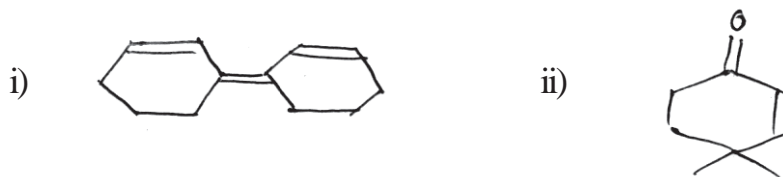
[6]

- i) What is bathochromic shift? P-nitrophenol Shows red shift in alkaline medium explain.
- ii) Explain various regions in IR spectroscopy.
- iii) Discuss different types of coupling in NMR.

P.T.O.

b) Solve the following [4]

Calculate the λ_{max} values for the following compounds.

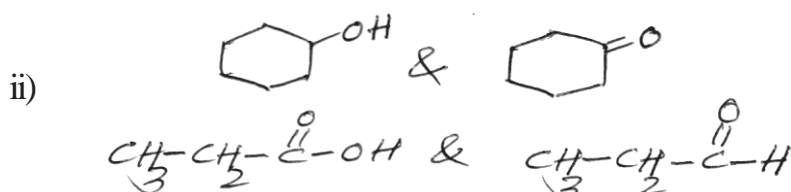


Q3) a) Attempt **any two** of the following. [6]

- How IR spectroscopy is useful for determination of hydrogen bonding in molecules?
- Draw chair conformation of trans - 1, 4 dimethyl cyclohexane. Comment on their stability.
- Why TMS is used as internal standard in NMR.

b) Answer the following [4]

- How will you distinguish following pair using IR spectroscopy?



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

a) Molecular formula - $\text{C}_8\text{H}_7\text{N}$

IR - 2220, 1620, 1510, 1450 cm^{-1}

NMR - i) 2.48 δ (s) 3H

ii) 7.25 δ (d) 2H

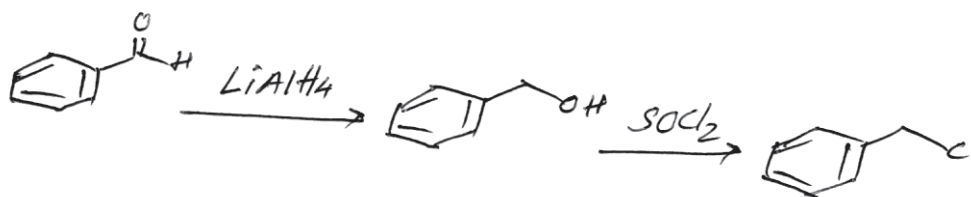
iii) 7.5 δ (d) 2H

- b) Molecular formula - C_8H_8O
 uv - $\lambda_{max} = 292 \text{ nm}$
 IR - $1722, 2740 \text{ cm}^{-1}$
 NMR - i) 7.27δ Singlet 5H
 ii) 2.80δ Singlet 2H
 iii) 9.88δ Singlet 1H

- c) Molecular formula - C_5H_8O
 IR - 1735 cm^{-1}
 NMR - i) 2.4δ t 4H $J = 8\text{Hz}$
 ii) 1.3δ t 4H $J = 8\text{Hz}$

B) Answer the following. [4]

- a) How will you follow following reaction by IR



- b) How is IR spectroscopy useful for determination of size of ring ketone.

Q5) Attempt Any Four of the following. [10]

- Write applications of uv spectroscopy.
- Write short note on types of vibrations.
- Draw chair conformation of *Gis*-1,3 dimethyl cyclohexane and comment on their stability.
- Discuss Rules of Spin-Spin coupling
- Give applications of IR spectroscopy.
- Write note on shielding and deshielding.

TABLE - 1
Characteristic Infrared Absorptions of Functional Groups

GROUP	FREQUENCY RANGE cm^{-1}	INTENSITY
A. Alkyl		
C-H (stretching)	2853-2962	(m - s)
Isopropyl - $\text{CH}(\text{CH}_3)_2$	1380 - 1385	(s)
tert - Butyl - C $(\text{CH}_3)_3$	and 1365 - 1370	(s)
	1385 - 1395	(m)
	and 1365	(s)
B. Alkenyl		
C-H (stretching)	3010 - 3095	(m)
C = C (stretching)	1620 - 1680	(v)
R - $\text{CH} = \text{CH}_2$	985 - 1000	(s)
	and 905 - 920	(s)
$\text{R}_2\text{C} = \text{CH}_2$	880 - 900	(s)
cis - $\text{RCH} = \text{CHR}$	(out of plane C-H bendings) 675 - 730	(s)
trans - $\text{RCH} = \text{CHR}$	960 - 975	(s)
C. Alkynyl		
$\equiv\text{C}-\text{H}$ (stretching)	3300	(s)
$\text{C}\equiv\text{C}$ (stretching)	2100 - 2260	(v)
D. Aromatic		
Ar - H (stretching)	-3030	(v)
Aromatic substitution type (C-H out-of-plane bendings)		
Monosubstituted	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		
$\text{C} = \text{N}$	2220 - 2260	(m)
I. $-\text{C}-\text{O}$ stretch (alcohol, ether, phenol)	1000 - 1300	(s)
J. Nitro $\text{N} = \text{O}$	1550 - 1350	(s)
k. Halides		
	F.	(s)
	Cl	(s)
	Br	(s)
	785 - 540	(s)
	< 667	(s)

TABLE - 2
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)		
1° Alkyl, RCH ₃	0.8 - 1.0		
2° Alkyl, RCH ₂ R	1.2 - 1.4		
3° Alkyl R ₃ CH	1.4 - 1.7		
Allylic, R ₂ C = C - CH ₂ R	1.6 - 1.9	Ester R - C(=O) - O - CH ₂ - R	4 to 4.5
Benzylic, ArCH ₂	2.2 - 2.5		
Alkyl chloride RCH ₂ Cl	3.6 - 3.8		
Alkyl bromide, RCH ₂ Br	3.4 - 3.6		
Alkyl iodide, RCH ₂ I	3.1 - 3.3		
Ether, ROCH ₂ R	3.3 - 3.9		
Alcohol, HOCH ₂ R	3.3 - 4.0		
Ketone, RC(=O)CH ₂ -	2.1 - 2.6	R-C(=O)-CH ₂ -	2.4 δ
		R-C(=O)-CH-	2.5 δ
Aldehyde, RCH=O	9.5 - 9.0		
Vinyllic, R ₂ C = CH ₂	4.6 - 5.0		
Vinyllic R ₂ C = CH	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 ^a		
Carboxylic, RCOOH	10 - 13 ^a		
Phenolic, ArOH	4.5 - 7.7 ^a		
Amino R-NH ₂	1.0 - 5.0		

^aThe 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 ₂	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)	6) - Cl	α 15 nm
2) Each extra conjugation	30 nm	7) - OH, -OR	β 12 nm
3) Homoannular	39 nm	8) - SR	α 35 nm
4) Substituents		9) - NR ₂	β 30 nm
a) Alkyl group at α	10 nm		β 85 nm
b) Alkyl group at β	12 nm		β 95 nm
c) Alkyl group at γ , δ & higher	18 nm		
5) Exocyclic double bond	05 nm		



Total No. of Questions : 5]

SEAT No. :

P5015

[Total No. of Pages : 2

[5822]-736

T.Y. B.Sc.

CHEMISTRY

CH - 608 : Organic Chemistry - III

(2019 Pattern) (CBCS) (Semester - VI) (36138)

Time : 2 Hours]

[Max. Marks : 35


Instructions to the candidates:

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

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

- a) What is synthon?
- b) Define isoprene rule.
- c) How sodium borohydride is prepared?
- d) What is carbanion?
- e) Give the structure of $\text{Li}(\text{BuO})_3\text{AlH}$.
- f) What is Michael reaction?

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

- i) Write the retrosynthesis and synthesis of 
- ii) Explain Simmon's Smith rearrangement with mechanism.
- iii) Write synthesis of Citral from methyl heptenone.

b) Answer the following : [4]

- i) Write applications of Lithium Aluminium hydride.
- ii) Give classification of terpenoids.

P.T.O.

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

- i) Write mechanism involved in cis-hydroxylation reaction of alkene.
- ii) What are alkaloids? Give general properties of alkaloids.
- iii) Discuss Hofmann rearrangement with mechanism.

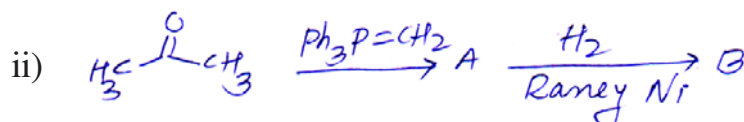
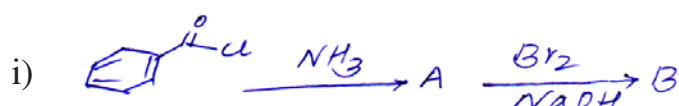
b) Answer the following : [4]

- i) How will you prove presence of benzene ring in ephidrene?
- ii) Give the methods of generation of carbenes.

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

- i) What is reduction? Give two applications of Raney Ni.
- ii) Give source, uses and properties of ephidrene.
- iii) What is oxidation? Explain mechanism involved in oxidation by using SeO_2 .

b) Identify A & B rewrite the reaction : [4]



Q5) Attempt any four of following : [10]

- a) Explain Wittig reaction with mechanism.
- b) What is benzyne? How will you prepare benzyne.
- c) Write disconnection approach and synthesis of benzyl benzoate.
- d) Write short note on Wolff rearrangement.
- e) Give structure and applications of DDQ.
- f) Write note on target molecule and disconnection.



Total No. of Questions : 5]

SEAT No. :

P5016

[Total No. of Pages : 2

[5822]-737

T.Y. B.Sc.

CHEMISTRY

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

(CBCS) (2019 Pattern) (Semester - VI) (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 euqal 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 the role of soil organism?
- b) Explain the term fertility of soil.
- c) What is soil testing?
- d) When to collect Soil sample?
- e) What is Manure?
- f) Explain the term nano-pesticides.

Q2) a) Answer any two of the following.

[6]

- i) What are Insecticides? Give classification of insecticides on the basis of mode of action.
- ii) What is Soil structure? Explain various types of Soil structures with suitable diagrams.
- iii) Explain factors affecting the composition of FYM.

P.T.O.

- b) What is Green manuring? Explain its characteristics, advantages and disadvantages. [4]

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

- i) Draw a diagram of sampling pattern for collecting a representative soil sample and explain how to collect sample.
 - ii) What are the essential requirements of good fertilizer and classify fertilizers on various basis.
 - iii) What are the advantages of use of nanopesticides over conventional pesticides?
- b) What is FYM? Explain in detail the french method of preparing FYM.[4]

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

- a) Explain difference between surface Soil and sub soil.
 - b) Explain how soil sample is prepared for analysis of various parameters?
 - c) What are the advantages and disadvantages of vermicomposting?
- B) Explain the term alkali soil and describe different methods for reclamation of alkali soil. [4]

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

- a) Ion exchange capacity of soil.
- b) Gobar gas.
- c) Application of fertilizer in solid form.
- d) Fungicides
- e) Biofertilizers.
- f) Effects of vermicompost on soil fertility.



Total No. of Questions : 5]

SEAT No. :

P5017

[Total No. of Pages : 2

[5822]-738

T.Y. B.Sc.

CHEMISTRY

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Solve any Three questions from Q.2 to Q.5.*
- 3) *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) Give statement of Locard's Exchange Principle.
- b) Define Narcotic Drugs.
- c) What is long form of I.B.?
- d) Draw the structure of Paracetamol
- e) Define Forensic Science.
- f) Give long form of 'W.A.D.A.'

Q2) a) Answer any Two of the following :

[6]

- i) What are natural and semisynthetic drugs? Give examples.
- ii) What are the duties of forensic scientist?
- iii) Explain how TLC is used for testing of narcotic drugs.

b) Answer the following :

[4]

- i) What is Dope test?
- ii) What are the responsibilities of Forensic Scientist?

P.T.O.

- Q3) a) Attempt any Two of the following : [6]**
- i) What are stimulant? Give example and Symptoms of use.
 - ii) Give the functions of forensic science.
 - iii) As per NDPS Act, when a crime is decided?
- b) Answer the following : [4]**
- i) How searching of dwelling done in NDPS cases?
 - ii) Define Hallucinogens. Give example.
- Q4) a) Explain any Two of the following : [6]**
- i) Explain urine analysis in NDPS case.
 - ii) What are the factors affecting crime scene?
 - iii) How clandestine drug laboratories investigated?
- b) Answer the following : [4]**
- i) Give the statements of “law of individuality” and “law of exchange”.
 - ii) Define “addiction” and “tolerance”.
- Q5) Write short notes on any four of the following : [10]**
- a) History of forensic science.
 - b) Hallucinogen Designer Drug.
 - c) Microcrystalline Test.
 - d) Punishment in NDPS Act.
 - e) Need of Forensic Science.
 - f) Collection and Preservation of drug evidence.



Total No. of Questions : 5]

SEAT No. :

P5018

[Total No. of Pages : 2

[5822]-739

T.Y. B.Sc.

CHEMISTRY

CH - 611 (A) : Analytical Chemistry - II

(2019 Pattern) (CBCS) (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) 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 following : [5]

- a) Define chromatography?
- b) Gives the Boltzmann's equation in FES.
- c) Calculate distribution ratio when concentration of solute in aqueous phase was 0.25M and in organic phase concentration of solute is 0.50M.
- d) Give any two type of detector system in HPLC.
- e) Define 'retention time'.
- f) Define 'Nebulization' in AAS.

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

- i) Distinguish between AAS and FES.
 - ii) Discuss flame ionization detector in Gas chromatography.
 - iii) Classify different types of chromatography describing the stationary & mobile phase used.
- b) A metal chelate was extracted 80% when equal volumes of aqueous and organic phases were shaken. What will be the % extraction if [4]
- i) Volumes of organic layer is doubled?
 - ii) Volume of organic layer is halved?

P.T.O.

- Q3)** a) Answer any two of following : [6]
- i) Draw a block diagram of flame photometer.
 - ii) Mention the components of Gas chromatogram.
 - iii) How will estimate Ca and Mg in water by AAS.
- b) Calculate the number of theoretical plates and HETP for 45cm long column used to obtain the chromatogram. peak obtained at $t = 55$ seconds and has width of 9.1 seconds. [4]
- Q4)** a) Answer any two among the following : [6]
- i) Write briefly about practical procedure used in HPLC.
 - ii) What is longitudinal diffusion in van-Deemter equation.
 - iii) What is principle of flame photometry.
- b) Solve the problem. [4]
- 5 grams of organic substance is present in 100 ml of aqueous solution. How much of it would be left after extracting the solution with two successive applications of 50ml ether. The distribution ratio of extraction is 2.
- Q5)** Write a short notes on any four of the following : [10]
- a) Relationship between distribution ratio and distribution coefficient.
 - b) Pumping system of HPLC.
 - c) Principle underlying Gas chromatography.
 - d) Theoretical plates.
 - e) Advantages and disadvantages of premix burners.
 - f) Qualitative and Quantitative applications of FES.



Total No. of Questions : 5]

SEAT No. :

P5019

[Total No. of Pages : 2

[5822]-740

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

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

- a) Define cosmetics.
- b) Which extraction method is used to isolate eucalyptus oil from eucalyptus leaves?
- c) Which organization regulates the manufacture of cosmetics in India?
- d) Define antiperspirants.
- e) Who can import cosmetics into India?
- f) Who issues the manufacturing license for cosmetics in India?

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

- i) Discuss colours used in preparation of cosmetics.
- ii) Give brief of cosmetics for hair.
- iii) Give the structure of α - santalol and β - santalol.
- iv) Explain the terms GRAS and GNRAS.

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

- i) Write any two uses of Jasmene.
- ii) What is meant by legal manufacturer or brand owner?

P.T.O.

- Q3) a) Attempt any two of the following : [6]**
- i) What are the three main classes of cosmetics.
 - ii) Give the list of documents required for grant of registration certificate for import of cosmetics in India.
 - iii) Give the methods of purification of essential oil.
- b) Answer the following : [4]**
- i) Which are the cosmetics for nails.
 - ii) What is new cosmetic? What is the procedure for prior permission for import or manufacture of new cosmetic in India.
- Q4) a) Attempt any two of the following : [6]**
- i) Write the special label requirements for hair dyes containing dyes, colours and pigments.
 - ii) Give classification of cosmetics in detail.
 - iii) Write any three uses of sandal wood oil.
- b) Discuss in detail the sources of fragrances. [4]**
- Q5) Write short notes (any four) : [10]**
- a) Preservatives used in cosmetics
 - b) Skin creams
 - c) Notes in perfumes
 - d) Geraniol
 - e) Civetone
 - f) Functions of CDSCO



Total No. of Questions : 5]

SEAT No. :

P5020

[Total No. of Pages : 2

[5822]-741

T.Y. B.Sc.

BOTANY

**BO - 361 : Plant Physiology and Metabolism
(CBCS) (2019 Pattern) (Paper - I) (Semester - VI) (36141)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any 3 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 labelled diagrams wherever necessary.*

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

- a) What is ionophores?
- b) What is pigment system?
- c) Who discovered tricarboxylic acid pathways?
- d) What is photoreception?
- e) What is Girdling?
- f) Define Graha.

Q2) a) Give practical application of cytokinesis. **[6]**

b) Explain the role of micronutrients. **[4]**

Q3) a) Describe pentose phosphate pathway. **[6]**

b) Explain the Girdling experiment. **[4]**

Q4) a) Describe non-cyclic photophosphortlation. **[6]**

b) Explain the role and functions of phytochrome. **[4]**

P.T.O.

Q5) Write short notes on any four of the following.

[10]

- a) Significance of photorespiration.
- b) Explain the physiological role of ethylene.
- c) Aerobic Respiration
- d) Carotenoids
- e) Pressure flow Model
- f) Photomorphogenesis



Total No. of Questions : 5]

SEAT No. :

P5021

[Total No. of Pages : 2

[5822]-742

T.Y. B.Sc.

BOTANY

BO - 362 : Biochemistry

(CBCS) (2019 Pattern) (Paper - II) (Semester - VI) (36142)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any 3 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 labelled diagrams wherever necessary.*

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

- a) Write two functional groups of biomolecules.
- b) What is weak interactions of water?
- c) Define amino acid
- d) What is holoenzyme?
- e) Write two examples of polysaccharides.
- f) Write two functions of vitamins.

Q2) a) Describe classification of amino acids. **[6]**

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

Q3) a) Describe various factors affecting on enzyme activities. **[6]**

b) Explain Miller and Urey's experiment. **[4]**

Q4) a) Describe functions of carbohydrates. **[6]**

b) Explain monosaccharides. **[4]**

P.T.O.

Q5) Write short notes on any four of the following :

[10]

- a) Biomolecules
- b) Structure of water molecule
- c) Properties of lipids
- d) Induced fit model
- e) Secondary structure of protein
- f) Oligosaccharides



Total No. of Questions : 5]

SEAT No. :

P5022

[Total No. of Pages : 2

[5822]-743

T.Y. B.Sc.

BOTANY

BO - 363 : Plant Pathology

(CBCS) (2019 Pattern) (Semester - VI) (36143)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Define the host.
- b) What is full form of IARI?
- c) What is infection?
- d) What is defence mechanism?
- e) What is sanitation?
- f) Give the basic concept of eradication.

Q2) a) Write a note on contribution of Anton de Bary. **[6]**

b) Describe the preexisting chemical defence mechanism in plants. **[4]**

Q3) a) Describe any microscopic methods of studying plant disease. **[6]**

b) Describe the causal organism, symptoms and disease management of Black arm of cotton. **[4]**

P.T.O.

