Total No. of Questions : 4]

SEAT No. :

PD616

[Total No. of Pages : 2

[6467]-501
T.Y. B.Sc. (Regular)
MATHEMATICS
DSE - 1A - MT - 351 : Metric Spaces
(2019 Pattern) (Semester-V) (35111)

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

Instructions to the candidates:

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

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

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

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

i) Q

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

c) Give an example of open balls $B(x,r)=B(y,s)$ for $x\neq y$ and $r\neq s$.

d) Let (X,d) be a discrete metric space. Find all closed sets in X.

e) Give an example of Cauchy sequence in X = (0, 1) which is not convergent.

f) Give an example of closed and bounded subset in Q which is not compact.

g) Show that the identity map is continuous from a metric space (X,d) to itself.

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

a) Prove that a subset E of a metric space (X,d) is closed if and only if E contains all its limit points.

b) Let (X,d) be a metric space, $x\in X$ and $r>0$. Then show that the open ball $B(x,r)$ is an open set.

P.T.O.

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

a) Let (X,d) and (Y,d) be metric spaces. Show that $d((x_1,y_1),(x_2,y_2)) = \max\{d(x_1,x_2),d(y_1,y_2)\}$ defines a metric on the product set X × Y.

b) Show that any Cauchy sequence in a metric space is bounded.

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

a) Prove that composite of continuous function is continuous.

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

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

a) Show that homeomorphism is an equivalence relation.

b) Show that a compact subset of a metric space is bounded.

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

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

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

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

a) Show that any closed subset of a compact set in a metric space (X,d) is compact.

b) Let A be a connected subset of a metric space X. Let $A \subset B \subset \bar{A}$. Then show that B is connected.

Total No. of Questions : 4]

SEAT No. : ____

PD617

[Total No. of Pages : 2

[6467]-502
T.Y. B.Sc. (Regular)
MATHEMATICS
DSE1B: MT-352: Real Analysis - I
(2019 Pattern) (Semester - V) (35112)

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

Instructions to the candidates:

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

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

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

b) Let $f(x) = \log x$, $(0 < x < \infty)$. Find image of f.

c) Define limit superior of a sequence of real numbers.

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

e) Define class l^2 of sequences of real numbers.

f) Does $\sum_{n=1}^{\infty} \frac{n+1}{10^{10}(n+2)}$ converge or diverge?

g) Show that the series $1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + ...$ is convergent.

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

i) Let S_1 and S_2 be countable sets. Prove that $S_1 \cup S_2$ is countable.

ii) If $\{s_n\}_{n=1}^{\infty}$ and $\{t_n\}_{n=1}^{\infty}$ are sequences of real numbers such that $\lim_{n\to\infty} s_n = L$ and $\lim_{n\to\infty} t_n = m$ then prove that $\lim_{n\to\infty} s_n + t_n = L + M$.

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

i) Show that the set of all sequences on the set {0, 1} is not countable.

ii) Show that [0, 1] and [10, 100] have same cardinality.

P.T.O.

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

i) If $\{s_n\}_{n=1}^{\infty}$ is a sequence of real numbers and if $\limsup_{n\to\infty} s_n = L = \liminf_{n\to\infty} s_n$, where $L \in \mathbb{R}$ then prove that $\lim_{n\to\infty} s_n = L$.

ii) If the sequence of real numbers $\{s_n\}_{n=1}^{\infty}$ converges then prove that $\{s_n\}_{n=1}^{\infty}$ is a cauchy sequence.

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

i) Prove that if $\lim_{n\to\infty} \frac{s_n}{n} = L \neq 0$ then $\{s_n\}_{n=1}^{\infty}$ is not bounded.

ii) Prove that the sequence $\left\{\log\left(\frac{1}{n}\right)\right\}_{n=1}^{\infty}$ diverges to minus infinity.

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

i) Let $\sum_{n=1}^{\infty} a_n$ be a series of real numbers. If $\sum_{n=1}^{\infty} |a_n|$ converges then prove that $\sum_{n=1}^{\infty} a_n$ is convergent.

ii) If $\{a_n\}_{n=1}^{\infty}$ is a non increasing sequence of positive real numbers and if $\sum_{n=0}^{\infty} 2^n a_{2^n}$ converges then prove that $\sum_{n=1}^{\infty} a_n$ converges.

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

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

ii) Prove that

1) $\sum_{n=1}^{\infty} \frac{3}{4+2^n}$ is convergent.

2) $\sum_{n=4}^{\infty} \frac{1}{n \log n}$ is divergent.

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Total No. of Questions : 4]

SEAT No. :

PD618

[Total No. of Pages : 2

[6467]-503
T.Y. B.Sc. (Regular)
MATHEMATICS
DSE - 2A - MT - 353 : Group Theory
(2019 Pattern) (Semester-V) (35113)

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

Instructions to the candidates:

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

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

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

b) Find all cosets of $\langle\overline{2}\rangle$ in $\mathbb{Z}_8$.

c) Define simple group.

d) Find the number of elements in the set $\{\sigma \in S_4 \mid \sigma(2) = 2\}$.

e) Give an example of abelian group which is not cyclic.

f) Define group Homomorphism.

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

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

a) Prove that if G is a group with binary operation $*$ and if a and b are any elements of G then linear equations $a * x = b$ and $y * a = b$ have unique solutions x and y in G.

b) Let H be a subset of a group G. Show that H is a subgroup of G if and only if :

i) H is closed under the binary operation of G

ii) The identity element e of G is in H

iii) For all $a \in H$ it is true that $a^{-1} \in H$.

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

a) Find the number of automorphisms of the group $\mathbb{Z}_6$. Justify your answer.

b) Show that $G = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix} \middle/ x \neq 0, x \in \mathbb{R} \right\}$ is a group with respect to matrix multiplication.

P.T.O.

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

a) Show that every group is isomorphic to a group of permutation.

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

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

a) List all the elements of the group $G = \frac{\mathbb{Z}_2 \times \mathbb{Z}_4}{\langle (0,2) \rangle}$. State identity element of the group G. Find the inverse of $(1,0) + \langle (0,2) \rangle$ in the group G.

b) Is the converse of the Lagrange's theorem true in general? Justify.

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

a) Let $\phi : G \to G'$ be a group homomorphism with Kernel H. Prove that $\phi[G]$ is a group and is isomorphic to G/H.

b) Prove that the group $\mathbb{Z}_m \times \mathbb{Z}_n$ is cyclic if and only if *m* and *n* are relatively prime.

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

a) Find all cosets of the subgroup $\langle \overline{3} \rangle$ of $\mathbb{Z}_{12}$. Show that $\frac{\mathbb{Z}_{12}}{\langle \overline{3} \rangle}$ is isomorphic to $\mathbb{Z}_3$.

b) Let $\rho = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 8 & 7 & 6 & 5 & 2 & 4 & 9 & 1 & 3 \end{pmatrix} \in S_9$. Then

i) Express ρ as product of disjoint cycles.

ii) Express ρ as product of transpositions.

iii) Determine whether ρ is odd or even permutation.

iv) Find inverse of ρ.

v) Find ρ^{99}.

Total No. of Questions : 4]

SEAT No. :

PD619

[Total No. of Pages : 2

[6467]-504
T.Y. B.Sc. (Regular)
MATHEMATICS
DSE - 2B - MT - 354 : Ordinary Differential Equations
(2019 Pattern) (Semester-V) (35114)

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

Instructions to the candidates:

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

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

a) State the principle of superposition.

b) Find general solution of $y''-4y'-4y=0$.

c) Find particular integral of $\left(\mathrm{D}^2+4\right)y=\sin 3x$.

d) Find singular points of Legender's equation
$\left(1-x^2\right)y''-2xy'+\alpha\left(\alpha+1\right)y=0$.

e) Find general solution of Euler equation $x^2y''-5xy'+9y=0$.

f) Rewrite $x'''=f\left(t,x,x',x''\right)$ as a system of first order equations.

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

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

a) Prove that $\dfrac{1}{\mathrm{F}(\mathrm{D})}\sin\left(ax+b\right)=\dfrac{1}{\mathrm{F}\left(-a^2\right)}\sin\left(ax+b\right),\ \mathrm{F}\left(-a^2\right)\neq 0$.

b) Explain the method of variation of parameter to solve the equation
$\mathrm{P}_0\left(x\right)y''+\mathrm{P}_1\left(x\right)y'+\mathrm{P}_2\left(x\right)y=\mathrm{F}\left(x\right)$.

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

a) Solve $\left(\mathrm{D}^3+\mathrm{D}^2+\mathrm{D}+1\right)y=\sin 2x+\cos 3x$.

b) Find the general solution of $xy''-\left(2x+1\right)y'+\left(x+1\right)y=x^2$ given that $y_1=e^x$ is a solution of the complementry equation $xy''-\left(2x+1\right)y'+\left(x+1\right)y=0$.

P.T.O.

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

a) Explain the method of undermined coefficient for the equation $ay'' + by' + cy = e^{\alpha x}\,\mathrm{G}(x)$ where α is a constant and G is a polynomial.

b) If roots of indicial equation $ar(r-1) + br + c = 0$ are r_1 and r_2. Then show that general solution of the Euler equation $ax^2y'' + bxy' + cy = 0$ on $(0,\infty)$ is $y = x^{r_1}(c_1 + c_2 lnx)$ of $r_1 = r_2$.

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

a) Suppose $y = \sum_{n=0}^{\infty} a_n x^n$ on, an open interval I that contains the origin. Express $(2-x)y'' + 2y$ as a power series in x on I.

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

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

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

b) Explain the reduction of order method to solve the equation $\mathrm{P}_0(x)y'' + \mathrm{P}_1(x)y' + \mathrm{P}_2(x)y = \mathrm{F}(x)$.

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

a) Find the coefficients $a_0, ..., a_5$ in the series solution $y = \sum_{n=0}^{\infty} a_n x^n$ of the initial value problem $y'' + 3xy' + (4 + 2x^2)y = 0,\ y(0) = 2,\ y'(0) = -3$.

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

Total No. of Questions : 4]

SEAT No. : ____

PD620

[Total No. of Pages : 4

[6467]-505
T.Y.B.Sc. (Regular)
MATHEMATICS
DSE-3A-MT-355 (A) : Operations Research
(2019 Pattern) (Semester - V) (35115A)

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

Instructions to the candidates:

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

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

a) Identify the direction of increase in Z when maximize $Z = -3x_1 + x_2$.

b) Define slack variable with an example.

c) Write the following LPP in equation form.

Maximize $Z = 5x_1 + 3x_2$

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

$6x_1 + 2x_2 \leq 24$

such that $x_1, x_2 \geq 0$.

d) Write the dual of following LPP.