- Q4)** a) Describe the abiotic causes of non-parasitic diseases with examples.[6]
b) Describe the nematodes as plant pathogen. [4]

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

- a) Management of anthonomosis.
- b) Biological control.
- c) Process of penetration
- d) Induced structural defence in plants.
- e) Give any two fungal diseases of plants.
- f) Pour plate method.



Total No. of Questions : 5]

SEAT No. :

P5023

[Total No. of Pages : 2

[5822]-744

T.Y. B.Sc.

BOTANY

BO-364 : Evolution & Population Genetics

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

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 right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*

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

- a) What is geological time of scale?
- b) Define Mendelian population.
- c) Define sympatric speciation.
- d) What is organic evolution.
- e) Write any two characters which can be used for indirect evidences of evolution.
- f) Write a name of theory which written by Lamark.

Q2) a) What is fossils and fossilization? Give the process of fossilization. **[6]**

b) Write a note on theory of natural selection. **[4]**

Q3) a) What is allopatric speciation? Write any one example of allopatric speciation. **[6]**

b) What is direct evidences of evolution elaborate any one example of it. **[4]**

P.T.O.

Q4) a) Write a note on Oparin's coacervate model. [6]

b) Write a note on organic evolution. [4]

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

a) Write a note on Gaia Hypothesis.

b) Write a note on origin of Genetic code.

c) Give any one example of evolution evidences from genetics.

d) What is mechanical isolation?

e) Write a note on genetic polymorphism.

f) What is Hardy-weinberg law of gene frequencies? Write it's equation.



Total No. of Questions : 5]

SEAT No. :

P5024

[Total No. of Pages : 2

[5822]-745

T.Y. B.Sc.

BOTANY

**BO 365 : Advanced Plant Biotechnology (Paper - V)
(2019 Pattern) (CBCS) (Semester - VI) (36145)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Define medicinal Biotechnology.
- b) What is an explant?
- c) Define nucleases.
- d) What is electroporation?
- e) Define seed bank.
- f) Enlist microorganisms used in fermentation.

Q2) a) Write brief account of patenting of Biotechnological inventions. **[6]**

b) Discuss approaches for germplasm conservation. **[4]**

Q3) a) What is organogenesis? Explain in short, indirect organogenesis. **[6]**

b) Explain role of different substrates used in fermentation. **[4]**

P.T.O.

Q4) a) What is indirect gene transfer? Add a note on Agrobacterium mediated gene transfer. [6]

b) Give a detailed account of beer production. [4]

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

a) Nanofertilizers.

b) Metabolic engineering of cyclodextrins.

c) Marketing of banana.

d) Cryoprotective agents.

e) Role of Cytokinins in plant tissue culture.

f) Genetically modified organisms.



Total No. of Questions : 5]

SEAT No. :

P5025

[Total No. of Pages : 2

[5822]-746

T.Y. B.Sc.

BOTANY (Paper - VI)

**BO 366 : Plant Breeding and Seed Technology
(2019 Pattern) (CBCS) (Semester - 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 indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*

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

- a) Define Acclimatization.
- b) Give any two scopes of plant breeding.
- c) Define rouging.
- d) Give objectives of hybridization.
- e) What is Breeder's seed?
- f) What is seed legislation?

Q2) a) Mention methods of hybridization. Explain procedure of bulk method of hybridization. **[6]**

b) Give steps involved in seed production. **[4]**

Q3) a) What is mutation? Give applications of mutation breeding. **[6]**

b) Write about pureline selection method. **[4]**

P.T.O.

- Q4)** a) Define Germination Testing. Write methods of Germination Testing. [6]
b) What is plant introduction? Give procedure of plant introduction. [4]

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

- a) Applications of tissue culture.
- b) Phases of seed certification.
- c) Seed borne bacteria.
- d) Sanitization of seed.
- e) Hybrid Vigour and Heterosis.
- f) Physical Purity Analysis.



Total No. of Questions : 5]

SEAT No. :

P5026

[Total No. of Pages : 2

[5822]-747

T.Y. B.Sc.

BOTANY

**BO-3610 : Nursery and Gardening Management
(2019 Pattern) (CBCS) (Semester - VI) (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) *Questions 2 to 5 carry equal marks.*
- 4) *Figurest to the right indicates full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*

Q1) Solve any five of the following :

[5]

- a) What is Plant Nursery?
- b) Define seed bank.
- c) What is plant hardening?
- d) Define sexual propogation.
- e) What is home gardening?
- f) What is nutritional value of carrat?

Q2) a) How cuttings are managed? Explain method of hardening of plants.[6]

b) Write note on Nursery classification. **[4]**

Q3) a) Give detail account on important garden operations. **[6]**

b) Explain methods of seed testing & seed certification. **[4]**

P.T.O.

- Q4)** a) Give detail account on cultivation & disease management of onion.[6]
b) Write note on Green houses and mist chamber. [4]

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

- a) Write various principles of garden development.
- b) Write note on Air layering.
- c) Comment on Seed Storage.
- d) Write note on propagating materials for vegetables.
- e) Write note on Nursery Beds.
- f) Comment on Diseases and pests of Cabbage.



Total No. of Questions : 5]

SEAT No. :

P5027

[Total No. of Pages : 2

[5822]-748

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

BOTANY

BO-3611 : Biofertilizers

(2019 Pattern) (CBCS) (Paper - XI) (361411)

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 mycorrhiza
- b) Name any two algae used as biofertilizers.
- c) Define symbiotic association.
- d) What are green manures.
- e) What does mean by PSB.
- f) Write name of carriers used in biofertilizers.

Q2) a) What is the isolation process of Rhizobium? **[6]**

b) Write down types of mycorrhiza. **[4]**

Q3) a) Write a note on benefits of vermicomposting. **[6]**

b) Comment on BGA in rice cultivation. **[4]**

Q4) a) Write a note on green manure? **[6]**

b) Explain carrier based inoculants? **[4]**

P.T.O.

Q5) Write short notes on any four of the following :

[10]

- a) VAM
- b) Vermicomposting
- c) Organic farming
- d) Root nodules
- e) Rhizobia bacteria
- f) Algal biofertilizers



Total No. of Questions : 5]

SEAT No. :

P5028

[Total No. of Pages : 2

[5822]-749

T.Y. B.Sc.

ZOOLOGY

ZO-361 : Medical & Forensic Zoology

(2019 Pattern) (CBCS) (Semester - VI) (Paper - I) (36151)

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 hypertension?
- b) What is Diabetes?
- c) Explain the term forensic entomology.
- d) Define injury.
- e) What is Death?
- f) What is mummification?

Q2) a) Describe early post mortem changes. [6]

OR

What is renal failure? Explain its causes.

b) What is obesity? Explain its causes. [4]

Q3) a) What is hypotension? Describe its symptoms & treatment. [6]

OR

Discuss the preventive measures & treatment of Hepatitis.

b) Give an account of Forensic laboratories in India. [4]

P.T.O.

Q4) a) Give an account of diff. forms of poisons. [6]

OR

Describe the constituent of urine.

b) Describe forensic importance of insects. [4]

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

- a) Post mortem samples
- b) Forensic medicine
- c) Dialysis
- d) Radioactive poisons
- e) Applications of forensic zoology
- f) Biological traces at crime scene



Total No. of Questions : 5]

SEAT No. :

P5029

[Total No. of Pages : 2

[5822]-750

T.Y. B.Sc.

ZOOLOGY

ZO - 362 : Animal Physiology

(CBCS) (2019 Pattern) (Paper - II) (Semester - VI) (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 Digestion
- b) What is Respiration
- c) Function of blood
- d) What is systole?
- e) What is Sacrolemma?
- f) Write the name of male sex hormone.

Q2) a) Draw the well labelled diagram of internal structure of human heart & describe it. **[6]**

OR

Describe the Inspiration & Expiration process of respiration.

b) Draw the well labelled diagram of uriniferous tubule. **[4]**

Q3) a) Explain the mechanism of urine formation. **[6]**

OR

Define vitamin. Explain the source and function of fat soluble vitamin.

b) Write note on chloride shift. **[4]**

P.T.O.

Q4) a) Discuss the hormonal control of Menstrual cycle. [6]

OR

Discuss the hormones secreted by adenohypophysis.

b) Write the mechanism of sliding filament theory. [4]

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

a) Carbohydrates and protein absorption in digestive tract.

b) Pacemaker

c) Haemoglobin as respiratory pigment

d) Function of parathyroid gland

e) Cardiac muscle

f) Adrenocorticoids hormone



Total No. of Questions : 5]

SEAT No. :

P5030

[Total No. of Pages : 2

[5822]-751

T.Y. B.Sc.

ZOOLOGY

ZO - 363 : Molecular Biology

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

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) Define leading strand
- b) Mention the radio active isotopes used in Hershey and chase Experiment.
- c) Define Nucleotide
- d) Mention the function of operator gene
- e) Define Nucleosomes?
- f) State any two examples of Restriction Enzyme.

Q2) a) Explain the structure of Watson and crick model of DNA. **[6]**

OR

Explain Meselson and stahl experiment.

- b) Explain the process of termination of transcription in prokaryotes. **[4]**

Q3) a) Describe the process of protein synthesis. **[6]**

OR

Describe photorepair mechanism and base excision repair mechanism in detail.

- b) Describe the different enzymes involved in replication. **[4]**

P.T.O.

Q4) a) Discuss the steps involved in PCR. [6]

OR

Discuss Griffith's experiment of transforming principle.

b) Explain the significance of Helicase and single stranded binding proteins in replication. [4]

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

- a) Structural gene in Lac operon
- b) Distinguish between DNA and RNA
- c) Charging of tRNA
- d) Euchromatin and Heterochromatin
- e) Histones and Nonhistones
- f) Promoter sequence in E.coli.



Total No. of Questions : 5]

SEAT No. :

P5031

[Total No. of Pages : 2

[5822]-752

T.Y. B.Sc.

ZOOLOGY

ZO-364 : Entomology

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Define Entomology
- b) Explain hamuli
- c) Define holometabolus
- d) Explain compound eye
- e) Functions of Antenna
- f) Describe Integument

Q2) a) Describe the characteristics of class Insecta. **[6]**

OR

Describe the morphological structure of Insect.

b) Explain piercing & sucking type of mouth parts. **[4]**

Q3) a) Describe the Digestive system of Grasshopper. **[6]**

OR

Describe economic importance of Insects.

b) Describe polymorphism in social insects with suitable example. **[4]**

P.T.O.

Q4) a) Define Insect ecology, add note of abiotic factors. [6]

OR

Describe leg modification in insects.

b) Define metamorphosis & its types. [4]

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

a) Describe eusocial relation in insects.

b) Insect as a vectors.

c) Tracheal system in insect.

d) Mimicry in insects.

e) Wing modification in insects.

f) Insects head & its orientation.



Total No. of Questions : 5]

SEAT No. :

P5032

[Total No. of Pages : 2

[5822]-753

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

ZOOLOGY

ZO- 365 : Techniques in Biology

(2019 Pattern) (CBCS) (Paper V) (36155)

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 Dehydration.
- b) What is Embedding ?
- c) What is Expanded form of SEM ?
- d) Define Monoclonal Antibodies.
- e) Define Biodiversity Index.
- f) What is Binocular ?

Q2) a) What is Magnification ? Explain it's types. [6]

OR

What is Antigen - Antibody interaction ? Explain chemical bonds responsible for Antigen Antibody reaction.

b) What is clearing agent ? [4]

Q3) a) Define Fixative and it's types with examples. [6]

OR

What is GPS ? Explain working system of GPS and uses.

P.T.O.

b) What is section cutting in Histological techniques. [4]

Q4) a) Explain types of sampling methods and sample size. [6]

OR

What is digital camera ? Enlist it's Features.

b) Explain the process of mounting and spreading of Ribbon. [4]

Q5) Write a short note on any Four : [10]

- a) Quadrant Sampling.
- b) A fixation.
- c) Clotting time.
- d) Principle of PCR.
- e) Sampling methodology for DNA Barcoding.
- f) Principle of WBC count.

↖ ↖ ↖

Total No. of Questions : 5]

SEAT No. :

P5033

[Total No. of Pages : 2

[5822]-754

T.Y. B.Sc.

ZOOLOGY

ZO - 366 : Evolutionary Biology

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

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

- a) What is Biogenesis?
- b) Define Palaeontology
- c) What is gene frequency?
- d) Define Mutagens.
- e) Define speciation.
- f) Define Directional selection.

Q2) a) Describe primitive living organisms. **[6]**

OR

Describe Homology as an evolutionary evidence.

b) Describe Natural selection. **[4]**

Q3) a) Explain isolating Mechanism. **[6]**

OR

Explain pattern's of speciation.

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

P.T.O.

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

OR

Discuss Australian Realm

b) Give top five mass extinctions. [4]

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

- a) Genetic drift
- b) Mutagenic agents
- c) Types of fossils
- d) Habitat isolation
- e) Bottle neck phenomenon
- f) Recombinations



Total No. of Questions : 5]

SEAT No. :

P5034

[Total No. of Pages : 2

[5822]-755

T.Y. B.Sc.

ZOOLOGY

ZO - 3610 : Environmental Impact Assessment

(2019 Pattern) (CBCS) (Paper - VII) (Semester - VI) (361510)

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) Define sustainable development.
- b) What is EIA?
- c) What is pollutant?
- d) Define IAA.
- e) Enlist types of pollution.
- f) What is IAA?

Q2) a) Describe exploitation of Natural resources. **[6]**

OR

Describe various pillars of sustainability.

b) Write a note on project level EIA. **[4]**

Q3) a) What is Water Pollution? Describe Water Pollution Act 1974. **[6]**

OR

Describe Environment Protection Act 1986.

b) Describe role of MPCB. **[4]**

P.T.O.

Q4) a) Describe Regional EIA and sectoral EIA. [6]

OR

Describe Biological Diversity Act 2002.

b) Describe the term Rapid and comprehensive EIA. [4]

Q5) Write short notes on any Four : [10]

- a) Importance of Environment.
- b) Effect of Air Pollution.
- c) Evolution of EIA.
- d) Monitoring and Clearance of EIA.
- e) National Green Tribunal Act 2010.
- f) Components of Environment.



Total No. of Questions : 5]

SEAT No. :

P5035

[Total No. of Pages : 2

[5822]-756

T.Y. B.Sc.

GEOLOGY (Paper - I)

GL-321 : Geology of India - II

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

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 Nos. 2 to 5 carry equal marks.*

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

- a) Five major mass extinctions.
- b) Kara Koram Granite Batholith.
- c) How Silurian system derived its name?
- d) Give Golden age of fish.
- e) Give flora and fauna of Devonian.
- f) Permo - Triassic boundary.

Q2) Answer the following :

- a) Ternary classification of Gondwana. **[6]**
- b) Cretaceous of Narmada. **[4]**

Q3) Answer the following :

- a) Classification of Siwalik. **[6]**
- b) Palaeozoic life. **[4]**

P.T.O.

Q4) Answer the following :

- a) Classification and lithology of Deccan trap. [6]
- b) Marine transgression and Regression. [4]

Q5) Write notes on (Any Five) : [10]

- a) Muth quartzite
- b) Age of Deccan Trap
- c) Stratigraphy of Maharashtra
- d) Trans Himalayan range
- e) Classification of kutchh
- f) Economic importance of Jurassic of Rajesthan



Total No. of Questions : 5]

SEAT No. :

P5036

[Total No. of Pages : 2

[5822]-757

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) *Question Nos. 2 to 5 carry equal marks.*

Q1) Answer the following in 2-3 sentences (Any 5) :

[5]

- a) Define ore mineral.
- b) What is prospecting?
- c) What are Gossans?
- d) Define pathfinder elements.
- e) What is channel sampling?
- f) What is strip mining.

Q2) Answer the following :

- a) Gravimeter method of mineral prospecting.
- b) Objectives of National Mineral Policy.

[6]

[4]

Q3) Answer the following :

- a) Geobotanical prospecting.
- b) Polygonal method of ore reserve estimation.

[6]

[4]

P.T.O.

Q4) Answer the following :

a) Describe Open Cast mining. [6]

b) Explain Grab sampling and pan sampling. [4]

Q5) Answer any 4 of the following : [10]

a) Structural guides in mineral prospecting.

b) Applications of electrical method of prospecting.

c) Basic principles of ore reserve estimation.

d) What is 'Pitting' in mining?

e) Core sample.



Total No. of Questions : 5]

SEAT No. :

P5037

[Total No. of Pages : 2

[5822]-758

T.Y. B.Sc.

GEOLOGY

GL - 323 : Oceanography

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

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

[5]

- a) Define Leewin current.
- b) Name any two Indian Ocean currents.
- c) Define salinity.
- d) Define spit.
- e) What are coastal Regulation zones?
- f) Enlist the Hand structural options for coastal conservation methods.

Q2) Answer the following :

[10]

- a) Explain the processes affecting sea level. **[6]**
- b) Explain the various features of erosional shores. **[4]**

Q3) Answer the following :

- a) Explain the main components of Ocean surface Circulation. **[6]**
- b) What are El-Nino and La-Nina events. **[4]**

P.T.O.

Q4) Answer the following :

- a) Give the prohibited activities within CRZ & Regulation of permissible activities in CRZ. **[6]**
- b) Explain the various features of dispositional shores. **[4]**

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

- a) Processes that decrease seawater salinity.
- b) Tectonic movements responsible of changes in sea level.
- c) Mechanism of sand movements perpendicular to the shoreline.
- d) Mechanism of sand movements parallel to the shoreline.
- e) Salinity variation with depth.
- f) Major dissolved components in seawater.



Total No. of Questions : 5]

SEAT No. :

P5038

[Total No. of Pages : 2

[5822]-759

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 No. 2 to 5 carry equal marks.*

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

- a) Enlist physical properties of crude oil.
- b) Enlist modes of Hydrocarbon occurrences.
- c) What is kerogene?
- d) Different examples of source rock.
- e) What is Bottom water?
- f) Composition of petroleum.

Q2) Answer the following :

- a) Explain in detail any one structural trap. **[6]**
- b) Explain origin of oil field brines. **[4]**

Q3) Answer the following :

- a) Explain seepages and mud volcanoes as crude occurrences. **[6]**
- b) Composition of natural gas. **[4]**

P.T.O.

Q4) Answer the following :

- a) Krishna-Godavari petroliferous basin. [6]
- b) Salt dome as hydrocarbon trap. [4]

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

- a) Bombay basin
- b) Kerogene
- c) Sprabery petroliferous basin of U.S.A.
- d) Recycled oil
- e) Secondary migration
- f) Reservoir water



Total No. of Questions : 5]

SEAT No. :

P5039

[Total No. of Pages : 2

[5822]-760

T.Y. B.Sc.

GEOLOGY

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

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 questions in 2-3 lines (any 5) : **[5]**

- a) What are the different layers of the atmosphere?
- b) What are the common components of climate models?
- c) What are the three main elements of Milankovitch cyclicality?
- d) What is the exact time period of 'Indian Summer Monsoon'?
- e) What is Cyclone?
- f) What is agro-climatic zone?

Q2) Answer the following :

- a) What are Milankovitch cycles? And how they controls the Earth's climate? **[6]**
- b) What are greenhouse gases? And how they affects the Earth's climate?**[4]**

Q3) Answer the following :

- a) What is the role of climate in landscape evolution? **[6]**
- b) Enlist the cyclones which had been struck to Indian West and East coast in recent years. **[4]**

P.T.O.

Q4) Answer the following :

- a) Explain the composition and structure of the atmosphere. [6]
- b) Explain the use of climate precise in paleo-climatology. [4]

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

- a) Atmosphere
- b) Atmospheric hazards related to climate change.
- c) El-Nino
- d) Agro-climatic divisions of peninsular India.
- e) Climate indicators
- f) Floods



Total No. of Questions : 5]

SEAT No. :

P5040

[Total No. of Pages : 2

[5822]-761

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

GEOLOGY

GL - 326 : Geological Field Methods & Mapping

(2019 Pattern) (36166)

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 No. 2 to 5 carry equal marks.*

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

- a) Define degree sheet.
- b) Define planimetric map.
- c) What is fore bearing.
- d) What is brunton compass.
- e) What is lineation.
- f) What is meant by navigation?