Maximize $Z = 3x_1 + 5x_2$

Subject to $x_1 \leq 2$

$2x_2 \leq 3$

$5x_1 + 6x_2 \leq 4$

and $x_1, x_2 \geq 0$.

e) Explain how to resolve the degeneracy of a solution in a transportation problem?

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

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	1	3	50
O_2	4	2	9	5	50
O_3	2	3	7	4	20
Demand	20	40	35	15	

P.T.O.

g) State, why following assignment problem is unbalanced?

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

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

i) A firm nanufactures two products A and B on which the profit earned per unit are ₹5 and ₹6 respectively. Each product is processed on two machines M_1 and M_2. Product A requires 1 minute of processing time on M_1 and 3 minutes on M_2, while B requires 2 minutes on M_1 and 4 minutes on M_2. Machine M_1 available not more than 450 minutes, while machine M_2 is available for 600 minutes during any working day. Formulate this as an LPP.

ii) Solve the following LPP using graphical method.

Maximize $Z = 6x_1 + 11x_2$

Subject to $2x_1 + x_2 \leq 104$

$x_1 + 2x_2 \leq 76$

and $x_1, x_2 \geq 0$.

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

i) Solve the following LPP using simplex method.

Maximize $Z = x_1 + 2x_2$

Subject to $x_1 \leq 4$

$x_2 \leq 3$

$x_1 + 2x_2 \leq 8$

and $x_1, x_2 \geq 0$.

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

	D_1	D_2	D_3	D_4	Supply
O_1	30	25	40	20	100
O_2	29	26	35	40	250
O_3	31	33	37	30	150
Demand	90	160	200	50	

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

i) Explain the Hungarian method to solve an assignment problem to minimize the overall cost.

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

	A	B	C	D
1	15	13	14	17
2	11	12	15	13
3	13	12	10	11
4	15	17	14	16

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

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

Maximize $Z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \geq 5$

$x_1 + 2x_2 \geq 6$

and $x_1, x_2 \geq 0$.

ii) Obtain the dual of following LPP

Maximize $Z = 2x_1 + 5x_3$

Subject to $x_1 + x_2 \geq 2$

$2x_1 + x_2 + 6x_3 \leq 6$

$x_1 - x_2 + 3x_3 = 4$

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

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

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

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

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

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

i) Obtain an initial basic & feasible sotution (IBFS) for following transportation problem using matrix-minima method.

	D_1	D_2	D_3	D_4	Supply
O_1	13	11	15	20	2
O_2	17	14	12	13	6
O_3	18	18	15	12	7
Demand	3	3	4	5	

ii) Using simplex method, show that following LPP has an alternate solution and hence find it.

Maximize $Z = x_1 + x_2$

Subject to $x_1 + 2x_2 \leq 20$

$x_1 + x_2 \leq 15$

and $x_1, x_2, \geq 0.$

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Total No. of Questions : 4]

SEAT No. : ____

PD621

[Total No. of Pages : 2

[6467]-506
T.Y.B.Sc. (Regular)
MATHEMATICS
MT 355 (B) : Differential Geometry
(2019 Pattern) (Semester - V) (35115 B)

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

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

a) Find the cartesion equation of the curve $r(t) = (\cos^2 t, \sin^2 t)$.

b) Show that every plane in $\mathbb{R}^3$ is a smooth surface.

c) Is $r(t) = (t^2, t^4)$, a parametrisation of the parabola $y = x^2$?

d) State isopermetric inequality.

e) Calculate the arc. length of the catenary $r(t) = (t, \cos ht)$ stating at the point (0.1).

f) Show that second fundamental form of a plane is zero.

g) Define regular point.

Q2) A) Attempt any ONE of the following. **[5]**

a) Prove that parametrized curve has unit. Speed reparametrisation it and only if it is regular.

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

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

a) Find the torsion of circular helix $r(\theta) = (a\cos\theta, a\sin\theta, b\theta)$.

b) Find the area of the interior of the ellipse $r(t) = (a\cos t, b\sin t)$ where a & b are positive constants.

P.T.O.

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

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

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

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

a) Find the arc length along the cycloid $r(t) = a\ (t - \sin t,\ 1 - \cos t)$ $0 \le t \le 2\pi$.

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

Q4) A) Attempt any ONE of the following. **[5]**

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

b) State and prove Meusnier's Theorem.

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

a) Calculate the first fundamental forms of the surface $\sigma(u,v) = (u - v, u + v, u^2 + v^2)$.

b) Show that $\sigma(u,v)$ = (Sec*hu* cos*v*, sec*hu* sin*v*, tan*hu*) is a regular patch for the unit sphere.

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Total No. of Questions : 4]

SEAT No. : ____

PD622

[Total No. of Pages : 2

[6467]-507
T.Y.B.Sc. (Regular)
MATHEMATICS
MT-355(C) : C-Programming
(2019 Pattern) (Semester - V) (35115 C)

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) What is an expression in C-language.

b) State any two rules to define constants.

c) What is the purpose of while loop?

d) Define comma operator in C-language.

e) A C program contains the following variable declarations

int i = 12345, j = 0xabcd9, k = 077777;

Show the output from the following printf statement printf (" % 3d, %3*x*, %30", i, j, k);

f) Find the output of the following C-Program

```
# include <stdio.h>
  main ()
    {
      int digit = 0;
      While (digit < = 3)
          {
            Printf ("% d\n", digit);
                + + digit;
                        }
                            }
```

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

P.T.O.

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

a) What is an operator? Describe several different types of operators that are included with in C - language.

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

i) Scanf ( )

ii) Printf ( )

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

a) Write a C - Program to calculate the factorial of an integer using the function.

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

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

a) Write a short note on 'Break' and 'Continue' statement in C-language.

b) Write in brief about do-while statement, Also write its syntax.

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

a) Write a C - Program to check whether the given number is prime or not.

b) Write a loop, to calculate the sum of every third integer that begin with $i = 2$, for all values of $i < 100$, by using following statement

i) while

ii) do-while

iii) for

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

a) What is recursion? Explain how it works?

b) What is an array variable? How does an array variable differ from an ordinary variable?

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

a) Write a C-Program to check whether a given word is palindrome or not.

b) Write a C-Program to find area of circle.

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Total No. of Questions : 4]

SEAT No. :

PD623

[Total No. of Pages : 2

[6467]-508
T.Y. B.Sc. (Regular)
MATHEMATICS
DSE - 3B - MT - 356(B) : Number Theory
(2019 Pattern) (Semester-V) (35116B)

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

Instructions to the candidates:

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

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

a) If $(a,b)=2$, then find $(a,b+3a)$.

b) Find all solutions of the congruence $20x \equiv 4 \pmod{30}$.

c) If x and y are odd integers, then show that $4x^2 + y^2$.

d) For what real numbers x it is true that $[x]+[x]=[2x]$.

e) True or False ; Justify your answer :

$4x \equiv 4y \pmod{6}$ implies $x \equiv y \pmod{3}$.

f) Find the smallest integer x for which $d(n)=6$.

g) Find value of $\left(\frac{5}{11}\right)$.

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

a) State and prove Fermat's theorem.

b) If p and q are distinct odd primes, then show that $\left(\frac{p}{q}\right)\left(\frac{q}{p}\right)=(-1)^{\left(\frac{p-1}{2}\right)\left(\frac{q-1}{2}\right)}$.

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

a) Show that 19 is not divisor of $4n^2+4$, for any integer n.

b) Find all integers that satisfy simultaneously $x \equiv 1 \pmod{4}$, $x \equiv 0 \pmod{3}$, $x \equiv 5 \pmod{7}$.

P.T.O.

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

a) If $(a,m)=1$, then prove that there is an x such that $ax \equiv 1 \pmod{m}$. Any two such x are congruent $\pmod{m}$. If $(a,m)>1$, then there is no such x.

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

B) Attempt any <u>One</u> of the following : **[5]**

a) Compute $\left(\frac{46}{61}\right)$.

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

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

a) Let $F(n)=\sum_{d \mid n} f(d)$, for every positive integer n, then prove that

$$f(n)=\sum_{d \mid n} \mu(d) \cdot F\left(n/d\right).$$

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

B) Attempt any <u>One</u> of the following : **[5]**

a) Find all integers x and y such that $147x+258y=369$.

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

Total No. of Questions : 4]

SEAT No. :

PD624

[Total No. of Pages : 2

[6467]-509
T.Y. B.Sc. (Regular)
MATHEMATICS
DSE - 3B - MT - 356(C) : Laplace Transform and Fourier Series
(2019 Pattern) (Semester-V) (35116C)

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

Instructions to the candidates:

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

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

a) Find $\mathrm{L}^{-1}\left\{\dfrac{1}{s^2-4s+20}\right\}$.

b) Find $\mathrm{L}^{-1}\{\log(s+4)\}$.

c) Evaluate $\int_0^{\infty} e^{-3t}\cos t\ dt$.

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

e) Evaluate $\int_0^{\infty} x^{10}e^{-x}dx$.

f) Give an example of a function which is of exponential order.

g) Evaluate $\int_{-a}^{a} x^2\sin x\ dx$.

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

a) Prove that $\int_0^{\infty}\delta(t)\mathrm{G}(t)\,dt=\mathrm{G}(0)$, where $\mathrm{G}(t)$ is continuous function on $[-\infty,\infty]$.

b) Show that $\left|\dfrac{1}{2}=\sqrt{\pi}\right.$.

P.T.O.

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

a) Evaluate $\int_0^{\infty} e^{-2t}\cos^3 t\ dt$.

b) Find $\mathrm{L}\left[\int_0^t \frac{\sin u}{u}\ du\right]$.

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

a) If $\mathrm{L}^{-1}\{f(s)\} = \mathrm{F}(t)$, then prove that $\mathrm{L}^{-1}\{f(as)\} = \frac{1}{a}\mathrm{F}\left(t/a\right)$, where $a > 0$.

b) If $\mathrm{L}^{-1}\{f(s)\} = \mathrm{F}(t)$, then show that $\mathrm{L}^{-1}\left\{f^{(n)}(s)\right\} = (-1)^n t^n \mathrm{F}(t)$.

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

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

b) $\mathrm{L}^{-1}\left\{\frac{s}{\left(s^2+a^2\right)^2}\right\}$.

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

a) Obtain the Fourier series of $f(x) = \begin{cases} 0; & -\pi \le x < 0 \\ 1; & 0 \le x \le \pi \end{cases}$.

b) Show that if $f(x)$ is even function, then $\int_{-\pi}^{\pi} f(x)dx = 2\int_0^{\pi} f(x)dx$.

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

a) $y'' + a^2 y = f(t)$.

b) Solve $y'' + a^2 y = f(t);\ y(0) = 1$ and $y'(0) = -2$.

c) Solve $ty'' + 2y' + ty = 0;\ y(0) = 1$ and $y'(\pi) = 0$.