Q2) Answer the following :

- a) Explain Toposheet reading. **[6]**
- b) Explain procedure of field bearing. **[4]**

Q3) Answer the following :

- a) Explain sampling procedure. **[6]**
- b) Explain labelling procedure. **[4]**

P.T.O.

Q4) Answer the following :

- a) Explain different type of lithological contact. [6]
- b) What is base map? Explain its uses. [4]

Q5) Write notes on any Five of the following : [10]

- a) Field correlation.
- b) Conventional signs on toposheet.
- c) GPS.
- d) Geological field work.
- e) Field equipments.
- f) Litholog.



Total No. of Questions : 5]

SEAT No. :

P5041

[Total No. of Pages : 2

[5822]-762

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 five) : **[5]**

- a) What is black body?
- b) What is Passive Remote Sensing?
- c) What is IRS?
- d) What is vertical photography?
- e) Uses of aerial photography.
- f) Define Remote sensing.

Q2) Answer the following :

- a) Enlist the various photorecognition elements used while interpreting the aerial photographs. Explain any two of them. **[6]**
- b) Explain the types of remote sensing satellites with respect to the orbit characteristics. **[4]**

Q3) Answer the following :

- a) Explain interaction of Electromagnetic spectrum in atmosphere. **[6]**
- b) Give the classification of aerial photograph on the basis of film and filter combination. **[4]**

P.T.O.

Q4) Answer the following :

- a) Write the applications of Remote sensing in Groundwater survey. [6]
- b) Write a note on Mirror stereoscope and pocket stereoscope. [4]

Q5) Answer the following (Any four) : [10]

- a) What is overlap and side lap.
- b) Write note on Atmospheric window.
- c) Give the photographic characters of flood basalts.
- d) What is Tilt and Tip?
- e) Describe Hyperspectral scanner.
- f) Define sensor. Write two main types of sensor.



Total No. of Questions : 5]

SEAT No. :

P5042

[Total No. of Pages : 2

[5822]-763

T.Y. B.Sc.

GEOLOGY

SECIV : Oil Field Services

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Answer the following questions in 2-3 line (any 5) :

[5]

- a) Types of drilling rigs.
- b) What is LWD?
- c) What is exploratory well?
- d) What is directional drilling?
- e) What is GTO?
- f) What is composition of drilling mud.

Q2) Answer the following :

- a) What is drilling fluid? Explain its uses.
- b) What are drilling parameters?

[6]

[4]

Q3) Answer the following :

- a) Explain components of rotary drilling.
- b) What are well logging tools.

[6]

[4]

P.T.O.

Q4) Answer the following :

- a) What is core? Explain core drilling method. [6]
- b) Why monitoring of drilling process is necessary. [4]

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

- a) Caliper log
- b) Oil wells
- c) Drilling mud
- d) Mud properties
- e) Wire line logs
- f) Formation Testing



Total No. of Questions : 5]

SEAT No. :

P5043

[Total No. of Pages : 2

[5822]-764

T.Y. B.Sc.

GEOLOGY

GL - SEC V : Watershed Development

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

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 Nos. 2 to 5 carry equal marks.*

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

[5]

- a) Defined Watershed.
- b) Write any two principles of Watershed Management.
- c) Write any two objectives of Watershed Management.
- d) Write any two benefits of Watershed Management.
- e) What is Watershed Planning?
- f) What is Rainwater Harvesting?

Q2) Answer the following :

[10]

- a) Explain the basic concept of Watershed Development. **[6]**
- b) What are objectives of Watershed Development? **[4]**

Q3) Answer the following :

[10]

- a) Why the Watershed Development program is essential in India? **[6]**
- b) Write a short note on Rain Water Harvesting in brief. **[4]**

P.T.O.

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

- a) Preparation of action plan for watershed management. **[6]**
- b) How the NGO agencies are developing the Watershed Management Program? **[4]**

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

- a) Water Conservation.
- b) Types of Rainwater Harvesting.
- c) Watershed Delineation.
- d) Soil Erosion.
- e) Drought Management.
- f) Watershed Modeling.



Total No. of Questions : 4]

SEAT No. :

P5044

[Total No. of Pages : 2

[5822]-765

T.Y. B.Sc.

STATISTICS

ST - 361 : Distribution Theory - II

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

- a) Choose the correct alternative in each of the following : **[1 each]**
- i) If $X \sim L(1, 2)$, then the quartile deviation is
 - a) 0.8512
 - b) 0.6532
 - c) 0.2315
 - d) 0.3466
 - ii) If $X \sim W(\alpha, \beta)$, then the distribution of $Y = X^\beta$ is
 - a) Weibull
 - b) Exponential
 - c) Normal
 - d) Laplace
 - iii) If $(X, Y) \sim BN(2.54, 4.36, 25.3, 43.2, 0.95)$, then the marginal mean of X is
 - a) 4.36
 - b) 25.3
 - c) 2.54
 - d) 43.2
- b) State whether **each** of the following statements is true or false : **[1 each]**
- i) Lognormal distribution is a positively skewed distribution.
 - ii) Laplace distribution is a mesokurtic distribution.

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

[5 each]

- a) Let $(X, Y) \sim BN(3.1, 2.8, 16, 25, 0.75)$, find the conditional variance of $(Y|X = 5)$ and the conditional variance of $(X|Y = 3)$.
- b) State the probability density function of normal distribution truncated above 'b'. Hence, derive its mean.
- c) Let $X \sim LN(\alpha, \mu, \sigma^2)$, find the first quartile of the distribution.

P.T.O.

Q3) Attempt **any two** of the following :

[5 each]

- a) If $X \sim W(\alpha, \beta)$, find the distribution function of X and hence find the first quartile.
- b) Let X follows Pareto (λ) distribution. Derive its variance (if exists).
- c) If $X \sim L(\mu, \lambda)$, find mean deviation about mean of X.

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

- a)
 - i) Let $X \sim L(\mu, \lambda)$, then show that all odd ordered central moments are zero. **[6]**
 - ii) If $X \sim LN(\alpha, \mu, \sigma^2)$, then find the distribution of $Y = \log_e(X - a)$. **[4]**
- b)
 - i) If $(X, Y) \sim BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$, then show that $(aX + bY + c)$ follows normal distribution. **[5]**
 - ii) If $X \sim L(\mu, \lambda)$, find second raw moment using moment generating function. **[5]**



Total No. of Questions : 4]

SEAT No. :

P5045

[Total No. of Pages : 3

[5822]-766

T.Y. B.Sc. (STATISTICS)

ST - 362 : Testing of Hypotheses

(2019 Pattern) (CBCS) (Paper - II) (Semester - VI) (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 :

a) Choose the correct alternative in each of the following : [1 each]

- i) Let X be a random variable with probability density function (p.d.f.) $f(x, \theta)$. If $H_0 : \theta = \theta_0$ and $H_1 : \theta \neq \theta_0$, then
 - A) H_0 and H_1 both are simple hypotheses
 - B) H_0 and H_1 both are composite hypotheses
 - C) H_0 is simple hypothesis and H_1 is composite hypothesis
 - D) H_0 is composite hypothesis and H_1 is simple hypothesis
- ii) Which of the following test is considered as a test of goodness of fit?
 - A) Sign test
 - B) Mann-Whitney test
 - C) Kolmogorov-Smirnov test
 - D) t - test
- iii) Let X_1, X_2, \dots, X_n be a random sample of size n from a probability distribution with pmf or pdf $f(x, \theta)$, $\theta \in \Theta$. To test $H_0 : \theta \in \Theta_0$ against $H_1 : \theta \in \Theta - \Theta_0$, the likelihood ratio test is to reject H_0 iff

$$\lambda(\underline{x}) = \frac{\sup_{\theta \in \Theta_0} L(\theta, \underline{x})}{\sup_{\theta \in \Theta} L(\theta, \underline{x})} < c, \text{ where } c \text{ is a constant that can be}$$

determined so that size of the test is α . The value of c is

- A) $c < 0$
- B) $c > 1$
- C) $0 \leq c \leq 1$
- D) $c < 0$ or $c > 1$

P.T.O.

- b) State whether each of the following statements is true or false : **[1each]**
- Nonparametric methods utilizes measurements on interval and ratio scales.
 - The value of the likelihood ratio statistic close to one indicates that data supports the alternative hypothesis (H_0).

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

- Let X_1, X_2, \dots, X_n be a random sample from Poisson distribution with mean λ . Construct MP test of size α for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1, (\lambda_1 < \lambda_0)$.
- A fair coin is tossed to test the hypothesis $H_0 : P = \frac{1}{2}$ against $H_1 : P = \frac{3}{4}$, where P is the probability of getting head. Let X be the number of heads appear in 10 tosses. Reject H_0 if $X > 6$, find probability of type I error and power of the test.
- Construct likelihood ratio test of level of significance α for testing $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 = \sigma_1^2 (\sigma_1^2 > \sigma_0^2)$, where σ^2 is the variance of normal distribution with known mean μ based on random sample X_1, X_2, \dots, X_n drawn from it.

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

- Construct likelihood ratio test of level of significance α for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$, where μ is the mean of normal distribution with unknown variance σ^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.,

$$f(x, \theta) = \begin{cases} \binom{10}{x} \theta^x (1-\theta)^{10-x} & , x = 0, 1, \dots, 10; \quad 0 < \theta < 1 \\ 0 & , \text{ otherwise} \end{cases}$$

Find UMP test of level of significance α for testing the null hypothesis $H_0 : \theta = 0.4$ against $H_1 : \theta = \theta_1, (\theta_1 > 0.4)$. On the basis of single observation from the distribution of X .

- following is a random sample drawn from the continuous population in the order in which the observations are made :
75, 56, 44, 89, 95, 23, 32, 84, 77, 71, 88, 41.
Test the hypothesis of randomness of the sample. Use 5% level of significance.

Q4) Attempt any one of the following :

- a) I) Describe Mann-Whitney Test. **[4]**
- II) Let X_1, X_2, \dots, X_n be a random sample from an exponential distribution with mean θ . Find UMP test of level of significance α for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1, (\theta_1 > \theta_0)$. Is this remains UMP for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1, (\theta_1 < \theta_0)$? **[6]**
- b) I) Define the following terms **[1 each]**
- i) Test of hypothesis
 - ii) Simple hypothesis
 - iii) Level of the significance
 - iv) Power of the test
 - v) Type II error
- II) Steel rods produced by a certain company have a median length of 10 meters when the process is operating properly. A sample of 10 rods, randomly selected from the production line, yields the following observed lengths:
- 9.83, 10.09, 9.72, 9.87, 10.04, 9.95, 9.82, 9.73, 9.79, 9.90
- Assuming that lengths are symmetrically distributed about their median, test whether the process is operating properly. Use 5% l.o.s. **[5]**



Total No. of Questions : 4]

SEAT No. :

P5046

[Total No. of Pages : 3

[5822]-767

T.Y. B.Sc. (Regular)

STATISTICS

ST - 363 : Sampling Theory

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

- a) In each of the following cases, choose the correct alternative : [1 each]
 - i) In case of stratified random sampling with proportional allocation, the sample size from i^{th} stratum is proportional to
 - A) N_i
 - B) S_i
 - C) $\sqrt{c_i}$
 - D) c_i
 - ii) The number of simple random samples with replacement of size 5 from a population of 10 is
 - A) 15
 - B) 10^5
 - C) $\binom{10}{5}$
 - D) 5^{10}
 - iii) The important feature of systematic sampling is
 - A) The population size N is the exact multiple of sample size n .
 - B) The samples are non overlapping
 - C) It is a non random sampling.
 - D) It is always better than simple random sampling method

P.T.O.

- b) In each of the following, state whether the given statement is true or false : **[1 each]**
- i) In case of simple random sampling, probability of selecting a specific unit from a population on first draw is equal to that of selecting it on any other specific draw.
 - ii) Variance of estimator of population mean for proportional allocation is less than the variance of estimator of population mean in case of Neyman's allocation.

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

- a) 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 systematic sampling method is used.
- b) In case of SRSWOR, derive an expression for the unbiased estimator of the population variance (σ^2).
- c) Obtain the formula for the sample size under SRSWR so as to achieve the predetermined precision in the estimation of population proportion of a certain attribute, with a given confidence coefficient.

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

- a) Using usual notations show that, $\text{Var}(\bar{y})_{\text{SRS}} \geq \text{Var}(\bar{y})_{\text{SRSWOR}}$
- b) With Usual notations prove that systematic sampling is more efficient than SRSWOR if $\rho \leq -\frac{1}{N-1}$, where ρ is intra-class correlation coefficient.
- c) Derive an expression for the variance of the estimator \bar{y}_{st} of the population mean in the case of stratified random sampling when the optimum allocation is used.

Q4) Attempt any one of the following :

- a) i) A population of size 1000 is divided into 4 strata with sizes and standard deviations as follows : [5]

Stratum No.	Stratum Size (N_i)	Standard Deviation (S_i)
1	300	5
2	100	2
3	600	9

Determine the sample sizes under proportional allocation and Neyman's allocation if the total sample size is 200.

- ii) Describe regression estimator of population mean. State the regression estimator of the population mean and its variance. [5]
- b) i) State an expression for the variance of an unbiased estimator of the population mean in case of systematic sampling. Compare it with the variance of unbiased estimator of population mean of SRSWOR. [5]
- ii) State the salient features of a good questionnaire. [5]



Total No. of Questions : 4]

SEAT No. :

P5047

[Total No. of Pages : 3

[5822]-768

T.Y. B.Sc.

STATISTICS : (Principal)

ST 364 : Introduction to Survival Analysis
(36174) (2019 Pattern) (Paper-IV) (Semester - VI)

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.

- A) Choose the correct alternative in each of the following. **[1 each]**
- i. If $T \rightarrow Exp(\lambda = 3)$, then equilibrium distribution function $H_F(t)$ is given by
 - a) $H_F(t) = e^{-3t}; t > 0$
 - b) $H_F(t) = 3e^{-3t}; t > 0$
 - c) $H_F(t) = 1 - e^{-3t}; t > 0$
 - d) $H_F(t) = 1 - 3e^{-3t}; t > 0$
 - ii. If T is continuous non-negative random variable with cumulative hazard rate $R(t)$ then distribution of $R(t)$ is
 - a) Exponential with parameter 2
 - b) Exponential with parameter 10
 - c) Exponential with parameter 1
 - d) Exponential with parameter 1.5
 - iii. Censoring is the technique to reduce
 - a) Time of the experimentation
 - b) Efficiency of the experiment
 - c) Cost of the experiment
 - d) both a and b

P.T.O.

- B) State whether **each** of the following statement is true or false. [1 each]
- Empirical distribution function is the biased estimator of cumulative distribution function.
 - Constant mean residual life function is characteristic of no-ageing class of life distribution.

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

- If T follows the Weibull distribution with parameter λ and γ then show that T^γ has exponential distribution with parameter λ .
- State two definitions of Increasing failure rate (IFR) class of life distribution and show that both the definitions are equivalent.
- Prove the implications $NBUE \Rightarrow HNBUE$ and $DMRL \Rightarrow NBUE$

Q3) Attempt **any two** of the following.

- Explain the concept of no-ageing. Define mean residual life function and show that no-ageing is characterize by constant mean residual life function. [5]
- If T_1, T_2, \dots, T_n are independent random variables with $T_i \rightarrow \exp(\lambda_i)$ for $i = 1, 2, \dots, n$ then show that $T = \min \{T_1, T_2, \dots, T_n\}$ has exponential distribution with parameter $\sum_{i=1}^n \lambda_i$. [5]
- Define the following [2]
 - Cumulative hazard rate
 - Mean residual life function
 - Let T be the continuous random variable having distribution function $F(t)$ and hazard rare $r(t)$ then define the cumulative hazard rate $R(t)$ and prove that $\bar{F}(t) = \exp\{-R(t)\}$ [3]

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

- a) i) Let T_1, T_2, \dots, T_n is random sample of size n form the exponential distribution with parameter λ and in order to reduce the time of the experiment experimenter decided to terminate the experiment as soon as $m (<n)$ failure occurs. Find the maximum likelihood estimator of parameter of exponential distribution. Also, find the fisher information for the parameter. [5]
- ii) Obtain confidence band for the survival function. [5]
- b) i) Following table shows the annual failure and removals (censored) of fleet of 200 single engine aircraft. [7]

Year	No. of failures	No. of removals
1981	5	0
1982	10	1
1983	12	5
1984	8	2
1985	10	0
1986	15	6
1987	9	3
1988	8	1
1989	4	0
1990	3	1

Obtain actuarial Estimator of survival function.

- ii) Derive the hazard rate function for the proportional hazard family.[3]



Total No. of Questions : 4]

SEAT No. :

P5048

[Total No. of Pages : 3

[5822]-769

T.Y. B.Sc.

STATISTICS (CBCS)

ST 365A : Actuarial Statistics (36175)

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

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.

a) Choose the correct alternative in each of the following. **(1 each)**

i) The present value of n year annuity certain immediate is

A) $\frac{1-v^n}{d}$

B) $\frac{1-v^n}{i}$

C) $1-v^n$

D) $\frac{(1-v)}{i}$

ii) Which of the following relation is NOT true?

A) $d = iv$

B) $i = \frac{d}{1-d}$

C) $1-d = v$

D) $v = id$

iii) To study the random variable Z_{k+1} , we need information on following aspect

A) Loss function, depending on the insurance product

B) Force of mortality

C) Accumulated value of the benefit

D) Interest rate reflecting the financial status of the country

P.T.O.

- b) State whether **each** of the following statements is true or false. **(1 each)**
- i) If the payments are made at the beginning of each payment interval, then annuities are called annuity certain due.
 - ii) loss at issue random variable $l(k)$ is defined as accumulated value of future income - accumulated value of the future outgo

Q2) Attempt **any two** of the following. **(5 each)**

- a) Define the future life time random variable. Hence, obtain its probability distribution function.
- b) An aviary of birds which has a constant intake of 1500 new born birds per year experiences the following mortality rates:

x	0	1	2	3	4	5
q_x	0.3	0.1	0.2	0.4	0.7	1

What is the expected number of birds in the aviary at any time?

- c) Write a benefit function, present value function and present value random variable corresponding to 5-year endowment insurance when the benefit is payable at the end of year of death. Hence, obtain the net single premium for the same.

Q3) Attempt **any two** of the following. **(5 each)**

- a) Find the to which \$15000 accumulated at
 - i) 4% per annum payable quarterly for 10 years.
 - ii) 5% per annum convertible half yearly for 10 years, 4% per annum convertible monthly for 5 years and 2.5% effective for 3 years.
- b) Explain the concept of risk and list the characteristics of insurable risk.
- c)
 - i) Explain the concept of utility function $U(w)$.
 - ii) Let G be one time premium and X be a loss random variable with $E(X) = \mu$. Show that $G \geq \mu$.

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

(10 each)

- a) i) For the constant force of mortality μ and constant force of interest δ , obtain the net single premium for the unit benefit of whole life insurance.
- ii) An annuity of Rs. 25000 per annum payable monthly in advance is purchased for 5 years, and its annual rate of interest is 4% hence obtain its price.
- b) i) A fully discrete 10-year term insurance of Rs. 10000 has an annual premium rate of Rs. 100 and the force interest is 0.05. Find the value of the loss at issue random variable when death occurs exactly 5 years after issue.
- ii) If $q_{28} = 0.135$, $q_{29} = 0.146$, $q_{30} = 0.159$, $q_{31} = 0.173$, $q_{32} = 0.188$ and $i = 0.05$, $A_{28:\overline{5}|}^1 = 0.508684$. What is the annual premium paid as 5-year temporary discrete annuity due, for a benefit of 1000, payable at the end of year of death, in a 5-year endowment insurance, issued to (28)?



Total No. of Questions : 4]

SEAT No. :

P5049

[Total No. of Pages : 3

[5822]-770

T.Y. B.Sc.

STATISTICS (Principal)

ST - 365 (B) : Operations Research - II

(36176) (2019 Pattern) (CBCS) (Semester - VI) (Paper - V)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt Each of the following :

- a) Choose the correct alternatives from the given alternatives. [1 each]
 - i) The graph of average cost verses year in replenishment model is
 - a) V shape
 - b) Straight line
 - c) U shape
 - d) Circular
 - ii) Which of the following criterion is used under risk?
 - a) Laplace criterion
 - b) Regret criterion
 - c) Savage criterion
 - d) EMV criterion
 - iii) The consumption pattern of inventory items are classified as per movement of items in
 - a) ABC analysis
 - b) FSN analysis
 - c) VED analysis
 - d) XYZ analysis

P.T.O.

b) State whether each of the following statement is true or false.

[1 each]

- i) Every sequencing problem must have unique optimum solution.
- ii) A game is said to be strictly determinable if the lower and upper values of the game are equal and both equals to one.

Q2) Attempt any Two of the following :

[5 each]

- a) Explain the algebraic method for games without saddle point.
- b) A manufacturing company is considering replacement of a machine, whose cost price is Rs. 6100/- and the scrap values Rs. 100/-. The running (maintenance and operating) cost in rupees are found from past experience as follows

Year	1	2	3	4	5	6	7	8
Running cost	100	250	400	600	900	1200	1600	2000

When should the machine be replace with optimum cost?

- c) What any two reasons for carrying inventory? Write a note on FNSD analysis.

Q3) Attempt any Two of the following :

[5 each]

- a) Explain the procedure of processing of n jobs through two machines in sequencing.
- b) The production department of a company requires 3,600 kg of raw material for manufacturing a particular item per year. The cost of placing on order is Rs. 40/- and the cost of carrying inventory is 20% of the investment in the inventories. The price of investment is Rs. 20/- per kg. Obtain the optimal lot size and minimum yearly variable inventory cost.
- c) Explain savage minimax regret criterion.

Q4) Attempt any One of the following :

- a) i) Find player A's optimal strategy of the following game by matrix method. [5]

Player A	Player B		
	B1	B2	B3
A1	1	7	2
A2	6	2	7
A3	5	1	6

- ii) A) What is the meaning of replacement of an item? Give one illustration of it. [2]
 B) Write a short note on safety inventory. [3]
- b) i) The following is a profit payoff (in Rs.) table for three strategies and two states of nature :

Strategies	States of Nature	
	N ₁	N ₂
S ₁	40	60
S ₂	10	-20
S ₃	-40	-150

On the basis of the above information, state the optimum strategy if each states of nature is equiprobable. [4]

- ii) In a toy manufacturing company, suppose the product acceptance probabilities are not known but the following data is known :

Product Acceptance	Anticipated First Year Profit ('000 Rs.)		
	Full	Partial	Minimal
Good	8	70	50
Fair	50	45	40
Poor	-25	-10	0

Determine the optimal decision using minimax regret. [4]

- iii) Explain the no passing rule of sequencing with one illustration. [2]



Total No. of Questions : 4]

SEAT No. :

P5050

[Total No. of Pages : 3

[5822]-771

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

Q1) Attempt Each of the following :

- a) Choose the correct alternatives in each of the following : [1 each]
 - i) Classify the following stochastic process based on the state space and index set. The number of customers in queue in front of an ATM for at the end of each hour of a day.
 - a) Discrete time discrete state stochastic process.
 - b) Discrete time continuous state stochastic process.
 - c) Continuous time discrete state stochastic process.
 - d) Continuous time continuous state stochastic process.
 - ii) Suppose that customers arrive at a counter in accordance with poisson process with mean rate 3 per minute. What is the probability that the exactly 4 customers arrive in an interval of 2 minute is
 - a) 0.714
 - b) 0.3131
 - c) 0.25
 - d) 0.133
 - iii) A persistent state of a Markon chain is said to be null persistent if its mean recurrence time is :
 - a) Finite
 - b) Infinite
 - c) Zero
 - d) One

P.T.O.

b) **State whether each of the following is True or False. [1 each]**

- i) If a closed set contains only one state then the state is absorbing state.
- ii) The row sum of transition probability matrix need not be equal to 1.

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

- a) State and Prove Chapman-Kolmogorov equation for Markov Chain.
- b) State and Prove addition property of Poisson Process.
- c) Explain periodicity of a state of a M.C. having state space $S = \{1, 2, 3\}$

$$P = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$$

Show that state 2 is a periodic with period 2.

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

- a) Discuss Gambler's ruin problem with an illustration.
- b) Let $\{X_n, n \geq 0\}$ be a Markov Chain With four states 1, 2, 3, 4 and one step transition probability matrix P as

$$P = \begin{bmatrix} \frac{1}{3} & \frac{2}{3} & 0 & 0 \\ 1 & 0 & 0 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

Show that states 3 and 4 are transient.

- c) Explain Poisson process with suitable illustration. Also explain the three postulates of Poisson Process.

Q4) Attempt any One of the following :

- a) i) Let $\{X_n, n \geq 0\}$ be a Markov Chain With three states $S = \{1, 2, 3\}$ and one step transition probability matrix P as

$$P = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & \frac{1}{4} & \frac{3}{4} \\ \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \end{bmatrix}$$

and initial distribution $P(X_0=1) = P(X_0=2) = \frac{1}{6}$ and $P(X_0=3) = \frac{2}{3}$

Compute :

- 1) $P(X_2 = 3 \mid X_0 = 1)$
- 2) $P(X_2 = 2, X_1 = 1 \mid X_0 = 1)$
- 3) $P(X_2 = 2, X_1 = 3, X_0 = 2)$

- ii) Explain types of stochastic processes with suitable illustration.

[6+4]

- b) i) A girl has 3 sets of earrings which she changes every day selecting at random. One of two not used on the previous day. Obtain one step transition probability matrix of the Markov chain. Also find stationary distribution of Markov Chain.

- ii) Define the following terms :

- 1) Markov Chain
- 2) Reducible and Irreducible Markov Chain
- 3) Communicating States.

[6+4]



Total No. of Questions : 4]

SEAT No. :

P5051

[Total No. of Pages : 3

[5822]-772

T.Y. B.Sc.

STATISTICS (Principal)

ST-366(B) : Reliability Theory and Applications

(36178) (2019 Pattern) (Paper-VI) (Semester - VI) (CBCS)

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:

A) Choose the correct alternative in each of the following. [1 each]

a) Structure function $\phi(\underline{X})$ of parallel system of n independent components is given by

i) $\prod_1^n x_i$

ii) $\prod_1^n x_i$

iii) $\prod_1^n (1 - x_i)$

iv) $\min \{x_1, x_2, \dots, x_n\}$

b) Number of minimal path sets for series system of n components are

i) n

ii) 1

iii) 2^n

iv) 3^n

c) Reliability of parallel system of 2 components is 0.64 then reliability each component is

i) 0.36

ii) 0.64

iii) 0.4

iv) 0.6

P.T.O.

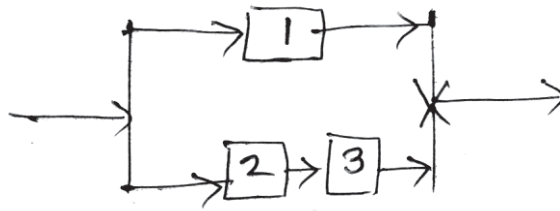
B) State whether **each** of the following statements is true or false : [1 each]

- a) For certain system with n-components $\phi(x) = 2^n$.
- b) In K out of n system there are n^k minimal path sets.

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
 - iv) Dual of the system.
- b) Derive the reliability of 3 out of 4 system. Hence or otherwise find reliability of 3 out of 4 system, if the reliability of each component is 0.7.
- c) Define duality of system. Derive the dual form of k out of n system.

Q3) Attempt any two of the following.

[5 each]

- a) Define and explain the following terms:
 - i) Series system
 - ii) K out of n system
- b) State and derive hazard rate of series system having n in independent life times.
- c) Compute hazard function for Weibull distribution. Also comment on its ageing class.

Q4) Attempt any one of the following.

A) a) Draw the reliability block diagram for the system having structure functions : **[6]**

i) $\phi(\underline{x}) = x_1(1 - (1 - x_2)(1 - x_3))x_4$

ii) $\phi(\underline{x}) = [1 - (1 - x_1)(1 - x_2x_3)]x_4$

b) Explain general models for reliability data, repairable and non — repairable systems. **[4]**

b) i) If $F(t) = 1 - e^{-t}, t \geq 0$. Find $f(t)$ and $h(t)$. Comment on failure rate. **[5]**

ii) Let x_1, x_2, \dots, x_n be random sample from exponential distribution with parameter λ , find $100(1-\alpha)\%$ exact confidence interval for λ . **[5]**



Total No. of Questions : 4]

SEAT No. :

P5052

[Total No. of Pages : 2

[5822]-773

T.Y. B.Sc.

STATISTICS (Principal)

ST - 366(C) : Medical Statistics and Clinical Trials

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

- A) Choose the correct alternative in each of the following. [1 each]
- a) The graph drawn by Dr. John Snow could find the cause of
 - i) Malaria
 - ii) Scurvy
 - iii) Puerperal fever
 - iv) Cholera
 - b) In epidemiology, logit function of probability π is given by
 - i) $\ln [(1-\pi) / \pi]$
 - ii) $\ln [\pi / (1-\pi)]$
 - iii) $\ln [\pi (1-\pi)]$
 - iv) $\ln [\pi / (1+\pi)]$
 - c) In Phase-I of clinical trials
 - i) Rates are used
 - ii) Humans are used
 - iii) Rabbits are used
 - iv) Dogs are used
- B) State whether **each** of the following statements is true or false : [1 each]
- a) A bias is a systematic error.
 - b) Humans are used in preclinical trials.

Q2) Attempt any two of the following :

[5 each]

- a) Write a short note on 'Crossover design' used in clinical trails.
- b) Explain in brief one of the discoveries in epidemiology.

P.T.O.

- c) Define the following terms: [1 each]
- i) $\pm 20\%$ rule for assessment of bioequivalence
 - ii) blinding
 - iii) efficacy of drug
 - iv) FDA
 - v) Placebo

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

- a) Define survival function and interpret it. Also, state its properties.
- b) 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.

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

- c) Explain the role of statistician in clinical trails.

Q4) Attempt any one of the following.

- a)
 - i) Explain in brief Phase II study in clinical trails [4]
 - ii) State the role of CRO. [2]
 - iii) Explain the drawback of exponential growth model. [4]
- b)
 - i) Write a short note on 'Bioequivalence'. [4]
 - ii) Explain the term washout period. [2]
 - iii) Write note on bath tub shaped hazard rate. [4]



Total No. of Questions : 5]

SEAT No. :

P5053

[Total No. of Pages : 2

[5822]-774

T.Y. B.Sc.

GEOGRAPHY

GG361 : Regional Geography of India - II

(2019 Pattern) (CBCS) (Semester - VI) (36181)

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) What is population growth?
- b) Define the concept of settlement.
- c) Which are the four varieties of iron ore?
- d) Write the names of any two rice producing states in India.
- e) Which are the major locations of cotton textiles industries in Maharashtra?
- f) State types of transportation in India.

Q2) a) Describe the population distribution in India. **[6]**

OR

Describe the types of rural settlements.

- b) Write in brief on importance of transportation. **[4]**

Q3) a) Describe the distribution and production of iron ore in India. **[6]**

OR

Describe the distribution and production of coal in India.

- b) Write in short on importance of Indian agriculture. **[4]**

P.T.O.

Q4) a) Explain the major types of agriculture. **[6]**

OR

Describe the major iron and steel industries in India.

b) Write in brief on importance of communication in India. **[4]**

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

- a) Population growth in India
- b) Linear settlements
- c) Bauxite production in India
- d) Hydroelectricity in India
- e) I.T. industries in India
- f) Importance of road transportation



Total No. of Questions : 5]

SEAT No. :

P5054

[Total No. of Pages : 2

[5822]-775

T.Y. B.Sc.

GEOGRAPHY

GG-362 : Geography of Economic Activities - II

(2019 Pattern) (Semester - VI) (36182) (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 5 carry equal marks.*

Q1) Solve any Five of the following :

[5]

- a) Which are the major technological hub in VSA?
- b) Which are the major auto clusters in India?
- c) What is web-based economic activities?
- d) List any two name of IT based industries in India.
- e) List any two name of Iron ore Producing industries in India.
- f) What is Magnetite?

Q2) a) Describe the characteristics of Dairy industry.

[6]

OR

Describe the global distribution of plantation agriculture.

b) Explain the global distribution of Iron ore.

[4]

Q3) a) Explain the distribution of chemical industry in India.

[6]

OR

Explain the use of web based plat form in tourism sectors.

b) Explain the global distribution of copper.

[4]

P.T.O.

Q4) a) Describe the characteristics of commercial grain farming. [6]

OR

Describe E-commerce platforms.

b) Discuss about silicon valley of VSA. [4]

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

- a) Types of Agriculture.
- b) Types of Iron-ore.
- c) Distribution of mineral oil.
- d) Web based economic activities.
- e) Use of GIS in economic activities.
- f) Distribution of fertilizer industries.



Total No. of Questions : 5]

SEAT No. :

P5055

[Total No. of Pages : 2

[5822]-776

T.Y. B.Sc.

GEOGRAPHY

**GG - 363 : Tourism Activities and Management
(CBCS) (2019 Pattern) (Semester - VI) (36183)**

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) What are the main advantages of the tourist place 'Jaisalmer'.
- b) In which state 'Ajanta' is located?
- c) In which state 'Shimla' is located?
- d) Mention the types of Hotel?
- e) Mention any two role of travel agency in tourism.
- f) Mention any two role of Tourist Guide in tourism.

Q2) a) Explain the potential for local tourism development in India. **[6]**

OR

Explain the allied activities in tourism.

b) Describe the concept of tourism product. **[4]**

Q3) a) Explain in detail about role of ITDC in tourism development of India. **[6]**

OR

'Shimla is the prime destination in tourism in India' Discuss.

b) Explain the importance of tourism mapping. **[4]**

P.T.O.

Q4) a) Explain the employability of tourism activities. [6]

OR

Discuss the modes of transportation in tourism.

b) Describe the National tourism policy in India. [4]

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

- a) Tour plan.
- b) Types of Hotel.
- c) Tourism as an economic activities.
- d) Educational Tour Planning.
- e) Tourism activities.
- f) Online booking in tourism.



Total No. of Questions : 5]

SEAT No. :

P5056

[Total No. of Pages : 2

[5822]-777

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 Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any Five of the following:

[5]

- a) What do you understand by resource management?
- b) Mention any two features of red soil.
- c) State the general types of humus formation.
- d) Define soil decomposition.
- e) State any two measures of soil conservation.
- f) Define contour farming.

Q2) a) Describe the various sources of organic matter in soil.

[6]

OR

Describe the carbon cycle in soil.

b) Write the effects of soil degradation.

[4]

Q3) a) Explain the measures of soil degradation.

[6]

OR

Explain in detail about causes of soil degradation.

b) Write the features of Alluvial soil.

[4]

P.T.O.

Q4) a) Discuss the methods of soil conservation. [6]

OR

Discuss the soil resource management in India.

b) Write the carbon cycle in soil. [4]

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

- a) Alfisols
- b) Fractionation of organic matter.
- c) C.N Ratio in soil
- d) Soil conservation
- e) Organic colloids.
- f) Soil erosion.



Total No. of Questions : 5]

SEAT No. :

P5057

[Total No. of Pages : 2

[5822]-778

T.Y. B.Sc.

GEOGRAPHY

**GG - 365 : Management of Man-Made Disasters
(CBCS) (2019 Pattern) (Semester - VI) (36185)**

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) Define the term physical disaster.
- b) Define the term pollution and give its type.
- c) Name any two factors contributing to man-made disaster.
- d) What is desertification?
- e) Define the term eutrophication.
- f) Explain the term nuclear hazard.

Q2) a) Describe in brief the classification of Man-Made disaster. **[6]**

OR

Write in brief about the case study of Australian forest fires.

b) Explain causes and effects of man induced landslide. **[4]**

Q3) a) Explain in detail the causes of chemical hazards. **[6]**

OR

Describe in detail the effects of physical hazards.

b) Write in brief about Industrial chemical accidents. **[4]**

P.T.O.

Q4) a) Describe in brief about the management of biological hazards. [6]

OR

Explain in detail about arsenic contamination of ground water.

b) Explain in brief about the disaster caused by locust & warms. [4]

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

- a) Soil erosion
- b) Oil spills
- c) Covid - 19
- d) Pollution
- e) Biological hazards
- f) Chemical hazards



Total No. of Questions : 5]

SEAT No. :

P5058

[Total No. of Pages : 2

[5822]-779

T.Y. B.Sc.

GEOGRAPHY

GG - 366 : Geoinformatics - II

(2019 Pattern) (CBCS) (Semester - VI) (36186)

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 Q. 2 to Q.5 carry equal marks.*

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

- a) What do you understand by the term Remote Sensing?
- b) Define electromagnetic spectrum.
- c) Define the term wavelength.
- d) What do you understand by the term swing and tilts?
- e) Write the full form of IRS.
- f) Define platform.

Q2) a) Discuss in detail the historical development of Remote Sensing. **[6]**

OR

Describe the types of Aerial cameras used in Remote Sensing.

b) What is Scattering? Discuss the types of Scattering. **[4]**

Q3) a) Write about the various types of photographs obtained from Remote Sensing. **[6]**

OR

Describe in detail the various Sensors used in Remote Sensing.

b) Explain the concept of Geostationary satellite. **[4]**

P.T.O.

Q4) a) Describe in detail the sensors and characteristics of IKONOS satellite series. [6]

OR

Describe in detail the elements of image interpretation.

b) Explain the concept of electromagnetic radiation. [4]

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

- a) SPOT
- b) Sun Synchronous Satellites.
- c) Application of Remote Sensing in Agriculture.
- d) Normal Colour photos.
- e) INSAT.
- f) Atmospheric interactions.



Total No. of Questions : 5]

SEAT No. :

P5059

[Total No. of Pages : 2

[5822]-780

T.Y. B.Sc.

GEOGRAPHY

GG-3610 : Research Methodology - II

(Skill Enhancement Course)

(2019 Pattern) (CBCS) (Semester - VI) (361810)

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.*

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

- a) Define secondary data.
- b) Define the concept of 'Questionnaire'.
- c) Write any two main aspects of a questionnaire.
- d) What is review article?
- e) Write any two types of research report.
- f) Write various parts of research report.

Q2) a) Describe the sources of secondary data. **[6]**

OR

Describe the demerits of Questionnaire Method.

b) Write in brief characteristics of a good questionnaire. **[4]**

Q3) a) Describe characteristics of good research report writing. **[6]**

OR

Differentiate between dissertation and thesis.

b) Write a short note on 'Research Paper'. **[4]**

P.T.O.

Q4) a) Explain the structure and organization of research reports. **[6]**

OR

Explain the case study method in detailed.

b) Write in short on the 'Footnotes'. **[4]**

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

- a) Sources of primary data.
- b) Research methodology.
- c) Government sources of secondary data.
- d) Types of research report.
- e) Abstract
- f) Bibliography



Total No. of Questions : 5]

SEAT No. :

P5060

[Total No. of Pages : 2

[5822]-781

T.Y. B.Sc.

GEOGRAPHY

GG-3611 : Total Station Surveying

(Skill Enhancement Course)

(2019 Pattern) (CBCS) (Semester - VI) (361811)

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) List the minimum equipment inventory required for total station survey.
- b) Mention the least count of a total station.
- c) Define Levelling.
- d) Define centering.
- e) What is non prism mode in total station surveying.
- f) What is EDM?