Total No. of Questions : 5]

SEAT No. : ____

PD625

[Total No. of Pages : 2

[6467]-510
T.Y.B.Sc. (Regular)
PHYSICS
PHY-351 : Mathematical Methods in Physics - II
(2019 Pattern) (Semester - V) (35121)

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

Instructions to the candidates:

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

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

a) State fuchs's theorem.

b) State Lorentz transformation equations.

c) Define cartesian co-ordinate system.

d) What is special function?

e) Define frame of reference.

f) State postulates of special theory of relativity.

Q2) Answer the following.

a) What do you understand by time dilation? Discuss the variation of time with velocity according to special theory of relativity. Explain the term proper time & nonproper time. **[6]**

b) Express $f(x) = x^3$ in terms of Legendre polynomials. **[4]**

P.T.O.

Q3) Answer the following.

a) For spherical polar co-ordinate system, $x = r\sin\theta\cos\phi$, $y = r\sin\theta\sin\phi$ and $z = r\cos\theta$. Verify the mutual orthogonality of $\frac{\partial\vec{r}}{\partial r}, \frac{\partial\vec{r}}{\partial\theta}, \frac{\partial\vec{r}}{\partial\phi}$ **[6]**

b) Find the speed of a particle whose total energy is 50% greater than its rest mass energy. **[4]**

Q4) Answer the following.

a) For function $\psi(\rho,\phi,z)$ separate the variables in Laplace's equation in cylindrical co-ordinates in the form of three ordinary differential equation. **[6]**

b) Prove that $P_n(-x) = (-1)^n P_n(x)$..... **[4]**

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

a) Explain even and odd parity function with suitable example.

b) Write a notes on Turin paradox.

c) Explain ordinary & partial differential equation.

d) Write note on Generating function for Bessel function of first kind.

e) A rocket ship leaves the earth at a speed of 0.98C. How much time does it take for the minute hand of a clock in ship to make complete revolution as measured by an observer on the earth?

f) Discuss importance of Fuchs's theorem.

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Total No. of Questions : 5]

SEAT No. : ____

PD626

[Total No. of Pages : 2

[6467]-511
T.Y. B.Sc. (Regular)
PHYSICS
PHY-352: Electrodynamics
(CBCS 2019 Pattern) (Semester - V) (Credits - 2) (35122)

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

Instructions to the candidates:

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

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

a) What is mean by Polar molecule?

b) Write an equation of continuity in magnetostatics.

c) What is Poynting vector?

d) Define surface charge density. Give its SI unit.

e) Find the potential of the charge $q = 1\times10^{-9}$ C at a point distance 1m from the charge.

f) The permittivity of Diamond is 1.46×10^{-10}. Calculate the dielectric constant of Diamond.

Q2) Answer the following questions.

a) i) Define electric vectors $\overline{D}, \overline{E}$ and $\overline{P}$. **[6]**

ii) Find the relation between $\overline{D}, \overline{E}$ and $\overline{P}$.

b) State Faraday's Law of electromagnetic induction. and prove that $\overline{\nabla} \times \overline{E} = -\dfrac{\partial \overline{B}}{\partial t}$. **[4]**

Q3) Answer the following questions.

a) i) State Ampere's Circuital law. **[6]**

ii) Obtain the relation $\overline{\nabla} \times \overline{B} = \mu_0 . J$

b) A Conductor 10m long lies along z direction with a current of IA in the $\hat{a}_z$ direction. Find the force if $\overline{B} = 0.04\hat{a}_x$ tesla. **[4]**

P.T.O.

Q4) Answer the following questions.

a) State and prove Poynting theorm. **[6]**

b) A parallel plate capacitor of plate area A = 100 cm^2 and seperation d = 1.5 cm is charged by a potential of 60 volts. Then the battery is disconnected and a dielectric slab of thickness b = 0.8 cm and dielectric constant k = 5 inserted. Calculate the three vectors D, E and P in the dielectric. **[4]**

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

a) State and explain Coulomb's law in electrostatics.

b) Write a note on Magnetization of Matter.

c) Distinguish between paramagnetic and Ferromagnetic materials.

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

e) Explain the term volume charge density.

f) State and explain Biot - Savart's law.

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Total No. of Questions : 5]

SEAT No. :

PD627

[Total No. of Pages : 2

[6467]-512
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 353 : Classical Mechanics
(2019 Pattern) (Semester-V) (Paper - III) (35123)

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

Instructions to the candidates:

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

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

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

b) Give two applications of classical mechanics in daily life.

c) What do you mean by centre of mass or C.M.?

d) Calculate force require to produce acceleration of 4 m/sec^2 on mass of 3 kg.

e) Give any one advantage of Lagrangian formulation over Newtonian approach.

f) A charged particle having charge of 3.5×10^{-9} C enters the magnetic field of induction 3×10^{-4} T with velocity 4×10^{4} m/sec with an angle 45° with the field. Find the force acting on the particle.

Q2) Answer the following :

a) Prove that the trajectory of the electric field perpendicular to the direction of motion of the charged particle is parabolic i.e. $4a = \dfrac{2m\mathrm{V}_x^2}{q\mathrm{E}y}$. **[6]**

OR

Derive differential equation of orbit in central force motion.

b) State and prove Kepler's second law of planetory motion. **[4]**

P.T.O.

Q3) Answer the following :

a) Find the relation between the scattering angles in the Lab and CM systems in two body elastic collisions. **[6]**

OR

In a central force field the Lagrangian in plane polar coordinates is given by $L = \frac{1}{2}m\left(\dot{r}^2 + r^2\dot{\theta}^2\right) - V(r)$ obtain the Hamiltonian and Hamiltonian equation.

b) Two masses m_1 and m_2 are suspended over a pulley of radius R and connected by a Flexible string of constant length l as shown in the figure. Set up the Lagrangian for the system. Find the acceleration of the system. **[4]**

Q4) Answer the following :

a) A particle describes a conic $\frac{l}{r} = 1 + e\cos\theta$, where l is the semi-latus rectum and 'e' is the eccentricity. Show that the force under which particle is moving is a central force. **[6]**

OR

From D'Almebert's principle obtain Lagrange's equation of motion.

b) The distance between the sun and earth is suddenly reduced to half of its present distance. What will be the duration of the year? **[4]**

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

a) Constraints.

b) D'Almbert's principle of virtual work.

c) Generalized coordinates.

d) Uses of artificial satellite.

e) Centre of mass.

Total No. of Questions : 5]

SEAT No. :

PD628

[Total No. of Pages : 2

[6467]-513

T.Y. B.Sc. (Regular)

PHYSICS

PHY - 354 : Atomic and Molecular Physics

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

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three from question 2 to 5.***
3) ***Que.2 to 5 carries equal marks.***
4) ***Use of calculators and log table is allowed.***

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

a) State Pauli's exclusion principal.

b) Define Phosphorescence.

c) State Hund's rule.

d) Find orbital angular momentum for *d* electron.

e) Write equation for energy of electron in 4^{th} Bohr's orbit for H-atom.

f) Write electronic configuration of chlorine (Z = 17).

Q2) a) Obtain an expression for rotational energy levels for rigid diatomic molecule. Draw energy level diagram for it. **[6]**

b) State and explain Lande interval rule. Represent it graphically for 3D term. **[4]**

P.T.O.

Q3) a) What is normal Zeeman effect. Explain in detail. **[6]**

b) Using *d-d* electronic configuration, find all possible values of total angular momenta J using L-S coupling. Write all singlet and triplet in spectroscopic notation. **[4]**

Q4) a) Derive an expression for energy of electron in Bohr's n^{th} orbit $E_n = \frac{-mz^2e^4}{8e_0^2n^2h^2}$. **[6]**

b) Calculate the frequency of revolution of an electron in 1^{st} and 2^{nd} orbit of hydrogen atom. **[4]**

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

a) Explain the term molecular polarizability. Write its S.I. unit.

b) Calculate energy of electron for 3^{rd} orbit of hydrogen atom.

c) Explain Bohr's 1^{st} postulate in detail.

d) What are Stoke's and anti Stoke's line.

e) Calculate atomic states for $l = 2$, and $s = 1/2$. Write all terms in spectroscopic notation.

f) A sample of certain element is placed in a magnetic field of flux density 0.3 T. How for apart are the Zeeman component of wavelength 4500Å.

Total No. of Questions : 5]

SEAT No. :

PD629

[Total No. of Pages : 2

[6467]-514
T.Y.B.Sc. (Regular)
PHYSICS
PHY- 355 : Computational Physics
(2019 CBCS Pattern) (Semester - V) (35125)

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

Instructions to the candidates:

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

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

a) Draw symbols of flowchart for terminal, input/output, process and decision.

b) Define a highlevel programming language.

c) What are the fundamental data types support by C compilers?

d) Define array with suitable example.

e) What is the function of DETECT macros in graphics?

f) What are the jump statements available in C?

Q2) Answer the following questions.

a) What is meant by field width for formatted output? Write the output of number $x = 12.3456$ under following different format specifications. **[6]**

i) printf ("%7.4f", x)

ii) printf ("% – 7.2 f", x)

iii) printf ("% f", x)

iv) printf ("% 7.2 f", x)

b) What are the C Tokens? Explain any two of them with suitable examples.**[4]**

P.T.O.

Q3) Answer the following questions.

a) Draw flowchart and write C-program to select larger number among three given numbers. **[6]**

OR

Explain automatic variables, global variables and static variables. **[6]**

b) What is top tested and bottom tested loops? Explain about while statement with syntax and flowchart. **[4]**

Q4) Answer the following questions.

a) Using bisection method find root of equation $x^3 - 1.8x^2 - 10x + 17 = 0$ at the end of 5^{th} iteration. **[6]**

OR

Find the specific volume V by solving the Van der Waal's equation $\left(p+\frac{q}{v^2}\right)$ (v – b) = RT, where R = 0.08205 litres atm/mole^o K, p = 70 atm, T = 200^{o}K, a = 3.59, b = 0.0427. Use Newton - Raphson method. **[6]**

b) Use Trapezoidal rule with four steps to estimate $\int_0^2 \frac{x}{\sqrt{2+x^2}}dx$. **[4]**

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

a) Explain the following commands in graphics with their syntax
   i) getpixel()
   ii) putpixel
   iii) line()
   iv) polyline
   v) circle.

b) What is a function? Write any 3 applications.

c) Describe incremental and decremental operators.

d) What are octal integers? check validity of following numbers, if non-valid state reason
   i) 0435 ii) 04280 iii) 077.77

e) Explain the terms resolution and pixel.

f) Write a formula for Trapezoidal and Simpson's $\frac{1}{3}$rd rule.