Q2) a) Describe the advantages of total station. **[6]**

OR

Explain the atmospheric correction factors of a total station.

- b) Write the principle behind the linear distance measurement in total station. **[4]**

Q3) a) Explain the precautions to be taken while using a total station. **[6]**

OR

Discuss the procedure for survey of beach with total station.

- b) Write the steps of coordinate measurement in total station. **[4]**

P.T.O.

Q4) a) Explain the fundamental parameters of a total station. [6]

OR

Describe the procedure for measurement of college campus with the help of total station.

b) What are demerits of total station. [4]

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

- a) Distance measurement in total station.
- b) Error sources of total station.
- c) Relationship of angle and distance.
- d) Uses of total station.
- e) Measurement of agriculture form with total station.
- f) Importance of total station in coordinate measurement.



Total No. of Questions : 5]

SEAT No. :

P5061

[Total No. of Pages : 2

[5822]-782

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

MICROBIOLOGY

MB - 361 : Medical Microbiology - II

(2019 Pattern) (CBCS) (36191)

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 parenteral route of drug administration.
- b) State the etiological agent for warts.
- c) Enlist the B-lactam antibiotics.
- d) Japanese encephalitis virus causes disease of _____.
- e) Define horizontal gene transfer.
- f) Name the antigenic structure of influenza virus responsible for release of viral particles.

Q2) a) Describe the following any three : **[6]**

- i) State the mechanism of action of streptomycin.
 - ii) Use of secondary cell line.
 - iii) Cultivation of Cryptococcus Spp.
 - iv) Mechanism of action of chloroquine.
- b) Explain the mode of action of Remdecivir. **[4]**

P.T.O.

- Q3) a)** Explain the following any three : [6]
- i) Explain lab diagnosis of Entamoeba.
 - ii) Enlist any three method of cultivation of virus.
 - iii) Mechanism of action of rifamycin.
 - iv) Prophylaxis of Japanese encephalitis virus.
- b) Discuss the pathogenesis of Dengue. [4]

- Q4) a)** Discuss the following any three : [6]
- i) Enlist the symptoms of cryptococcosis.
 - ii) Describe the mode of action of antibiotic acting on cell membrane.
 - iii) Enlist the antifungal agents.
 - iv) Viability characteristics of corona virus.
- b) Discuss the mechanism of drug resistance due to mutation in gene. [4]

- Q5) Write short notes on any four of the following : [10]**
- a) Rota virus
 - b) Inactivation of drug
 - c) Trimethoprim
 - d) Pathogenesis of aspergillosis
 - e) FMD
 - f) Histoplasma Capsulatum



Total No. of Questions : 5]

SEAT No. :

P5062

[Total No. of Pages : 2

[5822]-783

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) *Question 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 interferon with one example.
- b) Endogenous antigen is presented to T-cell which is associated with _____ on the surface of APC.
- c) What is tuberculin reaction?
- d) Enlist monoclonal antibodies used for immunosuppression.
- e) Define immunodeficiency disease with one example.
- f) Define anergy.

Q2) a) Describe the following any three : [6]

- i) Class switching.
- ii) Any two examples of type I hypersensitivity.
- iii) Peripheral tolerance.
- iv) Contribution of environmental factors in autoimmunity.

b) Explain the significance of cell mediated immune response. [4]

P.T.O.

- Q3) a)** Explain the following any three : **[6]**
- i) Response of secondary lymphoid organs to antigens.
 - ii) ADCC
 - iii) Hemolytic disease of newborn (HDN).
 - iv) Use of corticosteroids as immunosuppressive agents.
- b) Write comparative account of primary and secondary immune response. **[4]**

- Q4) a)** Answer the following any three : **[6]**
- i) Explain immune response against transplanted cells.
 - ii) Write any two differentiating characters of all four types of hypersensitivity reactions.
 - iii) Explain diagnosis of Myasthenia gravis.
 - iv) What are complement deficiencies?
- b) Describe attributes of cytokines with examples. **[4]**

- Q5) Write short notes on the following any four : **[10]****
- a) Role of adhesion molecules in cell to cell interactions.
 - b) Response to super antigen.
 - c) Mechanism of type III hypersensitivity.
 - d) Release of sequestered antigen.
 - e) Acquired immunodeficiency.
 - f) Types of autoimmune diseases.



Total No. of Questions : 5]

SEAT No. :

P5063

[Total No. of Pages : 2

[5822]-784

T.Y. B.Sc.

MICROBIOLOGY

MB-363 : Metabolism

(2019 Pattern) (CBCS) (Semester - VI) (36193)

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 Active transport.
- b) State second law of thermodynamics.
- c) List any two uncouplers of oxidative phosphorylation.
- d) Give one example of purple bacteria.
- e) Urea synthesis occurs exclusively in _____.
 - i) Liver
 - ii) Kidney
 - iii) Pancreas
 - iv) Gall bladder
- f) Name the sugar components of peptidoglycan.

Q2) a) Attempt the following any three : [6]

- i) Describe Osmosis.
 - ii) Explain concept of entropy.
 - iii) Enlist the steps in peptidoglycan synthesis.
 - iv) What is the role of cytochromes in ETC.
- b) Describe the concept of high energy compounds. Give example of pyrophosphates as high energy compound. [4]

P.T.O.

- Q3)** a) Explain the following any three : [6]
- i) Reduction reaction in calvin cycle.
 - ii) Free energy.
 - iii) Facilitated diffusion.
 - iv) Enlist steps in starch synthesis.
- b) Describe with structures, beta oxidation of fatty acids. [4]
- Q4)** a) Discuss the following any three : [6]
- i) Arrangement of components of ETC.
 - ii) Ionophores.
 - iii) Urea cycle.
 - iv) Photosynthetic apparatus of cyanobacteria.
- b) Diagrammatically represent cyclic photophosphorylation. [4]
- Q5)** Write short notes on any four of the following : [10]
- a) Group translocation of sugars in bacteria.
 - b) Structure of ATP synthetase.
 - c) Cyanobacteria.
 - d) Passive transport.
 - e) Phospholipid synthesis.
 - f) Chemolithotrophy.



Total No. of Questions : 5]

SEAT No. :

P5064

[Total No. of Pages : 2

[5822]-785

T.Y. B.Sc.

MICROBIOLOGY

MB - 364 : Molecular Biology

(CBCS) (2019 Pattern) (Semester - VI) (361694)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Attempt any Five of the following.

[5]

- a) Enlist the stages in eukaryotic cell cycle.
- b) State two examples of conditional lethal mutants of bacteriophages.
- c) Name the enzyme involved in light repair of damaged DNA.
- d) State any two examples of restriction endonucleases.
- e) Which chemical reagent is used for precipitation of DNA?
- f) Name the scientists who proposed the Nomenclature system for restriction enzymes.

Q2) a) Attempt any three of the following.

[6]

- i) Enlist the stages of parasexual cycle.
 - ii) State any four properties of pBR322.
 - iii) Describe different types of plaques formed by bacteriophages.
 - iv) How are cohesive ended and blunt ended fragments of DNA ligated in r-DNA technology?
- 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]
- i) Enlist the stages of mitosis.
 - ii) Explain Benzer's spot tests for fine structure mapping of rII locus of T₄ phage.
 - iii) Explain the principle of agarose gel electrophoresis.
 - iv) Describe r type mutants of T₄ phage.
- B)** With suitable diagram explain DNA damage by U.V. radiation. [4]

- Q4) a)** Attempt any three of the following. [6]
- i) Explain the role of Rec A protein in genetic recombination.
 - ii) Enlist steps in lytic cycle of bacteriophages.
 - iii) Explain the parental ditype (PD) tetrad in Neurospora crassa.
 - iv) Describe the method for isolation of Ts mutants of T₄ phage.
- b)** Explain blue - White selection method of screening of r - DNA. [4]

- Q5) Write short notes on (Any 4)** [10]
- a) Use of tetrad analysis for proving crossing over at four strand stage.
 - b) Use of deletion mutants of T₄ phage.
 - c) DNA damage by deamination.
 - d) Various steps in r - DNA technology.
 - e) Western blot technique.
 - f) Traits of pea plant considered in Mendel's experiment.



Total No. of Questions : 5]

SEAT No. :

P5065

[Total No. of Pages : 2

[5822]-786

T.Y. B.Sc.

MICROBIOLOGY

**DSEL - MB - 365 : Fermentation Technology - II
(2019 Pattern) (CBCS) (Semester - VI) (36195)**

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 the strain used in large scale production of glutamic acid.
- b) Enlist microorganisms used as Probiotics.
- c) Name the microorganisms used in steroid transformation.
- d) What are "Ales".
- e) State the name of Brewer's yeast.
- f) Name the microorganism used in penicillin fermentation.

Q2) a) Describe the following any three : **[6]**

- i) Types of Wine
 - ii) Recovery of penicillin
 - iii) Production of rabies vaccine
 - iv) Malt - adjuncts.
- b) Write the steps involved in citric acid recovery. **[4]**

P.T.O.

- Q3)** a) Explain the following any three : [6]
- i) Solid state fermentation.
 - ii) Vinegar production.
 - iii) Microbial production of bioemulsifer.
 - iv) Baker's yeast.
- b) Describe the recovery of vitamin B12. [4]
- Q4)** a) Discuss the following any three : [6]
- i) Anti-tetanus serum.
 - ii) Penicillin production.
 - iii) Aging of wine.
 - iv) Recovery of protease.
- b) Describe the yoghurt production. [4]
- Q5)** Write short notes on any four of the following : [10]
- a) Bioethanol production.
 - b) Esterases production.
 - c) Malo-lactic acid fermentation.
 - d) Types of beer.
 - e) Steroid transformation.
 - f) Lysine production.



Total No. of Questions : 5]

SEAT No. :

P5066

[Total No. of Pages : 2

[5822]-787

T.Y. B.Sc.

MICROBIOLOGY

MB - 366 : Food Microbiology

(2019 Pattern) (CBCS) (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) Red spot of meat is caused by _____
- b) spray drying is used in preservation of _____
 - i) Jams
 - ii) Pickles
 - iii) Ice cream
 - iv) instant soup mix
- c) Define TDT.
- d) What are probiotics?
- e) State the role of FDA in food industry.
- f) What are GRAS?

Q2) a) Describe the following any three : **[6]**

- i) Spoilage of canned food.
 - ii) Sensory properties of food.
 - iii) Changes in food preservation by high temperature.
 - iv) Intrinsic factors of food.
- b) What is tetrapak technology? What are the advantages? **[4]**

P.T.O.

- Q3)** a) Explain the following any three : [6]
- i) Food preservation by dehydration.
 - ii) Contamination of spices.
 - iii) Food botulism.
 - iv) Intermediate moisture foods.
- b) Explain the process of pasteurization. [4]
- Q4)** a) Discuss the following any three : [6]
- i) Health effects of fermented foods.
 - ii) Flavour defects in foods.
 - iii) Redox potential of food.
 - iv) Canning.
- b) Explain the food poisoning by Aspergillus flavus. [4]
- Q5)** Write short notes on any four : [10]
- a) Spoilage of cereal products.
 - b) Safety & Risk of probiotics.
 - c) Justify 'Sugars are semi-perishable food'.
 - d) Role of inhibitory substances in food.
 - e) Food infections Vs food poisoning.
 - f) pH as a factor affecting microbial growth.



Total No. of Questions : 5]

SEAT No. :

P5067

[Total No. of Pages : 2

[5822]-788

T.Y. B.Sc.

MICROBIOLOGY

Skill Based Elective Course

MB - 3610 : Waste Management

(CBCS) (2019 Pattern) (Semester - VI) (361910)

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 TDS.
- b) What is the use of screen chamber?
- c) Enlist microorganisms in anaerobic waste water treatment.
- d) What are total volatile solids?
- e) Define COD.
- f) Enlist microorganisms in biogas production.

Q2) a) Describe the following (Any three):

[6]

- i) pH and electrical conductivity for waste water characterization.
- ii) Aerated lagoon
- iii) Characterization of dairy waste
- iv) Vermicomposting.

b) Describe by-products of municipal solid waste treatment.

[4]

P.T.O.

- Q3) a) Explain the following (Any three) :** [6]
- i) Leachate refused derived fuel.
 - ii) Anaerobic digestion process.
 - iii) Trickling filters.
 - iv) Steps in biogas production.
- b) Describe the use of stabilization ponds. [4]

- Q4) a) Discuss the following (Any three) :** [6]
- i) BOD
 - ii) Total Solids
 - iii) Removal of pathogenic microorganisms from waste water
 - iv) Composting
- b) Describe biomedical waste with respect to definition, types & processing. [4]

- Q5) Write short notes on the following (Any Four) :** [10]
- a) Grit chamber
 - b) Waste water carriage system
 - c) E-Waste
 - d) Methods of collection system for waste water
 - e) Design of effluent treatment plant.
 - f) Fluidized bed reactor.



Total No. of Questions : 5]

SEAT No. :

P5068

[Total No. of Pages : 2

[5822]-789

T.Y. B.Sc.

MICROBIOLOGY

MB3611 - Nano - Biotechnology (Elective)

(CBCS) (2019 Pattern) (Semester-VI) (36911)

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) What are nanoscale assemblies?
- b) Write any two applications of nanomaterials.
- c) _____ is usually defined as a particle of matter that is between 1-100nm in diameter.
- d) What are nanoparticles made from?
- e) Give any two examples of nanoparticles used in drug delivery.
- f) Give any two examples of non-metallic nanoparticles.

Q2) a) Describe the following any three.

[6]

- i) Microbial synthesis of magnetic nanoparticles.
 - ii) Dynamic light scattering (DLS) technique used for characterization of nanoparticles.
 - iii) Antimicrobial property of nanoparticles.
 - iv) Protein nanotubes.
- b) Explain advantages of biological synthesis of nanoparticles.

[4]

P.T.O.

- Q3)** a) Explain the following any three. [6]
- i) Microbial synthesis of sulfide nanoparticles.
 - ii) Use of nanoparticles in wastewater treatment.
 - iii) Role of Nanotechnology in vaccine development.
 - iv) Characterization of Nanoparticles by XPS technique.
- b) Explain role of nanoparticles in drug delivery. [4]
- Q4)** a) Discuss the following any three. [6]
- i) Ag-Au alloy nanoparticles synthesis by microorganisms.
 - ii) TEM for characterization of nanoparticles.
 - iii) Biosynthesis of oxide nanoparticles by microorganisms.
 - iv) Biomedical applications of bioassemblies.
- b) Explain extracellular synthesis of silver nanoparticles. [4]
- Q5)** Write short notes on any four of the following. [10]
- a) Virus like particles.
 - b) Protein nanofibres.
 - c) Non-magnetic oxide nanoparticles.
 - d) Bioimaging of nanoparticles.
 - e) Non-metallic nanoparticles.
 - f) Cell targeting by nanoparticles.



Total No. of Questions : 5]

SEAT No. :

P5069

[Total No. of Pages : 2

[5822]-790

T.Y. B.Sc.

**NANOSCIENCE AND NANOTECHNOLOGY (Paper - I)
NS - 361 : Polymer Hetero Structure and Their Applications
(2019 Pattern) (Semester - VI) (36261)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Which reagent is used in pickering emulsion as 'pickling agents'?
- b) Give role of Triton X-100 and cyclohexane?
- c) Define photo-integrated circuit.
- d) Give any two uses of lasers.
- e) Give the example of p-n heterojunction.
- f) Which metal oxide are used for filling MWCNT's?

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

- i) Explain organic solar cell and types of junction.
- ii) Explain synthesis of Hetero structure by Ex-situ polymerisation using polymers.

b) Explain in detail applications of laser. **[4]**

P.T.O.

- Q3)** a) Attempt any ONE of the following : [6]
- i) Write the difference between Homogeneous and Heterogeneous catalysis.
 - ii) Explain synthesis of heterostructures by In-Situ polymerisation by using metal-oxide.
- b) Explain - P - P - Heterojunction. [4]

- Q4)** a) Attempt any ONE of the following : [6]
- i) Give synthesis of Hetero structure by Ex-situ polymerisation using metals.
 - ii) Explain in detail characterisation of Heterostructure by In-Situ polymerization using metals.
- b) Explain differential scanning analysis. [4]

- Q5)** Write short notes any FOUR of the following : [10]
- a) Host polymerisation.
 - b) p-n - Heterojunction.
 - c) Ex-Situ polymerization
 - d) Organic photovoltaic cell.
 - e) Applications of Red Laser pointer.
 - f) Chemisorption / Catalytic activity.



Total No. of Questions : 5]

SEAT No. :

P5070

[Total No. of Pages : 2

[5822]-791

T.Y. B.Sc.

**DEPARTMENT OF NANOSCIENCE AND
NANOTECHNOLOGY**

NS-362 : Functional Nanomaterials

(2019 Pattern) (Semester - VI) (Paper - II) (36262)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Solve any Five of the following :

[5]

- a) Define nanoparticles.
- b) Define Exciton.
- c) Write down the formula of porosity.
- d) What is Taylor cone?
- e) Define metal organic frameworks.
- f) Draw the diagram of one-dimensional oxide nanostructures.

Q2) a) Write down any one of the following :

[6]

- i) Write down the shape and composition control of semiconductor nanocrystals.
 - ii) Write down the synthesis of inorganic semiconductor nanocrystals.
- b) Explain the structure of Boron-Nitride Nanotubes. **[4]**

P.T.O.

- Q3) a)** Write down any one of the following : **[6]**
- i) Write down the Aqueous synthesis of semiconductor nanocrystals.
 - ii) Explain and write down the optical properties of Titania nanotubes Arrays.
- b) Explain the four synthesis generations. **[4]**
-
- Q4) a)** Write down any one of the following : **[6]**
- i) Explain the Electrospinning process.
 - ii) Write down the nanocomposite fiber and their structural applications.
- b) Explain the nanofabric production. **[4]**
-
- Q5) Write down any four of the following :** **[10]**
- a) Write down short note on LBL assembly with semiconductor nanoparticles.
 - b) Write short note on Ball milling and Annealing.
 - c) Write short note on Laser-Assisted method.
 - d) Write down the synthesis methods of Boron-Nitride nanotubes.
 - e) Explain synthesis of metal oxide frameworks.
 - f) Write down the nanofiber yarns preparation.



Total No. of Questions : 5]

SEAT No. :

P5071

[Total No. of Pages : 2

[5822]-792

T.Y. B.Sc.

NANOSCIENCE AND NANOTECHNOLOGY

NS-363 : Applications of Nanobiotechnology

(2019 Pattern) (Semester - VI) (Paper - III) (36263)

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 the term elastomers.
- b) What is a use of Biosensor?
- c) What is leukemia?
- d) What is a size of nanoparticles?
- e) What is a use of drug eluting stent?
- f) Define the term nanoarray.

Q2) a) Attempt any ONE of the following :

[6]

- i) Why Gold nanoparticles are used to unloading drug?
- ii) With the help of diagram describe the use of gold nanoparticle in various therapies.

b) Write short a account on transducer.

[4]

P.T.O.

- Q3) a)** Attempt any one of the following : [6]
- i) What is asthma? Write therapeutic applications of Nanoparticles in asthma.
 - ii) What is DDS? Write the various routes of administration.
- b) Write a short account on Hepatitis. [4]

- Q4) a)** Attempt any one of the following : [6]
- i) What are Transducer? Explain applications of mechanical transducer.
 - ii) What is Biomaterial? List the various applications of Biomaterial.
- b) Discuss protein Micro-array. [4]

- Q5) Write short note on any four of the following : [10]**
- a) Micro-fluidics.
 - b) Dendrimers.
 - c) Intelligent pills.
 - d) Carbon nano tubes.
 - e) Nano-Emulsions.
 - f) Nano-arrays.