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Total No. of Questions : 5]

SEAT No. :

PD630

[Total No. of Pages : 2

[6467]-515
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 356(A) : Astronomy and Astrophysics - I
(2019 Pattern) (Semester-V) (Elective-I) (35126 A)

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

Instructions to the candidates:

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

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

a) What is Chandrashekhar limit?

b) What are RR Lyrae?

c) What is interferometry?

d) Why neutron stars cannot turn into Black holes?

e) What is an Asteroid?

f) What is meant by transit?

Q2) Answer the following questions :

a) Compare Aparent magnitude with Absolute magnitude. Explain the scale of magnitude for celestial objects. **[6]**

b) Explain the concept of dark matter. What are the evidences of its presence? **[4]**

P.T.O.

Q3) Answer the following questions :

a) What are Cepheid variables? How do they pulsate? **[6]**

b) Describe construction and working of radio telescopes with the help of a neat diagram. **[4]**

Q4) Answer the following questions :

a) Explain construction and working of CCD. What are its advantages? **[6]**

b) Write a note on Black holes. **[4]**

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

a) Estimation of structure temperature of a star.

b) Components of the solar system.

c) Steady state universe.

d) Lunar Eclipse.

e) Open and Globular clusters.

f) 'O' type stars.

Total No. of Questions : 5]

SEAT No. :

PD631

[Total No. of Pages : 2

[6467]-516
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 356(B) : Elements of Material Science
(2019 Pattern) (Semester-V) (Paper-VI) (35126(B))

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

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

a) Define dielectric strength of material.

b) What is solid solution?

c) What is soft ferrite? Give one example of common soft ferrite.

d) The modulus of elasticity of Cu is 1,10,000 MPa. What is the elastic strain in copper rod that is stressed to 70 MPa?

e) State Gibb's phase rule.

f) What are degree of freedom of system of two components, when number of phases is one and two?

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

a) Explain with diagram lens type Cu-Ni phase diagram. **[3]**

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

c) Distinguish between elastic and plastic deformation. **[3]**

B) What is rules for interstitial solid solution? **[4]**

P.T.O.

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

a) Explain any three thermal properties of material. **[3]**

b) Write note on line defect. **[3]**

c) What is phase diagram? With diagram explain phase diagram of single component system. **[3]**

B) Copper has resistivity 17×10^{-9} Ohm-m. What is the resistance of copper wire of length 4m and radius of 0.04cm. **[4]**

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

a) State and prove lever rule. **[3]**

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

c) What is AX-type ceramic crystal structure. **[3]**

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

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

a) Write short note on Shape Memory Alloys (SMA).

b) State different types of smart material.

c) Explain single phase alloy with its microstructure.

d) What is ceramic phases.

e) Explain application of diffusion.

f) Define the term creep and fatigue.

Total No. of Questions : 5]

SEAT No. :

PD632

[Total No. of Pages : 2

[6467]-517
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 356(C) : Biophysics
(2019 Pattern) (Semester-V) (Elective-I) (35126C)

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

Instructions to the candidates:

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

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

a) What do you mean by Reduction?

b) Define Action potential.

c) State the principle of spectrophotometer.

d) Define Radioactivity.

e) What is Mitochondria?

f) Define osmosis.

Q2) Answer the following :

a) Describe in detail magnetic resonance spectroscopy with suitable examples. **[6]**

b) Describe the different types of an ECG electrodes. **[4]**

P.T.O.

Q3) Answer the following :

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

b) Describe the construction and working of colorimeter. **[4]**

Q4) Answer the following :

a) Describe in detail primary and secondary structure with suitable examples. **[6]**

b) Describe in detail positron Emission Tomography. **[4]**

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

a) What is Non-Polarizable electrodes?

b) State the principle of SEM.

c) Write a short note on "DNA structure".

d) Write a short note on "Metal electrodes".

e) What is Resting potential?

f) What is radio immuno assays?

Total No. of Questions : 5]

SEAT No. :

PD633

[Total No. of Pages : 2

[6467]-518
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 356(D) : Renewable Energy Sources - I
(2019 Pattern) (Semester-V) (Elective-I) (35126D)

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

Instructions to the candidates:

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

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

a) Define 'Air Mass'.

b) What is the principle of solar dryer?

c) Define an efficiency of 'flat plate collector'.

d) State different types of solar cells?

e) Define efficiency of solar cell.

f) What are the importance of energy storage?

Q2) Answer the following questions :

a) Draw a neat diagram of structure of the sun. Explain the electro magnetic energy spectrum. **[6]**

b) Describe the box type solar cooker with neat diagram. **[4]**

P.T.O.

Q3) Answer the following questions :

a) Explain I-V characteristics of solar cell and explain Fill Factor (FF) and maximum conversion efficiency. **[6]**

b) Describe the importance and needs of energy storage. **[4]**

Q4) Answer the following questions :

a) Explain Photovoltaic panels with diagram. **[6]**

b) Describe the box type solar cooker with neat diagram. **[4]**

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

a) Storage of chemical energy.

b) P-i-n solar cell.

c) PV system.

d) Heat conductor.

e) Heat insolation.

f) Solar pond.

Total No. of Questions : 5]

SEAT No. :

PD634

[Total No. of Pages : 2

[6467]-519
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 356(E) : Applied Optics
(2019 Pattern) (Semester-V) (Paper-VI) (35126E)

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

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

a) What is an optical fibre?

b) What do you mean by interference of light?

c) What is zone plate?

d) State Fermat's principle of extremum path.

e) Define Refraction matrix of an optical system.

f) Define half wave plate.

Q2) Answer the following questions :

a) Deduce expression for acceptance angle of an optical fibre. Show it is related to numerical aperature. **[6]**

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

P.T.O.

Q3) Answer the following questions :

a) Describe Michelson interferometer. How can it be used for measuring wavelength of monochromatic light? **[6]**

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

Q4) Answer the following questions :

a) Explain in detail Fermat's principle of extremum path and analyse case where the actual path of light may be maximum. Deduce Snell's law of refraction. **[6]**

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

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

a) Explain numerical aperature.

b) What is difference between spherical mirror and mirror?

c) Write sign convensions of optics.

d) What is critical angle?

e) What is glittering of diamond? Explain it.

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

Total No. of Questions : 5]

SEAT No. :

PD635

[Total No. of Pages : 2

[6467]-520
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 356(F) : C # Programming
(2019 Pattern) (Semester-V) (35126F)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any 3 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) Attempt any Five of the following : **[5]**

a) Define the term NET CLR.

b) Specify valid NET CLR JIT performance counters.

c) Define Managed Code.

d) Which of the utilities can be used to compile managed assemblies into processor specific native code?

e) Comment on the statement - 'It is not possible to extend if statement to handle multiple conditions using the else if arrangement'.

f) Which commands are used to terminate a while loop and transfer control outside the loop?

Q2) Answer the following :

a) In how many ways you can pass parameters to a method? **[6]**

b) Specify strong programming features of C#. **[4]**

P.T.O.

Q3) Answer the following :

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

b) What is IDE, Integrated Development Network? **[4]**

Q4) Answer the following :

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

b) What do you mean by global, stack & heap memory? **[4]**

Q5) Answer any Four : **[10]**

a) Write a short note on ADO.NET. **[2½]**

b) Write an algorithm to find root of equation using bisection method. **[2½]**

c) What are operators? Specify three types. **[2½]**

d) What do you mean by boxing and nuboxing? **[2½]**

e) What do you mean by RDBMS? **[2½]**

f) Write a note on operator's & it's types. **[2½]**

Total No. of Questions : 5]

SEAT No. :

PD636

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[6467]-521
T.Y. B.Sc. (Regular)
PHYSICS
PHY-356 (G) : Acoustics-I
(2019 Pattern) (Semester - V) (Paper-VI) (35126G)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Question no 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator and log-table is allowed.***

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

a) Define sound pressure level and sound power level.

b) Define reverberation time.

c) What do you mean by near field?

d) Determine velocity of sound in air at 30°C.

e) What is the ideal time difference between arrival times of sound according to HaaS effect?

f) What is a live room?

g) Determine PWL for a source corresponding to 1.0 Watt of acoustic Power (re.10^{-12} watts)

Q2) Answer the following questions.

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

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

Q3) Answer the following questions.

a) Write a note on HaaS effect. What is meant by audio delay? **[6]**

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

P.T.O.

Q4) Answer the following questions.

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

b) Following are the L_{PN} observation collected during an aircraft Flyover.Calculate L_{EPN}. **[4]**

Time (hrs)	03:30:14-03:30:16	03:30:16-03:30:18	03:30:18-03:30:20	03:30:20-03:30:22
L_{PN}(dB)	97	102	107	105

Time (hrs)	03:30:22 03:30:24	03:30:24 03:30:26	03:30:26 03:30:28
L_{PN} (dB)	102	100	96

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

a) Expansion chamber muffler.

b) Decibel scales.

c) Anechoic chamber

d) Pros and cons of headphones.

e) Sound transmission class (STC)

f) Acoustic standards and reference conditions.

Total No. of Questions : 5]

SEAT No. :

PD637

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[6467]-522
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 3510(H) : Python Programming
(2019 Pattern) (Semester-V) (SEC - I) (351210H)

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

Instructions to the candidates:

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

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

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

b) What are the types of variables in Python?

c) Explain any two tuple operations with an example.

d) What is the difference between X-range and Range?

e) How to call function?

f) Define Seaborn.

Q2) Answer the following questions :

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

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

P.T.O.

Q3) Answer the following questions :

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

b) List out the plots that can plot with Seaborn. **[4]**

Q4) Answer the following questions :

a) Write a python program to calculate the average of Numbers. **[6]**

b) Write a python generator function that reverse a given string. **[4]**

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

a) Dictionary data type in Python.

b) Explain how to delete elements in Dictionary.

c) Functools module.

d) What are the different output formats supported by Matplotlib library?

e) Scipy.

f) Write python program to find the factorial of a given number.

Total No. of Questions : 5]

SEAT No. :

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[6467]-523
T.Y. B.Sc. (Regular)
PHYSICS
PHY - 3510(I) : Energy Studies
(2019 Pattern) (Semester-V) (Skill Enhancement Course-I) (351210I)

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

Instructions to the candidates:

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

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

a) Define solar constaut.

b) Define efficiency of flat plate collector.

c) Give the nuclear sources of energy.

d) State photovoltaic principle.

e) State various forms of energy storages.

f) What do you mean by biomass?

Q2) Answer the following questions :

a) Explain Renewable energy sources with examples. **[6]**

b) Explain the term solar radiation at the earth's surface. **[4]**

P.T.O.

Q3) Answer the following questions :

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

b) A monoenergetic radiation beam having a wavelength of one micrometer. Calculate the energy of a single photon [h = 6.6256×10^{-34}J.sec, C = 3×10^{8} m/s]. **[4]**

Q4) Answer the following questions :

a) Describe the importance and needs of energy storage. **[6]**

b) Explain Biogas generation & working of biogas plant. **[4]**

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

a) Explain future trends in electric cars.

b) How wind energy is generated by wind mills?

c) State advantages and disadvantages of solar energy.

d) Explain the term "Solar Isolation".

e) Write a short note on concentrating collectors.

f) Explain the term "Solar Arrays".

Total No. of Questions : 5]

SEAT No. :

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T.Y. B.Sc. (Regular)

PHYSICS

PHY - 3510(J) : Introduction to Arduino

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

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

Instructions to the candidates:

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

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

a) What language is the Arduino IDE built on?

b) What is Arduino?

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

d) Which function are contained in Arduino IDE?

e) What is the microcontroller used in Arduino UNO?

f) Who is developer of Arduino?

Q2) Answer the following :

a) What is most popular board in the Arduino family? Why? **[6]**

b) State any four features of Arduino. **[4]**

P.T.O.

Q3) Answer the following :

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

b) What do you mean by embeded system? Give two examples of embeded system. **[4]**

Q4) Answer the following :

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

OR

What is function of SPI?

b) Explain the structure and functions of pin 6 : 3.3 V, pin Y : S V and pin 8 : GND. **[4]**

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

a) What are three important parts of Arduino? Explain them.

b) What is IDE?

c) List control structures used in Arduino.

d) What are two types of data in Arduino?

e) Write short note on microcontroller used in Arduino.

f) Explain various loops used in arduino.

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Total No. of Questions : 5]

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T.Y. B.Sc. (Regular)

PHYSICS

PHY - 3510(K) : Sensors and Transdusers

(2019 Pattern) (Semester-V) (Skill Enhancement Course-I) (351210K)

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

Instructions to the candidates:

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

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

a) What is strain gauge?

b) What is a transducer?

c) Why are capacitive sensors important?

d) What are the two applications of capacitive transducer?

e) State the principle of Liquid in Glass Thermometer (LIG).

f) What is Paimary Sensor?

Q2) Answer the following questions :

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

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

P.T.O.

Q3) Answer the following questions :

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

b) Explain how the variable capacitors is used for Displacement measurement. **[4]**

Q4) Answer the following questions :

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

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

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

a) LVDT.

b) Advantages of variable capacitance devices.

c) Applications of capacitive sensors.

d) RID material.

e) Working principle of variable capacitance transducer.

Total No. of Questions : 5]

SEAT No. :

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T.Y.B.Sc. (Regular)

PHYSICS

PHY-3511(L) : Physics Workshop Skill

(Skill Enhancement Course-II)

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

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

Instructions to the candidates:

1) ***Question No.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.***
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) Define sensitivity in measurement.

b) What is peak voltage of 200 volts R.M.S. mains AC voltage in C.R.O.?

c) Define loading effect.

d) State function of electron gun.

e) What is balancing condition of D.C. bridge?

f) State limitations of analog instruments.

Q2) Answer the following questions.

a) Draw block diagram of digital multimeter and explain working. **[6]**

b) Write note on RLC bridge. **[4]**

P.T.O.

Q3) Answer the following questions.

a) Draw labeled diagram of cathode ray tube. Explain its construction and working. **[6]**

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

Q4) Answer the following questions.

a) A sinusoidal voltage of 20V peak to peak is applied to the input of CRO, the timebase setting is 5ms/division. If the display shows 3 divisions for one complete cycle of the waveform. Find RMS voltage, time period and frequency of the input signal. **[6]**

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

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

a) Q meter

b) Significance of CRO

c) Function generator

d) Dual trace oscilloscope

e) Advantage of digital meter over analog meter.

Total No. of Questions : 5]

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T.Y.B.Sc. (Regular)

PHYSICS

PHY 3511 (M) : Biomedical Instrumentation

(Skill Enhancement Course-II)

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

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

Instructions to the candidates:

1) ***Question No.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.***
4) ***Figure to the right indicate full marks.***
5) ***Use of calculator and log table is allowed.***

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

a) What is systolic pressure?

b) What is transducer?

c) What are the different types of Bioelectric signals.

d) What is an ECG.

e) Define artifacts.

f) What is pulse oximetry.

Q2) Answer the following.

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

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

P.T.O.

Q3) Answer the following.

a) Describe in detail the indirect blood pressure measurements with suitable examples. **[6]**

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

Q4) Answer the following.

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

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

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

a) What are the different characteristics of transducer?

b) What do you mean by phonocardiography?

c) What do you mean by Biosensors?

d) Write a short note on "Resting potential".

e) Write a short note on "Electro-condution System of heart."

f) What is displacement transducer?

Total No. of Questions : 5]

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T.Y.B.Sc. (Regular)

PHYSICS

SEC-II : PHY-3511 N : Non Destructive Testing Techniques

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

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

Instructions to the candidates:

1) ***Question No.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.***
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 NDT.

b) What are the applications of visual inspection method?

c) What are the limitations of non-aqueous developer?

d) State the principle of magnetic particle testing method.

e) State the principle of MRI.

f) State the principle of acoustic emission testing technique.

Q2) Answer the following questions.

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

b) Describe the principle of radiography testing method with suitable diagram. **[4]**

P.T.O.

Q3) Answer the following questions.

a) Explain Helium leak testing method. **[6]**

b) State the principle of fluoroscopy testing method. Explain it with suitable diagram. **[4]**

Q4) Answer the following questions.

a) What is computed tomography? Explain with suitable diagram. **[6]**

b) Explain the thermography testing method. **[4]**

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

a) List the instruments used in visual testing method.

b) Portable electromagnetic yokes.

c) Limitations of water suspendable developer.

d) Limitation of dry powder developer.

e) Advantages of echo method of ultrasonic testing technique.

f) Draw suitable diagram gamma-ray non-destructive testing arrangement.

Total No. of Questions : 5]

SEAT No. :

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[6467]-529

T.Y.B.Sc. (Regular)

PHYSICS

SEC-II : PHY-3511O : Acoustics Applications

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

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

Instructions to the candidates:

1) ***Question No.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.***
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 understand by trauma?

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

c) State four names of percussion instruments.

d) Define reverberation time.

e) What are ultrasonic transducers?

f) What is a passive sonar?

Q2) Answer the following.

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

OR

With the help of a neat diagram, give the construction and working of a folded horn. **[6]**

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

P.T.O.

Q3) Answer the following.

a) i) Write a note on selection criteria of microphones. **[3]**

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

b) If the reverberation time is 3.22 sec for a room of volume $1600m^3$, then what will be the total sound absorption. **[4]**

Q4) Answer the following.

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

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

b) Write a note on nondestructive testing (NDT). **[4]**

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

a) A-weighted sound level

b) Bass-reflex cabinet

c) MP3 audio file format

d) Articulation test

e) Graphic Equalizers

f) Musical Instruments Digital Interface (MIDI)

Total No. of Questions : 5]

SEAT No. : [ ]

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[Total No. of Pages : 2

[6467]-530
T.Y.B.Sc. (Regular)
CHEMISTRY
CH-501 : Physical Chemistry - I
(2019 Pattern) (Semester - V) (35131)

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

Instructions to the candidates:

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

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

a) Define molar refraction.

b) Explain photochemical reaction.

c) What is zero point energy.

d) Define degeneracy.

e) What is quantum yield.

f) Define additive property.

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

i) Explain the use of dipole moment in the determination of molecular structure with two examples.

ii) Explain the term chemiluminescence with suitable example.

iii) Describe wave-particle duality.

b) The dipole moment of chlorobenzene is 1.549D. If the bond distance of C-Cl is 2.77 Aº, estimate the percent ionic character of bond. [$q=4.8\times10^{-10}$ esu.]. **[4]**

P.T.O.

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

i) What are Raykigh and Raman scattering? What are the stokes and anitistokes lines?

ii) Explain Heisenberg uncertainty principle. Give its physical significance.

iii) Explain terms photocatalysis and photosynthesis with suitable example.

b) When a substance is irradiated with light of wavelength 5000Aº, 1×10^{-4} moles of it undergoes decomposition. How many photons are absorbed during decomposition if quantum efficiency of a reaction is 8? **[4]**

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

i) Draw the plot of ψ and ψ^2 for particle in one dimensional box.

ii) Give the selection rule for rotational spectra. Draw energy level diagram and sketch the spectrum for a rigid diatomic molecule.

iii) Explain Flurescence and phosphorescence with the help of energy transition diagram.

b) The frequency difference of successive lines in rotational spectrum of HI molecule is observed to be $13.40\times m^{-1}$. Calculate the rotational constant and bond length in equilibrium. **[4]**

[Given : At.Wt H = 1, I = 127, N = 6.023×10^{23}, h = 6.626×10^{-27} erg. sec C = 2.987×10^{10}cm.sec^{-1}]

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

a) Hamiltonian operator.

b) Molar polarization.

c) Modes of vibrations.

d) Chemical actinometer.

e) de-Broglie hypothesis.

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Total No. of Questions : 5]

SEAT No. : ____

PD646

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[6467]-531
T.Y. B.Sc. (Regular)
CHEMISTRY
CH-502: Analytical Chemistry - I
(2019 Pattern) (Semester - V) (35132)

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

Instructions to the candidates:

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

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

a) What is co - precipitation?

b) What is a Group reageut in IQA?

c) What is Thermogram or TG curve?

d) What is the basic principle of UV Visible spectroscopy?

e) Define the term accuracy used in instrumental methods of Analysis.

f) Calculate absorbance of a selection if transmittance is 0.9.

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

i) What is post precipitation? Explain with suitable example.

ii) Explain construction & working of photovoltaic cell with neat and labelled diagram.

iii) What is common ion effect? Explain it with dissociation of acetic acid in presence of sodium acetate.

b) Explain criteria for chosing an analytical method with respect to, **[4]**

i) Precision

ii) Selectivity

iii) Analysis time

iv) Cost of analysis

P.T.O.