Total No. of Questions : 5]

SEAT No. :

P5072

[Total No. of Pages : 2

[5822]-793

T.Y. B.Sc.

NANOELECTRONICS

**36264 : Department of Nanoscience and Nanotechnology
(2019 Pattern) (Paper - IV) (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) *Q. 2 to 5 carry equal marks.*
- 4) *Draw neat & labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*

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

- a) What is mean by etching process?
- b) Define lithography.
- c) Give the types of opto electronic devices.
- d) Define Ballistic transport.
- e) State Moore's second law.
- f) What is mean by ion implantation?

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

- i) What is spintronic devices? Also explain any two types of spintronic devices.
- ii) Explain epitaxial growth of silicon by vapor phase.

b) Explain photolithography technique in detail. **[4]**

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

- i) Explain the roadmap of semiconductor characteristics.
- ii) Explain environment for VLSI technology.

b) Give the difference between thermal evaporation & sputtering method. **[4]**

P.T.O.

- Q4)** a) Attempt any ONE of the following. [6]
- i) Explain kinetics of silicon dioxide growth for thin & ultra thin films.
 - ii) Explain, why there is need for new concept in electronics?
- b) Write a note on molecular interconnects. [4]

- Q5)** Write a short note of any FOUR of the following. [10]
- a) Plasma enhanced vapor deposition method.
 - b) Multiphoton lithography.
 - c) ITRS
 - d) Single electron transistor
 - e) Nano scale MOSFETs
 - f) Scanning probe lithography



Total No. of Questions : 5]

SEAT No. :

P5073

[Total No. of Pages : 2

[5822]-794

T.Y. B.Sc.

(NANOSCIENCE AND NANOTECHNOLOGY)

NS - 365 : Energy Storage Devices and Applications

(2019 Pattern) (Paper - V) (Semester - VI) (36265)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Solve any Three questions of the Q. 2 to Q. 5.*
- 3) *Draw the neat and labelled diagram wherever necessary.*
- 4) *Figures to the right indicate full marks.*

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

- a) Define super capacitor?
- b) Define primary battery?
- c) Define separator?
- d) Define cell voltage?
- e) Define container?
- f) What is fusion?

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

- i) What is renewable resources? Explain it's different types.
- ii) What is non-renewable resources? Explain it's different types.

b) Explain the need of Energy storage. **[4]**

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

- i) Explain the construction of Battery.
- ii) Explain the working of Battery.

b) Design and working of Electrode of Battery? **[4]**

P.T.O.

- Q4)** a) Attempt any one of the following. [6]
- i) Explain the Latent heat storage.
 - ii) Explain the different types of super capacitor.
- b) Explain the sensible heat storage. [4]

- Q5)** Attempt any four of the following : [10]
- a) Explain the term Nuclear energy.
 - b) Explain the term Nuclear fusion.
 - c) Short note on Electrochemical Pseudo capacitor.
 - d) Short note on Hybrid capacitor.
 - e) Write and Explain Thermal energy storage.
 - f) Explain electrical energy storage.



Total No. of Questions : 5]

SEAT No. :

P5074

[Total No. of Pages : 2

[5822]-795

T.Y. B.Sc.

NANOSCIENCE AND NANOTECHNOLOGY

NS - 366 : Photocatalysis for Environmental Pollution Control

(2019 Pattern) (Paper - VI) (Semester - VI) (Elective - II) (36266)

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) *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 p-type semiconductor?
- b) Which chemical is used in photocatalytic air purifier?
- c) Give 1st law of photochemistry?
- d) Define kinetics.
- e) What is physisorption?
- f) Define Auto catalysis?

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

- i) What is Adsorption isotherm? Explain any two Adsorption isotherm.
 - ii) Give introduction to catalysis.
- b) Explain photocatalyst surface and active species. **[4]**

P.T.O.

- Q3)** a) Attempt any ONE of the following : [6]
- i) Write in detail applications of metal nanoparticles in organic reactions.
 - ii) Write in detail catalytic Efficiency and Turnover frequency?
- b) Explain properties of good photocatalyst. [4]
- Q4)** a) Attempt any ONE of the following : [6]
- i) Write in detail purification of water and air.
 - ii) Write in detail Application of metal nanoparticles in organic reactions.
- b) Factors affecting catalyst on kinetics of Reaction. [4]
- Q5)** Write short note on any FOUR of the following : [10]
- a) Lock and key model
 - b) Principle light over solid
 - c) Inhibition
 - d) Heterogenous catalyst
 - e) Physisorption
 - f) Photo catalysis



Total No. of Questions : 5]

SEAT No. :

P5075

[Total No. of Pages : 2

[5822]-796

T.Y. B.Sc.

NANOSCIENCE AND NANOTECHNOLOGY
NS - 3610 : Data Analysis and Computer Applications
(2019 Pattern) (CBCS) (Semester - VI) (362610)

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) Attempt any Five of the following : [5]

- a) Define the term 'Sample'.
- b) Write down the function which is used to find correlation between X and Y in MS-Excel.
- c) What is mean by 'Parameter'?
- d) Define inferential statistic.
- e) If X and Y are independent then what is value for correlation (x, y) .
- f) If $X \sim N(\mu = 10, \delta^2 = 25)$ then what is the $E(x)$.

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

- i) Find mean, geometric mean and Harmonic mean for following data.
10, 11, 12, 13, 14, 15.
- ii) Write short note on measures of variation.

b) Find mean for the following data. [4]

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
fi	2	3	10	15	20

P.T.O.

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

i) Find variance and standard deviation for following data.

Class	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
fi	6	7	5	4	8

ii) Fit regression line y on x for;

x	7	6	10	14	13
y	22	18	20	26	24

b) Let $X \sim N(\mu = 10, \delta^2 = 16)$ the find

i) $P(X < 9)$ **[2]**

ii) $P(1 < x < 2)$ **[2]**

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

i) Write the procedure to find mean for the grouped frequency distribution.

ii) Find covariance between X and Y.

X	10	11	14	20	22	16
Y	12	14	15	16	21	26

b) Write short note on Binomial distribution. **[4]**

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

a) Write sample space for tossing three coins.

b) Explain scatter diagram.

c) If $X \sim B(n = 5, p = 0.5)$ then find $P(X = 0)$

d) What is value of Median for X.

X: 10, 11, 2, 5, 9, 20

e) Explain the term positive correlation.

f) What is regression?



Total No. of Questions : 5]

SEAT No. :

P5076

[Total No. of Pages : 2

[5822]-797

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) *Figures to the right indicate full marks.*

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

- a) Define solar energy?
- b) Define solar pond?
- c) Define hydropower?
- d) What is solar cooker?
- e) Define stalling?
- f) Define wind?

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

- i) Explain the basic photovoltaic system for power generation.
- ii) Explain description of a basin-type solar still.

b) Explain construction and working of convecting solar pond. **[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) Explain the principle of photovoltaic solar cell. **[4]**

P.T.O.

- Q4)** a) Attempt any one of the following. [6]
i) Explain open cycle OTEC system.
ii) Explain closed cycle OTEC system.
b) Explain mechanical equipment of hydropower plant. [4]

- Q5)** Attempt any four of the following. [10]
a) Explain Bio-fouling.
b) Explain I-V characteristics of solar cell.
c) Explain the classification of WECS.
d) Explain forebay.
e) Explain Box-type solar cooker.
f) Explain power coefficient.



Total No. of Questions : 5]

SEAT No. :

P5077

[Total No. of Pages : 2

[5822]-798

T.Y. B.Sc.

ELECTRONIC SCIENCE (Paper - I)

EL - 361 : Modern Communication Systems

(2019 Pattern) (Semester - VI) (CBCS) (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) What is a MODEM?
- b) Define PCM.
- c) What is meant by handoff in cellular phone system?
- d) State Shannon's sampling theorem.
- e) Which frequency band is assigned to domestic satellites?
- f) Define quantization error in quantization process.

Q2) Attempt the following :

- a) i) List the advantages of FSK technique. **[2]**
ii) Explain in brief the satellite system uplink model. Draw its block diagram. **[4]**
- b) Explain the cellular concept of mobile communication system. **[4]**

Q3) Attempt the following :

- a) i) Briefly describe information capacity & bitrate. **[2]**
ii) Explain delta modulator with a neat block diagram. **[4]**
- b) Explain the concept of frequency reuse in cellular phone. **[4]**

P.T.O.

Q4) Attempt the following :

- a) i) What is the need of guard band in FDM? [2]
- ii) Explain TDM technique with a neat block diagram. [4]
- b) Determine the orbital velocity of a geosynchronous satellite revolving around the earth in a circular pattern directly above the equator 42, 164 km from the center of the earth. [4]

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

- a) What is ASK? State its merits and demerits.
- b) What is sectoring? State its purpose in cellular phone system.
- c) List the satellite system parameters.
- d) Draw a simplified block diagram of BPSK generation.
- e) What do you mean by segmentation and dualization in cellular phone system?
- f) State three basic sections of a satellite system.



Total No. of Questions : 5]

SEAT No. :

P5078

[Total No. of Pages : 2

[5822]-799

T.Y.B.Sc.

ELECTRONIC SCIENCE

**EL - 362 : Embedded System Design Using Microcontrollers
(2019 Pattern) (Semester - VI) (Paper - II) (CBCS) (36222)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any 3 questions from Q2 to Q5.*
- 3) *Q2 to Q5 carry equal marks.*

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

- a) What is an embedded system?
- b) What is the use of 'MOVLW' instruction?
- c) Write the instruction to add 50 with W-register.
- d) What is the use of relay?
- e) Write the fullform of ARM.
- f) Write the any two sensor's name used in washing machine.

Q2) Attempt the following.

- a)
 - i) Which registers of general purpose registers in ARM are called as low register's and 'High registers'? **[2]**
 - ii) State difference between embedded system and general computer system. **[4]**
- b) Explain the functional block diagram of washing machine. **[4]**

Q3) Attempt the following.

- a)
 - i) What is the size of program memory and SRAM in PIC 16F887?[2]
 - ii) Write any four features of PIC 16F887. **[4]**
- b) Write short note on Data memory of PIC. **[4]**

P.T.O.

Q4) Attempt the following.

- a) i) What is the use of registers R13 and R15 in ARM register? [2]
- ii) Explain status register of ARM microcontroller. [4]
- b) Write a note on memory of ARM microcontroller. [4]

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

- a) What are the various blocks in digital camera.
- b) Give any five examples of automotive embedded system.
- c) Give the classification of embedded system based on complexity and performance.
- d) Give the names of any five special function registers of PIC 16F887.
- e) Write PIC C program to make LED on connected to Pin RB7 only if, when RAO pin is High.
- f) Write PIC C program to generate square wave on Pin RA7.



Total No. of Questions : 5]

SEAT No. :

P5079

[Total No. of Pages : 2

[5822]-800

T.Y. B.Sc.

ELECTRONIC SCIENCE

EL-363 : Industrial Electronics

(2019 Pattern) (CBCS) (Semester - VI) (Paper - III) (36223)

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.*

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

- a) Draw the circuit symbols of SCR and PUT.
- b) Write the equation for time period (T) of PUT as relaxation oscillator.
- c) State advantages of SMPS.
- d) State the applications of Dielectric heating.
- e) State the names of circuits use in Electric vehicle.
- f) State advantage and disadvanqe of Hybrid vehicle.

Q2) Attempt the following :

- a) i) Draw the block diagram and circuit symbol of PUT. **[2]**
ii) Explain the working of AC motor with suitable diagram. **[4]**
- b) Compare between electric vehicle and hybrid vehicle. **[4]**

Q3) Attempt the following :

- a) i) Draw the circuit diagram to control the armature current of DC motor using SCR. **[2]**
ii) Explain the working of full Bridge Inverter with Resistive load (R) and draw the wave forms at its output. **[4]**
- b) What is hybrid vehicle? State advantages and disadvantages of hybrid vehicle. **[4]**

P.T.O.

Q4) Attempt the following :

- a) i) What is trickle charging use in electric vehicle and hybrid vehicle. [2]
- ii) Draw the block diagram of TRIAC and explain its working principle with I-V characteristics. [4]
- b) With the help of block diagram explain working of On-Line UPS. [4]

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

- a) Draw the circuit for dV/dt protection of SCR and explain its working.
- b) Explain the working principle of DIAC and draw I-V characteristics.
- c) State three difference between single phase and three phase.
- d) Write a short note on Dielectric Heating.
- e) State different types of DC motors.
- f) State various blocks required for design of electric motor drive.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-801

T.Y. B.Sc.

ELECTRONIC SCIENCE

EL - 364 : Manufacturing Processes for Electronics

(36224) (CBCS 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) *Q. 2 to Q. 5 carry equal marks.*

Q1) Attempt any five of the following :

[5]

- a) Define inductor.
- b) Name various types of solder material.
- c) What do you mean by silk mass screen?
- d) What is Vias?
- 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]**

P.T.O.

- Q3)** a) i) State importance of photoresist material in IC fabrication technology. [2]
ii) What is difference between single, double and multilayer PCB. [4]
b) What is stencil printing process? [4]

Q4) Attempt the following :

- a) i) How image transferred is done while designing PCB layout. [2]
ii) State any four steps in PCB manufacturing process. [4]
b) Explain construction of transistor and its working principle. [4]

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

- a) State the classifications of capacitors based on dielectric material.
b) State any two types of material as PCB substrate. State any three chemicals used in PCB manufacturing.
c) Sketch and indicate importance element of multilayer PCB.
d) What is vision guided assembly? Why inspection and quality control is needed in PCB manufacturing process.
e) What is difference between through hole and surface mount soldering.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

P5081

[5822]-802

T.Y. B.Sc.

ELECTRONIC SCIENCE

EL-365 : Process Control Systems

(36225) (2019 Pattern CBCS) (Semester - VI) (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]

- a) Define Instrument.
- b) What is meant by Data Acquisition System?
- c) Define process control.
- d) What is proportional controller?
- e) What is transfer function?
- f) What is meant by primary sensing element?

Q2) Attempt the following: [10]

- A) i) Explain error parameter in control system. [2]
- ii) Write applications of proportional control mode. [4]
- B) Draw & explain process control block diagram. [4]

Q3) Attempt the following: [10]

- A) i) Write difference between zero order & first order system. [2]
- ii) Draw & explain single channel Data Acquisition System. [4]
- B) Write the difference between deflection & null type methods, give suitable example. [4]

P.T.O.

Q4) Attempt the following: [10]

A) i) What is the effect of proportional derivative & proportional integral controller on the system performance. [2]

ii) Explain first-order system. [4]

B) Explain derivative control mode. [4]

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

a) Enlist the methods of correction for interfacing & modifying inputs.

b) How many elements are used in data acquisition system? Explain it.

c) What is control system? Explain closed loop system.

d) How many types of method of measurements? State it in details.

e) What is second order system? Give its example.

f) Write advantages of automation process control.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

P5082

[5822]-803

T.Y.B.Sc.

Electronic Science

EL366(A): PLC & SCADA

(CBCS 2021 Pattern) (Semester-VI) (Paper VI(A)) (Regular)

(36226A)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5. Which carry equal marks.*

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

- a) What does PLC mean?
- b) What is full form of SCADA?
- c) What is DCS?
- d) What is full form of RTU?
- e) What is LAN?
- f) “SCADA is process!” justify.

Q2) a) i) List any two applications of PLC. **[2]**

ii) what is the role of PLC in automation. **[4]**

b) How A/D converter and D/A converter is important in PLC? **[4]**

Q3) a) i) List any two types of PLC based on output. **[2]**

ii) Explain in single sentence any four advantages of PLC. **[4]**

b) Name any four wiring techniques use in PLC. **[4]**

P.T.O.

- Q4)** a) i) Define SCADA. [2]
ii) List any four purpose of SCADA system. [4]
b) What are the four functions of SCADA? [4]

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

- a) DNP3 protocol.
- b) Applications of SCADA system.
- c) Digital Logic Gate use in Ladder-Logic.
- d) Six Basic Components of SCADA.
- e) Key Features of SCADA.
- f) SCADA Vs PLC comparison.



Total No. of Questions : 5]

SEAT No. :

P5083

[Total No. of Pages : 2

[5822]-804

T.Y.B.Sc.

ELECTRONIC SCIENCE

EL - 366(B) : Sensors and Systems

(CBCS - 2019 Pattern) (Semester - VI) (Paper - VI(B)) (36226B)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Question 2 to question 5 carry equal marks.*

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

- a) What is photoelectric effect?
- b) Define the term hysteresis of sensor.
- c) State the name of signal conditioner circuit used for thermocouple.
- d) State examples of actuators.
- e) Step angle of stepper motor is 1.8 degree. Calculate the number of pulses required to complete one rotation of 360 degree.
- f) State the importance of sensors used in industry security.

Q2) Attempt the following:

- a) i) Draw the block diagram of single channel data acquisition system. [2]
ii) Explain with diagram the gas sensing mechanism in semiconductor metal oxide gas sensor. [4]
- b) State and define two characteristics of op-amp for using it as a precision amplifier. [4]

Q3) Attempt the following.

- a) i) State applications of servomotor. [2]
ii) State the difference between AC motor and DC motor. [4]
- b) State the different-types of light sensors used and names of materials used as photo detective materials. [4]

P.T.O.

Q4) Attempt the following.

- a) i) State the names of power controlled devices used to control the current/voltage of AC motor. [2]
- ii) Draw the block diagram of multichannel data acquisition system and explain. [4]
- b) Explain the working of stepper motor with the help of diagram. [4]

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

- a) Define the term linearity and selectivity of sensor.
- b) State the names of vibration sensor and its working principle.
- c) Write a short note on self-heating in RTD.
- d) State the role of ADC and signal conditioner in the data acquisition system.
- e) Draw and explain the block diagram of green house for controlling humidity, soil moisture and temperature.
- f) Draw block diagram of home security system and state various sensors and actuators used in it.



Total No. of Questions : 5]

SEAT No. :

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T.Y.B.Sc.

ELECTRONIC SCIENCE

**ELSEC - 361 : SEC1 : Design and Fabrication of Printed Circuit Board
(CBCS 2019 Pattern) (Semester - VI) (Paper - X) (362210)**

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.*

Q1) Attempt any five of the following.

[5]

- a) What is GETEK in PCB?
- b) What is gerber file?
- c) Give the meaning of footprint?
- d) Mention the use of various colors in PCB.
- e) What is conductor?
- f) What is full form of PCB?

Q2) Attempt the following:

a) i) Give the definition of:

a) Vias

b) Tracks

[2]

ii) Explain in short tetra functional FR-4 PCB material.

[4]

b) Write a short note on flexible boards.

[4]

P.T.O.

Q3) Attempt the following.

- a) i) What is outline in PCB? [2]
- ii) Explain in short auto routing method. [4]
- b) Give the physical properties of laminates. [4]

Q4) Attempt the following.

- a) i) Explain net listing in PCB. [2]
- ii) Write a short note on etching & drilling of PCB. [4]
- b) Explain any two layers of PCB. [4]

Q5) Attempt the following (any four). [10]

- a) Write a short note on single sided PCB board.
- b) Write the advantages of use of heat sink with IC.
- c) Write in short SMD.
- d) Explain hazardous effects of PCB industry on environment.
- e) Explain THM and SMT.
- f) Describe DRC in PCB.



Total No. of Questions : 5]

SEAT No. :

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[5822]-806

[Total No. of Pages : 2

T.Y. B.Sc.

ELECTRONIC SCIENCE

**ELSEC - 362 : SEC : 2 - Mobile Application Development (MAD)
(CBCS 2019 Pattern) (Semester - VI) (362211) (2 Credits)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) What is base of android operating system?
- b) What is Android version number for Donut?
- c) “Android Application can be test by simulation without physical device is possible with the help of Android Emulator” justify.
- d) “Python & COBOL language are used to develop various types of Applications in Eclipse” Justify?
- e) Which Android version has release date on 9 February 2009?
- f) Strings.xml file located in which folder?