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

i) Give conditions of good precipitation in Gravimetric analysis.

ii) In UV- Visible spectroscopy, what is light filter? Explain interference filter.

iii) What is DTA? Give its applications.

b) A solution of $K_2Cr_2O_7$ of concentration 2.8×10^{-5} M shows an absorbance of 1.1 at its $\int$ max. Calculate concentration of an unknown $K_2Cr_2O_7$ which shows an absorbance of 0.81 in the same cuvette. **[4]**

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

i) What is Group reagent? Explain role of dil. HCl in separation of Gr. I basic radicals (cations).

ii) What is thermal methods of analysis? Give its classification.

iii) Explain Job's continuous variation method.

b) Calculate Gravimetric factor for following stoichiometric conversion. **[4]**

Analyte (molar mass)	Precipitate (molar mass)
Bi_2S_3 (514.15)	$3BaSO_4$ (233.40)

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

a) Calculate % Mass loss for the following reaction.

$$Ca\ CO_3 \xrightarrow{\Delta} Ca\ O(s) + CO_2 \uparrow$$

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

b) What are the different methods used for preparation of original solution in Inorganic Qualitative Analysis?

c) Give schematic diagram of a double beam spectrophotometer.

d) Calculate absolute & relative error for the following:

Measured value = 0.69, Expected value = 0.68.

e) What is the role of organic precipitant in gravimetric analysis? Give the structure of DMG.

f) Explain effect of solvent & temperature on solubility of precipitate.

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Total No. of Questions : 5]

SEAT No. :

PD647

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[6467]-532
T.Y. B.Sc. (Regular)
CHEMISTRY
CH - 504 : Inorganic Chemistry - I
(2019 Pattern) (Semester-V) (35134)

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

Instructions to the candidates:

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

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

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

b) Define conductors.

c) Why Na metal has more conductivity than Mg metal?

d) Write symbol of element having atomic No. 131.

e) What is formation constant?

f) Calculate the magnetic moment for Fe^{3+} ion by using spin only formula (Fe at No. 26).

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

i) Explain multiple bonding in complexes.

ii) What is n-type semiconductor? Explain with the help of N(E) curve.

iii) Explain the overall formation constant for the formation of complex.

P.T.O.

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

i) What is non-stoichiometric compound? Explain it with suitable example.

ii) Explain oxidation state of d-block element.

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

i) What is nuclear fuel? Explain the types of nuclear fuel.

ii) What is intrinsic semiconductors? Explain with the help of N(E) curve.

iii) Write assumptions of M.O.T.

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

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

i) Explain the complex formation ability of d-blocks element.

ii) What is super conductor and give it's applications.

iii) Explain the neutron bombardment method for synthesis of transuranic element.

b) Explain the molecular orbital energy level diagram for $\left[Co(CH)_6\right]^{3-}$.**[4]**

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

a) Lanthanide contraction.

b) Charge transfer spectra.

c) Nephelauxetic effect and series.

d) Heavy ion bombardment.

e) Electroneutrality principle.

f) n-type semiconductors.

Total No. of Questions : 5]

SEAT No. :

PD648

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[6467]-533
T.Y. B.Sc. (Regular)
CHEMISTRY
CH - 505 : Industrial Chemistry - I
(2019 Pattern) (Semester-V) (Paper - V) (35135)

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

Instructions to the candidates:

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

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

a) What is OSHA?

b) Define the term space velocity.

c) What is mean by Rum?

d) What is emulsion?

e) Explain the term anti-oxidant.

f) What are plasticizers?

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

i) Explain the term quality control and quality assurance involved in chemical Industry.

ii) What are functional properties of Soap?

iii) Give synthesis, uses of basic dues.

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

i) Carbonation process.

ii) Contact converter.

P.T.O.

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

i) Give an importance of process control in chemical process industry.

ii) What are basic requirement for a chemical industry?

iii) Discuss manufacture of vinegar from Wines.

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

i) Write a note on fatty acid.

ii) Give synthesis and uses of phenophthalein.

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

i) Differentiate between continuous and batch process.

ii) Explain the factor favourable for fermentation.

iii) What is the role of R and D in chemical plant.

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

i) Give synthesis and uses of Indigo.

ii) What are advantages and disadvantages of detergents.

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

a) What are the important use of soaps?

b) What are qualities of good dye?

c) Write a note on Fermentation.

d) What is Fuming sulphuric acid? Explain the absorption process of SO_3.

e) What are functions of Human resources?

f) Mention important of IP rights.

Total No. of Questions : 5]

SEAT No. :

PD649

[Total No. of Pages : 2

[6467]-534
T.Y.B.Sc. (Regular)
CHEMISTRY
CH- 507 : Organic Chemistry - I
(2019 Pattern) (CBCS) (Semester - V) (35137)

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

Instructions to the candidates:

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

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

a) Give the synthesis of pyrrole from 1.4 diketone.

b) Name any two rearrangement reactions which involves isocynate intermediate.

c) What are heterocyclic compounds?

d) Draw the structure of Diethyl malonate.

e) State Antimarkovnikof's Rule.

f) What is kinetic isotopic effect?

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

i) Comment on aromaticity of furan, pyrrole & pyridine.

ii) Describe factors affecting the reactivity in Elimination reaction.

iii) Explain the synthesis of Butyric acid from ethylacetoacetate.

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

i) Explain Mc-Lafferty rearrangement.

ii) l-iodopropane undergoes E_2 elimination faster than 1-chloropropane. Explain.

P.T.O.

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

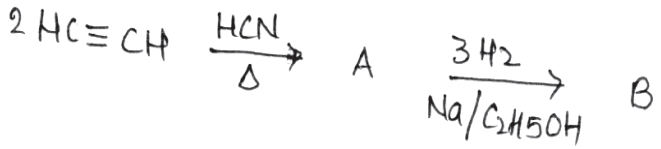
i) What is E_1 elimination? Discuss the evidences for E_1 elimination.

ii) Anthracene undergoes electrophilic substitution at 9,10 position. Explain.

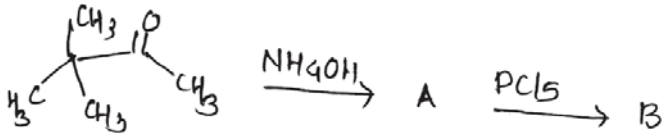
iii) Explain pinacol-pinacolone rearrangement with suitable example.

b) Predict the products and justify answer **[4]**

i)



ii)



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

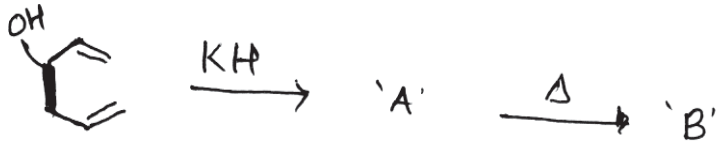
i) What do you mean by reactive methylene group? How will you prepare carbanion in reactive methylene compounds?

ii) Discuss any two name reaction for synthesis of primary amine.

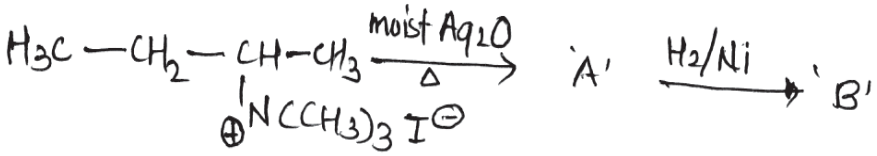
iii) Explain orientation & reactivity in E_2 elimination reaction.

b) Identify the products 'A' & 'B' in the following reactions: **[4]**

i)



ii)



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

a) Lossen Rearrangement.

b) Beckmann Rearrangement.

c) Classification of Heterocyclic compound.

d) Distinguish between E_2 & E_1 elimination reactions.

e) Paal knorr synthesis.

f) Synthesis & stability of carbocation.

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Total No. of Questions : 5]

SEAT No. : ____

PD650

Total No. of Pages : 2

[6467]-535
T.Y. B.Sc. (Regular)
CHEMISTRY
CH-508: Chemistry of Biomolecules
(2019 Pattern) (CBCS) (Semester - V) (35138)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Questions 2 to 5 carry equal marks.***
4) ***Figuers 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 functions of cell wall.
b) Define simple lipids.
c) Draw structure of sucrose.
d) What are amino acids?
e) Which hormones released by thyroid gland
f) What are enzymes?

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

i) Give the classification of amino acids.
ii) What are oligosoccharides? Explain with an examples.
iii) Explain bacterial cell with diagram.

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

i) What is phosphatidic acids? Give its structures.
ii) What is active site of enzymes?

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

i) Glucose shows mutaration. Explain.
ii) Describe conjugated protein in details.
iii) Define competative and non-competative enzyme.

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

i) Give michaelis-menton equation with meaning of each term.
ii) What are triacylglycerols?

P.T.O.

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

i) What are lipids? Give two functions of lipids.

iii) Describe biological significance of carbohydrates.

iii) What are proteins? Discuss α–helical structure with neat lable diagram.

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

i) Write short note on steroids.

ii) Give the following reactions of D-Glucose.

1) Br_2 /Water 2) Na-H_9 /H_2o

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

a) Give the classification of proteins on the basis of functions.

b) Write reactions of amino acid with Dansyl chloride.

c) Give the medical uses of enzymes.

d) What is enzyme inhibitors? Give their classification.

e) What is endocrine gland? Explain the function of harmones.

f) Give the significance of gastro intestinal harmones.

Total No. of Questions : 5]

SEAT No. :

PD651

[Total No. of Pages : 2

[6467]-536
T.Y. B.Sc. (Regular)
CHEMISTRY
CH - 510(A) : Introduction to Medicinal Chemistry
(2019 CBCS Pattern) (Semester-V) (351310A)

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) ***Q.2 to Q.5 carry equal marks.***
4) ***Figures to the right indicates full marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of logarithmic tables & Calculators is allowed.***

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

a) What are polyene antibiotics?

b) Name any two infectious diseases.

c) Define : Drug.

d) What is receptor?

e) Name any two antibacterial agents.

f) Draw the structure of paracetamol.

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

i) Draw the structure of Penicillin. Discuss its mode of action.

ii) Define : Inflammation. Write two examples of anti inflammatory agents. Write mode of action of SAID.

iii) What are tetracyclins? Write their SAR.

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

What are Macrolides? Write their mechanism of action. Discuss their applications and side effects.

P.T.O.

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

i) Write a note on : Metallodrugs.

ii) Discuss Covid-19 Vaccins.

iii) What is Lipinski rule of 5?

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

What is pharmacology? Discuss 'ADME' in pharmacokinetics.

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

i) Explain the term : Therapeutic Index.

ii) Write note on : CVDs.

iii) Discuss historical background of drug design and development.

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

Write mode of action, uses and side effects of Ibuprofen.

Q5) Draw structure, any 2 properties and uses of any four drugs : **[10]**

a) Acyclovir

b) Chloramphenicol

c) Salvarsan

d) Ibuprofen

e) Cisplatin

Total No. of Questions : 5]

SEAT No. :

PD652

[Total No. of Pages : 2

[6467]-537
T.Y. B.Sc. (Regular)
CHEMISTRY
CH - 510(B) : Polymer Chemistry
(2019 Pattern) (CBCS) (Semester-V) (351310B)

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

Instructions to the candidates:

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

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

a) Define the term-Polymer.

b) What is meant by condensation polymerisation?

c) Name any two inihibitors used in free radical polymerisation.

d) What is threshold value of polymer?

e) Bakelite is the trade name of the polymer _____.

f) What is polyamide?