Q2) a) i) Define AVD. **[2]**

ii) How the android : version code & android.versionName attributes are different in the Android manifest.xml file? **[4]**

b) List four main layers of Android operating system. **[4]**

Q3) a) i) What will be display on screen if you have many activities with the same intent filter action name? **[2]**

ii) Comment about reason why, “Different colours and different images are always use in Mobile application development on display screen button”. **[4]**

P.T.O.

- b) Explain the role and importance of [4]
i) Scroll view
ii) Screen orientation

- Q4)** a) i) List any two location based services. [2]
ii) Give any two importance of Display Map in Mobile Application. [4]
b) Why progress Bar view is important? Give any two examples. [4]

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

- a) Interface designing principles.
b) Android operating system features.
c) Layout components.
d) Android Software Development Kit.
e) Android Development Tools.
f) Managing Resources Components.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-807

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) Answer one or two sentences (Any five)

[5]

- a) Define personality.
- b) What is cardinal trait?
- c) What is defense mechanism?
- d) Define collective consciousness.
- e) What is a trait?
- f) Who proposed social cognitive theory of personality?

Q2) a) Explain the characteristics of good personality theory.

[6]

OR

Explain Behavioristic perspective of personality.

- b) What did Skinner believe about personality?

[4]

Q3) a) Discuss Freud's Psychoanalytic approach of personality.

[6]

OR

Explain Maslow's need hierarchy theory.

- b) Evaluate the role of birth order in personality development

[4]

P.T.O.

Q4) a) Discuss Eysenck's Hierarchical model of personality. [6]

OR

Explain Kelley's personal construct theory.

b) Compare Humanistic and Behavioral perspectives of personality [4]

Q5) Write short notes. (Any 4). [10]

- a) Identity Formation.
- b) Determinants of Personality.
- c) Personal dispositions.
- d) Cognitive style
- e) Developing one's self.
- f) Ego crisis.



Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

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 ADHD?
- b) Define Personality disorder.
- c) What is Insomnia?
- d) What is Bullemia?
- e) What is OCD?
- f) What is alcohol abuse?

Q2) a) Explain nature, symptoms and causes of Nacolepsy and breathing related sleep disorders. **[6]**

OR

Explain in detail Avoidant personality disorder and Dependent Personality disorders.

b) What is the difference between drug abuse and drug dependence? **[4]**

Q3) a) Discuss Autism Spectrum disorder with symptoms and treatment. **[6]**

OR

What is communication disorder? Explain the types of communication disorder with symptoms.

b) Compare Biuge Eating disorder? with pica disorder. **[4]**

P.T.O.

Q4) a) Discuss various causal factors and treatment of -alcohol dependence. **[6]**

OR

Explain Antisocial personality disorder and Borderline Personality disorders in detail.

b) Illustrate various treatments for eating disorder. **[4]**

Q5) Write short notes (Any Four) **[10]**

- a) Dyslexia
- b) Withdrawal symptoms.
- c) Psychoactive drugs
- d) Anorexia Nervosa
- e) Narcissistic personality disorder
- f) Hypersomolence disorder



Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

[5822]-809

T.Y. B.Sc.

PSYCHOLOGY

Educational Psychology

(2019 Pattern) (Semester - VI) (Paper-III) (36203)

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 answer in one of two sentences. (Any Five) **[5]**

- a) Define learning.
- b) Define Educational Psychology.
- c) Who has proposed the theory of cognitive development?
- d) Who is social learning?
- e) What is participative teaching method?
- f) What is cognition?

Q2) a) Discuss how the knowledge of Educational Psychology helps the learner and learning process. **[6]**

OR

Throw light upon the scope of Educational Psychology. **[6]**

b) Analyse the role of good physical Environment in classroom teaching. **[4]**

Q3) a) Explain the role of information processing Approach. **[6]**

OR

Discuss the role of Behavioristic approach in learning. **[6]**

b) Analyse the meaning and nature of individual differences. **[4]**

P.T.O.

Q4) a) Explain the role of motivation in teaching and learning [6]

OR

Explain the process of language development. [6]

b) Analyse the role of culture in overall development. [4]

Q5) Write short notes. (Any Four). [10]

- a) Experiential Learning.
- b) Nature of Educational Psychology.
- c) Constructivist view of learning.
- d) Classroom assessment.
- e) Positive Environment of learning.
- f) Emotional Development



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-810

T.Y. B.Sc.

PSYCHOLOGY

**Paper - IV : Human Resource Management
(2019 Pattern New) (Semester - VI) (36204)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) What is job analysis?
- b) Define HRM.
- c) What is token economy.
- d) Define job evaluation.
- e) State the employee welfare schemes.
- f) Define incentive.

Q2) a) Explain different types of training methods. [6]

OR

Describe the various employee selection methods.

- b) Analyse the HRM model. [4]

Q3) a) Discuss the functions and challenges of HRM. [6]

OR

Elaborate the components and factors at employee remuneration.

- b) Examine the various types of employee benefit services. [4]

P.T.O.

Q4) a) Explain the objectives and principles of HRM. [6]

OR

Describe the performance appraisal methods with their challenges.

b) Investigate the goals of Training programs. [4]

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

- a) Scope of HRM.
- b) Process of training program.
- c) Employee remuneration.
- d) Employee selection process.
- e) Training need analysis.
- f) Importance of incentive payments.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-811

T.Y. B.Sc.

PSYCHOLOGY

Rehabilitation Psychology

(2019 Pattern) (Semester - VI) (Paper-V) (36205) (Regular)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

Q1) Solve any five of the following.

[5]

- a) Define Coring.
- b) What is Stigma?
- c) State the types of approaches in rehabilitation.
- d) Define Psychotherapy?
- e) What is Community?
- f) Name the types of counseling.

Q2) a) Explain the impact of disability on individual & family.

[6]

OR

Describe rehabilitation programme in vocational training units.

- b) Differentiate the intervention for family burden and work performance. **[4]**

Q3) a) Elaborate the hisrorical perspectives of rehabilitation.

[6]

OR

Explain the Community based programmes in rehab.

- b) Analyze the advantages of hostel & day care rehabilitation programmes.[4]

P.T.O.

Q4) a) Describe the advantages and disadvantages of hospital and residential rehab programmes. [6]

OR

Explain the any two approaches of rehabilitation programmes.

b) Investigate the effects of individual & group Counseling. [4]

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

- a) Psychiatric disorder
- b) Goals of rehabilitation
- c) Assessment of disability
- d) Halfway home rehabilitation
- e) Objectives of rehab
- f) Roles of Eclectic.



Total No. of Questions : 5]

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T.Y.B.Sc.

PSYCHOLOGY

Psychotherapies (Paper-VI)

(36206) (2019 Pattern-New) (Semester-VI)

Time : 2 Hours]

[Max. Marks : 35

Instructions :

- 1) *Q1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Questions from 2 to 5 carry equal marks.*

Q1) Solve any Five of the following.

[5]

- a) Define Psychotherapy.
- b) Who was the founder of psychoanalytic therapy?
- c) State the full form of REBT.
- d) What is mindfulness?
- e) State the full form of CBT.
- f) Define aversive conditioning.

Q2) a) Elaborate the various types of Psychotherapy.

[6]

OR

Describe the elements and steps of systematic desensitization.

- b) Analyze the ego states in TA.

[4]

Q3) a) Explain the objectives, benefits and process of Psychotherapy.

[6]

OR

Describe the key components and process of cognitive therapy.

- b) Justify the effectiveness of play therapy.

[4]

P.T.O.

Q4) a) Explain the key components and process of REBT. [6]

OR

Discuss the techniques and barriers of assertiveness training.

b) Analyze the benefits of family therapy. [4]

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

a) Therapeutic relationship.

b) Critics on psychoanalytic therapy

c) Steps in mindfulness training.

d) Application of token economy.

e) Advantages of dance therapy

f) Usages of aversive therapy.



Total No. of Questions : 5]

SEAT No. :

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T.Y.B.Sc.

PSYCHOLOGY

SEC - I : Basic Therapeutic Skills

(2019 Pattern New) (Semester - VI) (362010)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Question 2 to question 5 carry equal marks.*

Q1) Solve any five of the following.

[5]

- a) Define psychotherapy.
- b) State the benefits of psychotherapy.
- c) Define positive regards.
- d) What is termination?
- e) Define empathy.
- f) State the types of communication.

Q2) a) Explain the objectives and process of psychotherapy.

[6]

OR

Describe the components and advantages of empathy.

b) Justify the role of effective listening skills among therapists.

[4]

Q3) a) Discuss the various factors influencing on effects of psychotherapy. **[6]**

OR

Distinguish between reflecting & paraphrasing in counseling.

b) Critically analyze the impact of termination on client.

[4]

P.T.O.

Q4) a) Explain the key elements of immediacy & genuineness skills among therapists. **[6]**

OR

Investigates the challenges for setting boundaries in therapeutic relationship.

b) Analyze the component of building rapport with client. **[4]**

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

a) Therapeutic relationship.

b) Social skills of therapists.

c) Critical thinking.

d) Interpretation skills.

e) Use of questions skills.

f) Concreteness.



Total No. of Questions : 5]

SEAT No. :

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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 Q2. to Q5.*
- 3) *Questions from 2 to 5 carry equal marks.*

Q1) Solve any five of the following:

[5]

- a) Define soft skills.
- b) Define communication.
- c) State the needs of goal setting.
- d) Define etiquettes.
- e) State the types of communication.
- f) State the steps of time management.

Q2) a) Explain the various barriers in communication.

[6]

OR

Describe the process of goal setting.

- b) Differentiate soft skills and hard skills.

[4]

Q3) a) Describe the nature and types of soft skills.

[6]

OR

Discuss the telephone etiquettes.

- b) Critically evaluate the factors that hamper listening.

[4]

P.T.O.

Q4) a) Explain the importance of soft skills. [6]

OR

Describe the types of non-verbal communication.

b) Investigate the email etiquettes. [4]

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

- a) Steps in career planning
- b) Component of etiquettes
- c) Types of hard skills
- d) Senses of time management
- e) Social etiquettes
- f) Benefits of goal setting



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-815

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

**EVS - 301 : Aquatic Ecosystem and Management
(2019 Pattern) (Semester - VI) (Paper - I) (36241)**

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 : Limnology.
- b) Write the importance of Ramsar Convention.
- c) Differentiate between Lentic and Lotic water ecosystems.
- d) Enlist the parameters of Aquatic environment.
- e) What are Coral reefs?

Q2) a) Write in brief about the food production potential of marine resources.

[6]

- b) Explain the zonation in lake ecosystem.

[4]

P.T.O.

Q3) a) Explain the ecological classification of freshwater organisms. [6]

b) Justify : Applications of Remote sensing in coastal management. [4]

Q4) a) Describe about any one method of aquatic ecosystem sampling. [6]

b) Discuss the various functions of wetlands. [4]

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

a) Concept of Integrated aquatic ecosystem management.

b) Ecodevelopment program and aquatic ecosystem management.

c) Aquatic ecosystem sampling.

d) Types of wetlands.

e) Ecological classification of freshwater organisms.

f) Coral reef bleaching.



Total No. of Questions : 05]

SEAT No. :

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[Total No. of Pages : 2

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS-302 : 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) Which animal is the state animal of maharashtra. **[1]**
- b) What are the four biodiversity hotspots in India? **[1]**
- c) What do you mean by Gene Sanctuary? **[1]**
- d) What is in-situ conservation? **[1]**
- e) What does mean by cryo preservation? **[1]**
- f) What is field gene banking? **[1]**

Q2) a) Write note on National park.

[6]

b) Write in brief about Nature conservation.

[4]

Q3) a) Describe major roles of NGOs in Conservation of Nature.

[6]

b) Explain any four challenges of in situ nature conservation.

[4]

Q4) a) Write on importance of awareness in nature conservation.

[6]

b) Explain the functions of BNHS in nature conservation.

[4]

P.T.O.

- Q5)** Write short notes on any Four of the following. **[10]**
- a) Functions of MOEFCC. **[2.5]**
 - b) Importance of SPCB. **[2.5]**
 - c) Write note on seed banks. **[2.5]**
 - d) Describe principles of nature conservation. **[2.5]**
 - e) Describe two challenges of Ex - situ conservation. **[2.5]**
 - f) Write note on wwf. **[2.5]**



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-817

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS-303 : Air and Noise Quality

(36243) (2019 Pattern) (Semester - VI) (Paper-III)

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) *Questions from 2 to 5 carries equal marks.*

Q1) Solve any Five of the following.

[5]

- a) Define the Air Pollution.
- b) Full form of APTI and AQI
- c) Define-Sound Intensity.
- d) What is meant by Noise Indiceo?
- e) Enlist the various causes of Ozone layer depletion.
- f) Define-Noise Pollution.

Q2) a) Explain in detail effects of Air Pollution on human health, plants and animals, materials. **[6]**

b) Write a short note on Noise Instrumentation and Monitoring Procedure. **[4]**

Q3) a) Write short note on various air pollution control equipments used in Industries for particulate matter. **[6]**

b) Explain in detail Noise standards and Limit values. **[4]**

Q4) a) Write short note on effects of Noise Pollution on human health. **[6]**

b) Write short note on-composition of Atmosphere. **[4]**

P.T.O.

Q5) Write short note on any four of the following.

[10]

- a) Indoor Air pollution.
- b) Noise Indiceo and Annoyance Rating scheme
- c) Electrostatic Precipitators
- d) Smog
- e) Causes of Noise Pollution.
- f) Effect of carbon monoxide on human health.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-818

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS - 304 : Issues in Environmental Science

(36244) (2019 Pattern) (Semester - VI)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q1 is compulsory.*
- 2) *Solve any 3 questions from Q2 to Q5.*

Q1) Attempt any five of the following.

[5×1=5]

- a) What is full form of MIC gas?
- b) How many biosphere reserves are in India?
- c) Who is father of Green Revolution?
- d) What do you mean by 'Appiko Movement'.
- e) Write any two examples of Bioresource.
- f) Give the 2 examples of in-situ conservation.

Q2) Attempt the following.

- a) What is eutrophication? What are the threat and remedial measures for it? **[6]**
- b) Explain the various measures for energy conservation. **[4]**

Q3) Attempt the following.

- a) What is importance of wetland? Add a note on its conservation method. **[6]**
- b) Explain the importance of ecofeminism on environment protection. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Briefly write the food crisis. Add a note on importance of Green revolution. [6]
- b) What are the causes of desertification? [4]

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

- a) Pastrolism.
- b) Ex-situ conservation.
- c) Forest resources.
- d) Population explosion.
- e) Utilization of flyash.



Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

[5822]-819

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

**EVS - 305 :Environmental Governance - EMS, EIA and ISO4000
(2019 Pattern) (Semester - VI) (Paper-V) (36245)**

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 benefit being ISO Certified?
- d) What is the need of Environmental Policy?
- e) What is Cost-Benefit Analysis?
- f) What are three pillars of sustainability?

Q2) Answer the following.

- a) Write in detail about the elements of EMS and EMP. **[6]**
- b) What are the requirements of ENvironmental Impact Assessment studies? **[4]**

Q3) Answer the following.

- a) What are the important considerations under PDCA cycle? Add note on benefits of ISO 14000. **[6]**
- b) What are disadvantages of life cycle Assessment. **[4]**

P.T.O.

Q4) Answer the following

- a) Explain the need of Environmental Governance. Add a note on working of Environmental Regulations in India. [6]
- b) Write in short about scope and denefits of ISO 14000 standards. [4]

Q5) Write a short note on any five of the following. [5×2=10]

- a) Functions of Bureau of Indian Standards.
- b) Advantages of EIA.
- c) Types of Enviromental Audit.
- d) Importance of 'Plan' 'Do' in PDCA cycle.
- e) Different methods of Data Collection.
- f) Objectives of Environmental Governance.



Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

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T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

EVS-306: Environmental Biotechnology-II

(2019 Pattern) (Semester-VI) (36246)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Question 2 to 5 carry equal marks.*

Q1) Attempt any Five of the following.

[5×1=5]

- a) Define air pollution.
- b) What is the principal of bioremediation.
- c) What is Rhizofiltration name few organisms associated with it?
- d) What are the different types of Xenobiotics?
- e) Which bacteria are used to leach out minerals in biomining?
- f) What is the pH of biogas plant?

Q2) Attempt the following

[10]

- a) How environmental biotechnology play role in bioremediation? **[6]**
- b) Write in detail any four examples of indicator organisms. **[4]**

Q3) Attempt the following

[10]

- a) Explain in detail phytoremediation with their types. **[6]**
- b) Which fuels is made in a biodigester? **[4]**

Q4) Attempt the following

[10]

- a) Explain in detail biosorption techniques for removal of pollutants. **[6]**
- b) Explain in detail biopolymer. **[4]**

P.T.O.

Q5) Attempt any four of the following.

[10]

- a) Immobilized enzyme.
- b) Streptococci
- c) Activated sludge.
- d) Oxic & anoxic degradation of Xenobiotic..
- e) Metal precipitation.
- f) Heterotropic plate counts.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

P5100

[5822]-821

T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

**EVS - 3013 : Solid Waste Management
(2019 Pattern) (Semester - VI) (362410)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*

Q1) Attempt any five of the following.

[5]

- a) Define hazardous waste.
- b) Write any two impact of Solid Waste on soil.
- c) Define sewage.
- d) Define Paralysis.
- e) Which type of material used for composting.
- f) What is WTE process.

Q2) Attempt any four of the following.

a) Define the thermal treatment of solid waste.

[6]

b) Why industrial waste management is important.

[4]

Q3) Attempt any two of the following.

a) Explain the bioleaching of metals in mining waste treatment.

[6]

b) Briefly write the collection and disposal methods of municipal solid waste. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Briefly write the integrated waste management practices. **[6]**
- b) Briefly write the energy recovery from waste. **[4]**

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

- a) RDF.
- b) Gasification of solid waste.
- c) Primary treatment unit – screening.
- d) Soil leachate.
- e) Pyrolysis.
- f) 3R principle.



Total No. of Questions : 5]

SEAT No. :

P5101

[5822]-822

[Total No. of Pages : 2

ENVIRONMENTAL SCIENCE

EVS - 3014 : Urban Ecosystem

(2019 Pattern) (Semester - VI) (Paper - I) (362411)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Right figures indicate full marks.*
- 3) *Question 2 to 5 solve any three.*
- 4) *Question 2 to 5 carry equal marks.*

Q1) Attempt any FIVE of the following-

[5×1=5]

- a) Define urban pollution.
- b) What are the urban natural resources?
- c) What are the main cause of soil pollution.
- d) Why are the major housing problems in urban areas.
- e) What is meant by urbanization.
- f) What is impact of urban sprawl.

Q2) Attempt the following.

- a) How can cities become more sustainable and livable. **[6]**
- b) What are green spaces and what is its purpose. **[4]**

Q3) Attempt the following.

- a) Narrate the importance of alternative resources. **[6]**
- b) Explain the importance natural spaces. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Write the benefits of environmental management. [6]
- b) Write the importance of natural forest ecosystem. [4]

Q5) Attempt the following. [10]

- a) Green building
- b) Non-conventional energy resources.
- c) Sanitary Land fill
- d) Rain water harvesting
- e) Town planning
- f) Smart city



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P5102

[5822]-823

Third Year B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 601 : Armed Forces and Disaster Management

(2019 Pattern) (Semester - VI) (36231)

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) State the concept of Disaster.
- b) Define Biological Disaster.
- c) State the Meaning of Meteorological Disaster.
- d) Define Industrial Disaster.
- e) State the aims of Disaster Management.

Q2) Write short notes on (any two)

[10]

- a) Human Disaster
- b) Disaster Mitigation
- c) Disaster Recovery

P.T.O.

Q3) Attempt the following questions (any two).

[10]

- a) Explain the Types of Disaster.
- b) Explain the Importance of Team-Building in Disaster Management.
- c) State the Emerging trends in Disaster mitigation.

Q4) Answer in details (any one).

[10]

- a) Explain the public health system its role in disaster management prevention.
- b) State the effect of culture and disaster management.



Total No. of Questions : 04]

SEAT No. :

P5103

[5822]-824

[Total No. of Pages : 1

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 602: United Nation Organization - II

(2019 Pattern) (Semester-VI) (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 Collective security.
- b) State the Function of the UN.
- c) Define Arms control.
- d) State the Function of Trusteeship Council.
- e) State the role of India in UN.

Q2) Write short notes on (any two). [10]

- a) WHO
- b) ICJ
- c) UDHR

Q3) Attempt the following questions (any two). [10]

- a) UN Role in Human rights.
- b) Role of the General Assembly.
- c) State the Future Threats in Globalization.

Q4) Answer in details (any one) [10]

- a) Explain the role of the Economic and Social Council.
- b) Explain the Origin of the UN.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 1

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[5822]-825

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 Idealism.
- c) Define Nation.
- 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) Liberalisms
- c) Normative Approaches

Q3) Attempt the following questions (any two) **[10]**

- a) Explain the role of the Economic and Social Council.
- b) Explain the Scientific Approaches in International Relations.
- c) Explain the Traditional Approaches in International Relations.

Q4) Answer in details (any one) **[10]**

- a) Explain the Traditional Approaches in International Relations.
- b) Explain the Social Approaches in International Relations.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 1

P5105

[5822]-826

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 right indicate full marks.*

Q1) Define the following questions. **[5]**

- a) Define counter Terrorism.
- b) Define military.
- c) Define paramilitary.
- d) State the role of media in counter Terrorism.
- e) Define international community.

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

- a) Counter Terrorism
- b) Law Enforcement Mechanism
- c) International Community

Q3) Attempt the following questions (any two) **[10]**

- a) Explain the Counter Terrorism in Jammu and Kashmir.
- b) Explain the Counter Terrorism groups.
- c) State the Role of Military in Counter Terrorism.

Q4) Answer in details (any one) **[10]**

- a) Explain the Role of Paramilitary in Counter Terrorism.
- b) Explain the Counter Terrorism in Jammu and Kashmir.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P5106

[5822]-827

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 606(A) : Major Global Conflict-II

(2019 Pattern) (Semester - VI) (Regular) (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) Why does China grow faster than India?
- b) Define the environment.
- c) Define Nuclear Deal.
- d) Define Defence.
- e) What is the issue with the US and Iran?

Q2) Write short notes on (any two)

[10]

- a) Doklam Issue
- b) Pollution
- c) Galwan Valley Conflict

Q3) Attempt the following questions (any two)

[10]

- a) State the Iran USA Conflict Present Status.
- b) Explain the Role of the UN in Environmental Issues.
- c) State the historical background of the India China Conflict.

Q4) Answer in details (any one)

[10]

- a) Explain China's role in the Indian ocean.
- b) Describe the Chinese Maritime disputes with Japan.



P.T.O.

Total No. of Questions : 4]

P5106

[5822]-827

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 606(B) : Regional Security System-II

(2019 Pattern) (Semester - VI) (Regular) (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. **[5×1=5]**

- a) Write the full form QUAD
- b) Write the full form SCO
- c) Write the full form BRICS
- d) Write the full form BIMSTEC
- e) Write the full form UE

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

- a) Structure of BRICS
- b) Structure of SCO
- c) Origin of BIMSTEC

Q3) Attempt the following questions (any two) **[10]**

- a) State the Development of BIMSTEC.
- b) Explain the Role of BRICS
- c) State the Origin of QUAD.

Q4) Answer in details (any one) **[10]**

- a) Explain the structure, Objectives of QUAD.
- b) State the Origin and Development of BIMSTEC.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5822]-828

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 607(A) : India's Maritime Security-II

(36237 A) (2019 Pattern) (Semester - VI)

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 Indian Ocean.



P.T.O.

Total No. of Questions : 4]

P5107

[5822]-828

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS 607(B) : Peace & Conflict Studies-II

(36237 B) (2019 Pattern) (Semester - VI)

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 Peace.
- b) Define Conflict.
- c) Define Security.
- d) Define Defence.
- e) Define Conflict Studies.

Q2) Write short notes on (any two)

[10]

- a) Peace Studies
- b) Outcomes of Conflict
- c) Impact of Peace

Q3) Attempt the following questions (any two)

[10]

- a) State the measures of Peace Building.
- b) State the Nature and Impact of Peace.
- c) Explain the Goals of Peace.

Q4) Answer in details (any one)

[10]

- a) Describe the problems of Peace Building in the 21st Century.
- b) Explain the U.N. System : Methods of Pacific Settlements of Disputes.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P5108

[5822]-829

T.Y.B.Sc

DEFENCE AND STRATEGIC STUDIES

DS 608(A) : Indian Military History (1974-2020)

(2019 Pattern) (Semester - VI) (36238A)

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 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]

P5108

[5822]-829

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES
DS 608(B) : British Indian Military History
(2019 Pattern) (Semester - VI) (36238B)

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 Military History.
- b) Define Nationalism.
- c) Define Swadeshi Movements.
- d) Define Revolt.
- e) Define Gandhian Nationalism.

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

- a) British Indian Military History.
- b) Modern India.
- c) Quit India Movement.

Q3) Attempt the following questions (any two). **[10]**

- a) Explain the Revolutionary Movements in India.
- b) Explain the Causes of the 1857 Revolt.
- 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. :

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[Total No. of Pages : 2

[5822]-830

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 609(A) : Cold War and Post Cold War (1945-1991)

(2019 Pattern) (Semester - VI) (36239 A) (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.

[5×1=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 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 Cold War 1963-1989.

P.T.O.

Total No. of Questions : 4]

P5109

[5822]-830

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS - 609(B) : India's Defence Policy

(2019 Pattern) (Semester - VI) (36239 B) (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

[5×1=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) Defence Policy
- b) Defence collaboration
- c) Make in India

Q3) Attempt the following questions (any two)

[10]

- a) Explain the objectives of Defence Policy.
- b) Explain the elements of defence policy.
- c) State the principles of defence policy.

Q4) Answer in details (any one)

[10]

- a) Explain in detail India's characteristics of India's Defence policy.
- b) Explain in detail India's defence policy from 1962-1999.

ॐ ॐ ॐ

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 1

P5110

[5822]-831

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.

[5×1=5]

- a) Define security.
- b) Define networking.
- c) Define cyber.
- d) Define Information.
- e) Define threat modeling.

Q2) Write short notes on (any two)

[10]

- a) Cyber security
- b) Security Password
- c) Transmission media

Q3) Attempt the following questions (any two)

[10]

- a) Explain the meaning and concept of information security.
- b) Explain the types of networking.
- c) Describe basic communication systems.

Q4) Answer in details (any one)

[10]

- a) Explain in detail networking topography.
- b) Explain in detail Basics of threat and vulnerability.

ॐ ॐ ॐ

Total No. of Questions : 4]

SEAT No. :

P5111

[5822]-832

[Total No. of Pages : 1

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

[5×1=5]

- a) Define Human rights.
- b) Write the concept of sarvodaya.
- c) State the fundamental rights.
- d) Explain 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) Human rights.
- b) National human rights commission.
- c) National commission for schedule caste and schedule tribes.

Q3) Attempt the following questions (any two)

[10]

- a) Explain a brief look at various aspects of human rights in India.
- b) State the role of Maharashtra State human right commission.
- c) Explain in detail judicial organs on an international level.

Q4) Answer in details (any one)

[10]

- a) Explain the National Human Rights Commission of India.
- b) Explain in detail Maharashtra State Commission for Protection of Child Rights.



Total No. of Questions : 5]

SEAT No. :

P5112

[5822]-833

[Total No. of Pages : 2

T.Y. B.Sc.

VOCATIONAL BIOTECHNOLOGY

**VBt : 321 : Biotechnology in Agriculture and Environment
(CBCS 2019 Pattern) (Semester - VI) (36571) (Regular)**

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 labelled diagrams wherever necessary.*

Q1) Solve any five of the following.

[5]

- a) Name the selective medium used for culturing phosphate solubilizers.
- b) Give any one application of phytoremediation.
- c) Define xerobiotics.
- d) Enlist the two types of bioremediation.
- e) Give any one feature of an ideal biosensor.
- f) Name any two organisms involved in hydrogen gas production.

Q2) a) Answer any two of the following:

[6]

- i) Define biosensors. Explain the components of biosensors in detail.
- ii) Describe the process of biodegradation of atrazine.
- iii) Explain the mechanism of action of cry protein on the insect's digestive system.

a) Answer any one of the following:

[4]

- i) Describe any one genetically modified plant in detail.
- ii) Give features of Azolla-Anabaena as biofertilizer.

P.T.O.

Q3) a) Write short note on any one of the following. [6]
i) Phytodegradation.
ii) Process of bioethanol production.

b) Explain any one ex-situ method of bioremediation in detail. [4]

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

i) Name any two methods of in-situ bioremediation. Give the applications of bioremediation.

ii) Define hyper accumulators. What are phytochelatins and metallothioneins? Give their role in phyto extraction.

iii) Explain the stages involved in biogas production.

iv) Give any two applications of biosensors.

b) Give any three features of Azotobacter. Give the advantages of Azotobacter as biofertilizer. [4]

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

a) Leghemoglobin.

b) Advantages of biopesticides.

c) Applications of phytoremediation.

d) Features of phosphate solubilizers.

e) Adverse effects of chemical pesticides on the environment.

f) Antisense RNA technology.



Total No. of Questions : 5]

SEAT No. :

P5113

[Total No. of Pages : 2

[5822]-834

T.Y. B.Sc. (Vocational Biotechnology)

**VBt - 322 : BIOENTREPRENEURSHIP & BIOTECHNOLOGY
FOR HEALTH**

(CBCS 2019 Pattern) (Semester - VI) (36572)

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

Q1) Solve any five of the following:

[5]

- a) Define Regenerative medicine.
- b) Enlist any two features of entrepreneurship.
- c) What are nanoparticles?
- d) Name any one enzyme used in Enzyme therapy.
- e) Give full form of SISI.
- f) Give any two functions of FDA.

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

[6]

- i) Describe in detail composition and role of IAEC.
- ii) Describe how market survey can be used as tool in Entrepreneurship development.
- iii) Comment on scope & concept of Bioentrepreneurship.

b) Answer any one of following:

[4]

- i) How enzymes are used as therapeutics. Give any one example?
- ii) Give general introduction and applications of Nanomedicine.

P.T.O.

- Q3) a) Answer the following Questions (Any Two): [6]**
- i) Explain in detail role of DIC in promoting Entrepreneurship.
 - ii) Explain any two forms of Business organisations.
 - iii) What are stem cells? Give characteristics and properties of stem cells.
- b) Answer any one of following: [4]**
- i) Enlist and explain any four applications of Nanomedicine.
 - ii) Comment on skills and attributes of an entrepreneur.
- Q4) a) Answer the following Question (Any Two): [6]**
- i) Discuss in detail the role of project report and project formulation in promoting Entrepreneurship.
 - ii) Comment of “Co-operative organisations”.
 - iii) What are Nanobiochemical devices? Give their features?
- b) Answer any one of following: [4]**
- i) Give brief introduction to Genomic and personalized medicine.
 - ii) Comment on start up ideas for entrepreneurship.
- Q5) Write short notes on (Any Four): [10]**
- a) DNAase I in enzyme therapy.
 - b) Tissue Engineering in Regenerative medicine.
 - c) Various types of Entrepreneurs.
 - d) Scope of Biotechnology in Health.
 - e) Advancements in Diagnosis in Healthcare.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

P5114

[5822]-835

**T.Y. B.Sc. (Vocational)
SEED TECHNOLOGY**

**ST - 3.4 : Seed Farm Management, Processing and Storage
(CBCS 2019 Pattern) (Semester - VI) (2 Credits) (36891) (Paper - V)**

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 farm management.
- b) What is capital limitations?
- c) Define seed technology.
- d) What is single storage plant?
- e) Define Receiving.
- f) In-list the methods of seed storage.
- g) In-list the storage containers.

Q2) Attempt the following questions.

- a) Give the brief introduction of farm management.
- b) Explain the locality limitations.

[6]

[4]

Q3) Attempt the following questions.

- a) What is seed cleaning? Explain it details.
- b) Draw the basic flow pattern in seed processing plant.

[6]

[4]

P.T.O.

Q4) Attempt the following questions.

a) What is need of seed treatment? [6]

b) Write a note on storage containers. [4]

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

a) In-list the kinds of seed.

b) Which physical changes coming during the seed storage.

c) What is the seed maturity?

d) Write a short note on warehouse.

e) Write a note on sanitation.

f) Dehumidification.

g) Write a note on or Draw the diagram of slurry treater.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

P5115

[5822]-836

T.Y. B.Sc. (Vocational)

SEED TECHNOLOGY

**ST - 3.5 : Biotechnology and Intellectual Property Rights
(CBCS - 2019 Pattern) (Semester - 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 Q.2 to Q.5.*
- 3) *Questions 2 to Question 5 carry equal marks.*

Q1) Solve any five of the following:

[5]

- a) Define Callus.
- b) What is a Recombinant DNA technique?
- c) Which medium is used for Banana culture?
- d) What is Transgenics?
- e) Which chemicals are used in production of artificial seed?
- f) Define Inoculation.

Q2) Attempt the following questions:

- a) Explain rhizogenesis. **[6]**
- b) Give the application of Biotechnology. **[4]**

P.T.O.

Q3) Attempt the following questions:

- a) Explain tissue culture technique in Banana. [6]
- b) What is Caulogenesis? [4]

Q4) Attempt the following questions:

- a) Explain Embryo culture technique. [6]
- b) Give the details of PCR technique. [4]

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

- a) Artificial seed.
- b) Application of Transgenics.
- c) Rights of patentee.
- d) Scope of Biotechnology.
- e) Need of intellectual property rights.
- f) Western Blotting.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-837

T.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY

IMB - 365 : Bioentrepreneurship & IPR

(CBCS 2019 Pattern) (Semester - VI) (36825)

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) What is Marketing?
- b) State importance of Commercial Banks.
- c) What is Market Segmentation?
- d) What is dispute settlement?
- e) State any theory of IPR.
- f) State importance of trademarks.

Q2) Solve the following:

[10]

- a) Describe role of Banks.

[6]

OR

Describe role of WIPO.

[6]

- b) Write note on Private Banks.

[4]

P.T.O.

Q3) Solve the following: [10]

a) Explain process of starting start-up. [6]

OR

Explain role of Patenting process. [6]

b) Write note on merits and demerits of Joint Stock Company. [4]

Q4) Solve the following: [10]

a) Discuss merits of sole proprietorship. [6]

OR

Discuss merits of copy writing. [6]

b) Write note on types of patents. [4]

Q5) Solve any four: [10]

a) Role of Marketing.

b) Key features of Entrepreneur.

c) Marketing Mix.

d) Financial value of IPR.

e) Commercialisation of IPR.

f) Types of Intellectual Property.



Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

[5822]-838

T.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY

IMB - 366 : Recombinant DNA Technology

(CBCS 2019 Pattern) (Semester - VI) (36826) (Regular)

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) Represent diagrammatically - structure of 2' 3' dideoxynucleotide triphosphate.
- b) Draw the vector map for pBR322.
- c) What is meant by alpha complementation?
- d) State an example of heat stable DNA polymerase.
- e) State another name for chain termination method of sequencing.
- f) State the importance of DNA polymorphism in RDT?

Q2) Solve the following:

- a) Describe the process of Real time PCR.

[6]

OR

Describe the process of Sanger sequencing.

- b) Diagrammatically explain alpha complementation.

[4]

P.T.O.

Q3) Solve the following:

- a) Explain the concept of mutagenesis. [6]

OR

Explain the concept of DNA Polymorphism.

- b) Write a short note on site-directed mutagenesis. [4]

Q4) Solve the following:

- a) Discuss the impact of recombinant DNA technology on detection and diagnosis of pathogens and genetic diseases. [6]

OR

Discuss the impact of DNA fingerprinting on modern day forensic science.

- b) Write a short note on screening and selection of transformants in cloning. [4]

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

- a) Advances in genomics and proteomics.
- b) Pyrosequencing.
- c) Development of humulin.
- d) Action of Restriction endonuclease.
- e) Construction of cDNA library.
- f) Fetal DNA analysis.



Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

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) *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) Write full Form of EMBL.
- b) Give an example of a search engine used in bioinformatics.
- c) What is Global alignment in bioinformatics?
- d) State example of protein database.
- e) What is meant by orthologous sequences?
- f) What is KEGG?

Q2) Solve the following.

- a) Describe the types of and importance of sequence alignment based on number of sequences used for alignment. **[6]**

OR

Describe different types of databases used in bioinformatics.

- b) Write a note on Gen Bank.

[4]

P.T.O.

Q3) Solve the following.

- a) Explain applications of Bioinformatics. [6]

OR

Explain the process of sequence alignment.

- b) Enlist and describe different data submission tools. [4]

Q4) Solve the following.

- a) Discuss the impact of Bioinformatics on modern science. [6]

OR

Discuss role of bioinformatics in culture independent approach.

- b) Write a short note on metrics for alignment. [4]

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

- a) MEGA
- b) Local sequence alignment.
- c) Multiple sequence alignment.
- d) Types of algorithms used for phylogenetic tree building.
- e) Tools for aligning DNA sequences.
- f) Structure databases.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-840

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 Question 5 carry equal marks.*

Q1) Solve any five of the following:

[5]

- a) What is meant by “Entrepreneurship”?
- b) Define term Innovation.
- c) What are the legal liabilities of employee?
- d) What is income tax?
- e) State the job of pollution control board.
- f) State the role of MIDC in entrepreneurship.

Q2) a) Solve the following:

i) What is TDS?

[2]

ii) Comment : “Market Survey is important before the start of new business.”

[4]

b) State and explain some useful guidelines for the aspiring entrepreneurs.**[4]**

P.T.O.

- Q3) a)** Solve the following:
- i) What is difference between an entrepreneur and a small business owner? [2]
 - ii) What is a project report? State its important elements. [4]
- b) What is meant by ‘service industry’? [4]

- Q4) a)** Solve the following:
- i) State any two problems faced by small scale industry. [3]
 - ii) Explain the advantages and disadvantages of partnership. [3]
- b) Explain the role of consultancy organization in entrepreneurship development. [4]

- Q5) Attempt any four of the following: [10]**
- a) State main types of small scale industries.
 - b) Discuss the socio economic origins of entrepreneurship.
 - c) Discuss the necessary criteria for selection of new business.
 - d) What is working capital? Explain it with example.
 - e) Write a short note on “legal aspects” of small business.
 - f) Write a short note on : Marketing Strategy.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

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[5822]-841

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

Q1) Attempt any five of the following:

[5]

- a) What is electro-oculography?
- b) What is the nature of bioelectric potential?
- c) What is systolic blood pressure?
- d) Name the different components of an ECG wave?
- e) What is offset potential?
- f) What is meant by bundle of his?

Q2) Answer the following:

- a) Explain skin contact impedance.

[6]

OR

Discuss internal electrodes.

- b) Explain the basic electronic recording system.

[4]

P.T.O.

Q3) Answer the following:

- a) Write a short note on 'Spectrophotometer'. [6]

OR

Explain in detail ion selective electrodes.

- b) Discuss isolated power distribution system. [4]

Q4) Answer the following:

- a) Explain flame photometer in detail. [6]

OR

Explain shock hazards in context with bio-instrumentation system.

- b) Explain the features of alpha and beta waves. [4]

Q5) Answer in short (Any 4): [10]

- a) Explain general senses.
b) Explain special senses.
c) State four components of reflex arc.
d) Write the short note on microelectrodes.
e) Draw the different components of an ECG waveform.