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

i) What is the glass transition temperature? Explain factors affecting glass transition temperature.

ii) Discuss in brief pearl (suspension) polymerization.

iii) Write a note on practical significance of molecular weight.

b) i) How is vinyl chloride prepared? Describe the application of PVC.

ii) Distinguish between the Addition and condensation Polymerization. **[4]**

P.T.O.

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

i) What is a polydispersed polymer system?

ii) What are polyesters? Give their applications.

iii) Give the full account of anionic polymerisation.

b) i) Distinguish between the straight chain & branched chain polymer.

ii) Write the uses of polyvinyl alcohol.

[4]

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

i) Draw the structure of Nylon 6, 6 and give its commercial applications.

ii) Explain any three methods of termination in free radical polymerisation.

iii) Comment on glass transition temperature value of polyethylene and polyvinyl carbazole.

b) A certain polymer sample contains fractions A, B and C with their number and molecular weights as shown below : **[4]**

Fraction A : 60 molecules with molecular weight 14,000 each

Fraction B : 80 molecules with molecular weight 10,000 each

Fraction C : 100 molecules with molecular weight 8,000 each

Calculate the number average molecular weight for the polymer.

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

a) Zeigler-Natta catalyst.

b) Primary and secondary bonding forces in polymers.

c) High Density Polyethylene (HDPE).

d) Homochain and Heterochain polymers.

e) Natural rubber.

f) Advantages and disadvantages of Emulsion Polymerization.

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Total No. of Questions : 5]

SEAT No. :

PD653

[Total No. of Pages : 2

[6467]-538

T.Y.B.Sc. (Regular)

CHEMISTRY

CH-511 A : Environmental Chemistry

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

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

Instructions to the candidates:

1) ***Question No.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.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagrams wherever necessary.***
6) ***Use of logarithm tables and calculator is allowed.***

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

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

b) Define contaminant.

c) What are detergents?

d) What is meant by sedimentation of waste treatment?

e) What is meant by speciation?

f) What is meant by sludge digestion?

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

i) Write a note on biosphere.

ii) Distinguish between B.O.D and C.O.D.

iii) What is reverse osmosis? Explain.

b) Explain in detail preliminary waste treatment. **[4]**

P.T.O.

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

i) Write a note on electrodialysis.

ii) Write a note on industrial sewage treatment.

iii) What are the important classes of inorganic pollutants. Give a note on acid mine drainage.

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

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

i) Write a note on Eutrophication.

ii) Explain activated sludge process.

iii) How can detergents cause water pollution?

b) Briefly describe the segments of environment. **[4]**

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

a) Write a note on Hydrosphere.

b) Write a note on biological treatment of waste water.

c) Write a note on Minamata disease.

d) Primary waste water treatment.

e) Trickling filter.

f) Explain nitrogen fixation by bacteria.

Total No. of Questions : 5]

SEAT No. :

PD654

[Total No. of Pages : 2

[6467]-539

T.Y.B.Sc. (Regular)

CHEMISTRY

CH-511(B) : Chemo-Informatics

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

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

Instructions to the candidates:

1) ***Question No.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.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***

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

a) What is lead compound?

b) What is toxicity?

c) What is algorithm?

d) What is SMILE?

e) What is drug delivery?

f) Define the term, covalent bond.

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

i) Write a note on virtual learning.

ii) Explain any one search engine used in chemo-informatics.

iii) Discuss QSAR with examples.

b) Give the historical developments of chemo-informatics. **[4]**

P.T.O.

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

i) Discuss the full structure search.

ii) How do you use Marvin sketch?

iii) Explain graph theory and its limitations.

b) Write a note on pharmacophore modelling. **[4]**

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

i) Draw the SMILES for the following.

1) Ethanol

2) Benzene

3) Cyclohexane

ii) Discuss different machine learning methods.

iii) What are different methods for the representation of molecules in 3D structure?

b) Define drug. Discuss Lipinski rule of five in drug development. **[4]**

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

a) Explain Linear Free Energy Relations.

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

c) What is computational chemistry? Discuss its significance in modern science.

d) Discuss the significance of mol files, sd files and pdb files.

e) Write the significance of matrix representations in computational chemistry.

f) Write a note on Expert Protein Analysis System (Expasy).

Total No. of Questions : 5]

SEAT No. :

PD655

[Total No. of Pages : 2

[6467]-540

T.Y.B.Sc. (Regular)

BOTANY

BO-351 : Cryptogamic Botany Algae & Fungi

(2019 Pattern) (CBCS) (Semester-V) (Paper - I) (35141)

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

Instructions to the candidates:

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

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

a) Define Cryptogams.

b) What is the cell wall composition in algae?

c) What is mycorrhiza?

d) Write the scientific name of yeast.

e) Give the occurrence of *Chara*.

f) Enlist the stages of *Puccinia* occurs in wheat and barbery plant.

Q2) a) Explain the types of vegetative reproduction in yeast? **[6]**

b) Write about thallus structure in *Chara*. **[4]**

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

b) Describe the thallus organization in algae. **[4]**

P.T.O.

Q4) a) Explain the types of Mycorrhiza **[6]**

b) Give brief account on the thallus structure of *Penicillium*. **[4]**

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

a) Ectomycorrhizae

b) Teleutospores

c) Economic importance of algae as food.

d) Mode of Nutrition in fungi.

e) Fragmentation in *Nostoc*

f) Hyphae in *Rhizopus*

Total No. of Questions : 5]

SEAT No. : ____

PD656

[Total No. of Pages : 2

[6467]-541
T.Y. B.Sc. (Regular)
BOTANY
BO-352: Archegoniate
(2019 CBCS Pattern) (Semester - V) (35142)

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) What is Archegonium?

b) Name the bryophyte in which sporophyte consists capsule only.

c) What is gemmae?

d) Give the two methods of vegetative reproduction in Anthoceros.

e) Who proposed Telome Theory of evolution of pteridophytes.

f) Define Siphonostele.

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

b) Write differences between bryophytes and pteridophytes. **[4]**

Q3) a) Describe L.S. of Strobilus of Equisetum. **[6]**

b) Give an account of vegetative reproduction in Funaria. **[4]**

Q4) a) Describe structure of Anthoceros sporophyte. **[6]**

b) Explain origin of bryophytes from algae. **[4]**

P.T.O.

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

a) General characters of Archegoniate.

b) Salient features of class Music.

c) Alternation of generations in Funaria.

d) Origin of pteridophytes from bryophytes.

e) Structure of Sporangium in Equisetum.

f) Economic importance of pteridophytes.

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Total No. of Questions : 5]

SEAT No. :

PD657

[Total No. of Pages : 2

[6467]-542

T.Y. B.Sc. (Regular)

BOTANY

BO - 353 : Spermatophyta and Paleobotany

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

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

Instructions to the candidates:

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

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

a) Define Polyembryony.

b) Write any two factors required for fossilisation.

c) Define botanic garden.

d) Give any two characters of family-Nymphaeaceae.

e) What is neoendemism?

f) Mention classes of Gymnosperms.

Q2) a) What is speciation? Comment on Parapatric speciation. **[6]**

b) Explain Pseudoanthial theory. **[4]**

P.T.O.

Q3) a) Describe internal structure of Pinus needle. **[6]**

b) What are fossils? Explain Pith Cast and Coal ball. **[4]**

Q4) a) Give an account of distinguishing characters, floral formula, floral diagram of family Cannaceae. **[6]**

b) Mention merits and limitations of APG IV system. **[4]**

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

a) Male cone of Pinus.

b) Angiospermic characters in Gnetum.

c) Functions of Herbarium.

d) Economic importance of Gymnosperms.

e) Holoendemism.

f) Biological species concept.

Total No. of Questions : 5]

SEAT No. :

PD658

[Total No. of Pages : 2

[6467]-543

T.Y. B.Sc. (Regular)

BOTANY

BO - 354 : Plant Ecology

(CBCS 2019 Pattern) (Semester-V) (Paper - IV) (35144)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Questions 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) What is ecology?

b) Define speciation.

c) What is population ecology?

d) Define Community.

e) What is GPS?

f) Which are 3 pillars of sustainability?

Q2) a) Describe the community structure. **[6]**

b) What is food chain? Explain with suitable examples. **[4]**

P.T.O.

Q3) a) Describe the network method of EIA. Give its advantages. **[6]**

b) Explain Allopatric speciation with suitable example. **[4]**

Q4) a) Define environmental audit. Give its objectives. **[6]**

b) What is population dispersion? Give its types. **[4]**

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

a) Concept of ecological management.

b) Advantages of remote sensing.

c) Benefits of environmental audit.

d) Strategic environment assessment.

e) Denitrification.

f) Niche concept.

Total No. of Questions : 5]

SEAT No. : ____

PD659

[Total No. of Pages : 2

[6467]-544
T.Y.B.Sc. (Regular)
BOTANY
BO- 355 : Cell and Molecular Biology
(CBCS 2019 Pattern) (Semester - V) (Paper - V) (35145)

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 labeled diagrams wherever necessary.***

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

a) Enlist any two functions of mitochondria.

b) State function of DNA ligase.

c) Enlist types of chromosomes based on number of centromeres.

d) Enlist types of eukaryotic promoters.

e) Define autocrine signaling.

f) What is translation?

Q2) a) Define lysosomes. Explain their structure and function. **[6]**

b) Describe Griffith's transformation experiment. **[4]**

Q3) a) Give a detailed account of initiation of DNA replication in prokaryotes. **[6]**

b) Give a brief account of signal molecules in plants. **[4]**

P.T.O.

Q4) a) What is genetic code? Explain in brief properties of genetic code. **[6]**

b) Give a brief account of nuclear pore complex. **[4]**

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

a) Packing of DNA into chromosomes.

b) Endoplasmic reticulum.

c) Plasmodesmata.

d) rRNA

e) Inhibitors of DNA replication.

f) Elongation of translation in prokaryotes.

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Total No. of Questions : 5]

SEAT No. : ____

PD660

[Total No. of Pages : 1

[6467]-545
T.Y. B.Sc. (Regular)
BOTANY
BO-356 : Genetics
(2019 CBCS Pattern) (Semester - V) (Paper-VI) (35146)

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

Instructions to the candidates:

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

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

a) What is germinal variation?
b) Define genetics.
c) Give any two examples of chemical mutagens.
d) What is homomorphic self-Incompatibility?
e) Define hypoploidy?
f) 2n+1 denotes which type of aneuploidy?

Q2) a) What is recombination? explain its types in details. **[6]**
b) Comment on complementary gene action (9:7) **[4]**

Q3) a) Give difference between qualitative and quantitative characters. **[6]**
b) Comment on translocation. **[4]**

Q4) a) Describe in detail the sex-influenced genes with suitable example. **[6]**
b) Explain law of independent assortment with suitable example. **[4]**

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

a) Gametophytic system of self-Incompatibility.
b) Back cross with suitable example.
c) Artificial mutation.
d) Deletion of chromosome.
e) Types of crossing over.
f) Petite mutants in yeast.

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Total No. of Questions : 5]

SEAT No. :

PD661

[Total No. of Pages : 2

[6467]-546

T.Y. B.Sc. (Regular)

BOTANY

BO-3510 : Medicinal Botany

(CBCS 2019 Pattern) (Semester-V) (351410)

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

Instructions to the candidates:

1) ***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 Medicinal Plants.

b) What is I.U.C.N.?

c) Define Ayurveda.

d) What is Umoor-e-tabia?

e) Define Ex-Situ Conservation.

f) What is Nursery?

Q2) a) What is In-Situ Conservation? Explain Sacred Groves with respect to In-Situ Conservation. **[6]**

b) Mention any four applications of Ethnobotany. **[4]**

OR

P.T.O.

Q3) a) What are the folk medicines? Mention any four applications of fold medicines. **[6]**

b) Add a note on the ethnic communities of India. **[4]**

OR

Q4) a) Define Air-layering? Give the detailed account of steps followed in Air-layering. **[6]**

b) Write the role of Biosphere Reserves in Conservation of Plants. **[4]**

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

a) Components of Nursery.

b) Applications of Medicinal Plants.

c) Medicinal Plants in Siddha System of Medicine.

d) Ethnomedicine.

e) Palaeo-ethnobotany.

f) Ethnoecology.

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Total No. of Questions : 5]

SEAT No. :

PD662

[Total No. of Pages : 2

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T.Y.B.Sc. (Regular)

BOTANY

BO-3511 : Plant Diversity and Human Health

(2019 Pattern) (CBCS) (Semester-V) (351411)

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

Instructions to the candidates:

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

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

a) Define Biodiversity.

b) What is genetic drift?

c) Write any two names of national parks.

d) What is pomology?

e) Define forestry.

f) What is biodiversity conservation?

Q2) a) Write a note on IUCN. **[6]**

b) Explain Ex-situ conservation. **[4]**

Q3) a) Describe ecosystem diversity. **[6]**

b) Write note on Hedonic pricing method. **[4]**

P.T.O.

Q4) a) Give an account of contribution of NBPGR in genetic resource management. **[6]**

b) Discuss social approaches to conservation. **[4]**

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

a) Uses of wood.

b) Maintainance of Biodiversity.

c) Biodiversity Act.

d) Organizations involved in Biodiverstity conservation.

e) Factors affecting biodiversity (genetic) loss.

f) Change in productivity method.

Total No. of Questions : 5]

SEAT No. :

PD663

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[6467]-548

T.Y. B.Sc. (Regular)

ZOOLOGY

ZO - 351 : Pest Management

(2019 Pattern) (Semester-V) (Paper - I) (35151)

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

Instructions to the candidates:

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

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

a) Define pest.

b) Sterilization.

c) Principles of IPM.

d) Predators.

e) Plant disease.

f) Importance of Qurantine.

Q2) a) Give an account of insecticidal residue problems in fruits. **[6]**

OR

Biological control measures with weed killers and their Mass production.

b) Describe the action and chemical nature of insecticide. **[4]**

P.T.O.

Q3) a) What is Biotechnology approaches & its methodology? **[6]**

OR

Describe the cultural control of pest management with reference to Sanitation and Tillage.

b) Explain the use of fungi and viruses in pest management. **[4]**

Q4) a) Describe use of genetic engineering in pest management. **[6]**

OR

Describe the damage caused by the pest.

b) Explain the principles and components of IPM. **[4]**

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

a) Types of pesticide.

b) Crop rotation.

c) Somaclonal variability.

d) Transgenic plants.

e) Describe MRLs.

f) Entomopathogens.

Total No. of Questions : 5]

SEAT No. :

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[6467]-549
T.Y. B.Sc. (Regular)
ZOOLOGY
ZO-352: Histology
(2019 Pattern) (Semester - V) (35152)

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

Instructions to the candidates:

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

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

a) Define histology.

b) What is pseudostratified epithelium?

c) What is filiform papilla?

d) Define endocrine gland.

e) What is dentin?

f) Explain the term diphydont.

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

OR

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

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

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

OR

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

b) Write note on thyroid follicle. **[4]**

P.T.O.

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

OR

Explain the structure and functions of gastric gland.

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

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

a) Leucocytes

b) Taste buds

c) Seminiferass tubules

d) Rugae

e) Duplex gland

f) Trachea

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Total No. of Questions : 5]

SEAT No. :

PD665

[Total No. of Pages : 2

[6467]-550

T.Y. B.Sc. (Regular)

ZOOLOGY

ZO - 353 : Biological Chemistry

(2019 Pattern) (Semester-V) (Paper - III) (35153)

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

Instructions to the candidates:

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

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

a) Give any two examples of Disaccharides.

b) What are reducing sugar?

c) pH of solution is measured by _____.

d) What are zwitterions?

e) Why lipids are insoluble in water?

f) Define Enzymes.

Q2) a) What is Henderson-Hasselbalch equation? Give its significance. **[6]**

OR

Explain any two heteropolysaccharides with examples.

b) What are glycosidic bonds? **[4]**

P.T.O.

Q3) a) Describe the general structure of amino-acid and add a note on essential amino acids. **[6]**

OR

What is the effect of substrate concentration on enzyme activity.

b) Give the difference between regulatory and non-regulatory enzymes. **[4]**

Q4) a) Explain Isoenzymes with example. **[6]**

OR

Explain clinical significance of Hypoglycemia.

b) Mention four important biological functions of proteins. **[4]**

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

a) Secondary structure of protein.

b) PKU.

c) pH.

d) Biological significance of lipids.

e) Significance of Glycogenesis.

f) Obesity.

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Total No. of Questions : 5]

SEAT No. :

PD666

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T.Y. B.Sc. (Regular)

ZOOLOGY

ZO - 354 : Genetics

(2019 Pattern) (Semester-V) (Paper - IV) (35154)

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 holandric genes.

b) Describe parthenogenesis.

c) What is panmictic mating?

d) Define Hypertrichosis.

e) Define Muton.

f) Explain induced mutation.

Q2) a) Explain the characteristics & importance of multiple alleles using suitable example. **[6]**

OR

Explain different mutagenic agents using suitable examples.

b) Explain Mendel's Law of segregation. **[4]**

P.T.O.

Q3) a) Discuss chromosomal abnormality in Down syndrome & common physical features of its patient. **[6]**

OR

Describe genetic basis of colour blindness and its inheritance pattern using a hypothetical cross.

b) Explain XX-XO method of sex determination. **[4]**

Q4) a) Explain Dominant lethal genes & their inheritance pattern. **[6]**

OR

Describe various applications of Genetics.

b) Differentiate between transversion & transition mutation. **[4]**

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

a) Hardy Weinberg Law.

b) Gynandomorphism.

c) Klinefelter syndrome.

d) Somatic & Gametic mutation.

e) Codominance.

f) Rh Blood Group System.

Total No. of Questions : 5]

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[6467]-552
T.Y.B.Sc. (Regular)
ZOOLOGY
ZO- 355 : Developmental Biology
(2019 Pattern) (Semester - V) (Paper - V) (35155)

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 growth.

b) What is induction?

c) Define developmental biology.

d) What is vitellogenesis?

e) Define cell communications.

f) What is primitive streak?

Q2) a) What is spermatogenesis? Describe process of spermatogenesis. **[6]**

OR

Describe the process of prevention of polyspermy.

b) Explain penetration of sperm. **[4]**

Q3) a) Describe the head process development and regression of primitive streak in chick embryo. **[6]**

OR

Explain the types of eggs on the basis of amount of yolk.

b) Explain the theory of epigenesis in development. **[4]**

P.T.O.

Q4) a) Define cleavage. Describe different planes of cleavage. **[6]**

OR

Describe fertilizin - antifertilizin reaction.

b) Describe the types of regeneration. **[4]**

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

a) Coeloblastula.

b) Centrolecithal egg.

c) Amphimixis.

d) Discoblastula.

e) Egg membranes.

f) Radial cleavage.

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Total No. of Questions : 5]

SEAT No. :

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[6467]-553
T.Y. B.Sc.(Regular)
ZOOLOGY
ZO-356 : Parasitology
(2019 Pattern) (Semester - V) (Paper-VI) (35156)

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 parasitology.
b) Define medical entomology.
c) What is superficial endoparasites.
d) What is paratenic Host.
e) What is host parasite relationship.
f) What is encystation.

Q2) a) Describe morphology, pathogenecity & treatment of P-vivax **[6]**

OR

Describe life cycle of Taenia Solium in pig.

b) Describe advantages of parasitism to parasite . **[4]**

Q3) a) Describe external morphology of Head Louse. **[6]**

OR

Describe Host specificity and their types.

b) Explain role of ticks in transmission of pathogens. **[4]**

Q4) a) Explain habit,habitat & morphology of trophozoite stage of E.Histolytica. **[6]**

OR

P.T.O.

Describe in detail the mode of infection, pathogenecity and treatment for Ascariasis disease.

b) Explain morphological adaptations in parasites. **[4]**

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

a) Vector.
b) Anti malarial campaign in India.
c) Sporozoites.
d) Parasitic adaptations in Taenia Solium.
e) Preventive measures against tick.
f) Control of rat flea.

Total No. of Questions : 5]

SEAT No. :

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[Total No. of Pages : 2

[6467]-554
T.Y. B.Sc. (Regular)
ZOOLOGY
ZO - 3510 : Aquarium Management
(2019 Pattern) (Semester-V) (Paper - X) (351510)

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

Instructions to the candidates:

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

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

a) Define Salting.

b) Define endemic species.

c) Define fish food.

d) What is fish preservation.

e) Examples of Larvicidal fishes.

f) Guppy Fish

Q2) a) Describe common characters Guppy and Molly fish. **[6]**

OR

Explain preservation and processing technique in fish management.

b) Explain diseases of Aquarium fishes. **[4]**

P.T.O.

Q3) a) Describe Live Fish transportation. **[6]**

OR

Explain physico-chemical parameters of water for fish culture.

b) Explain rules and regulations of fish rearing. **[4]**

Q4) a) Describe the common characters and sexual dimorphism of Gold fish and Angel fish. **[6]**

OR

Explain composition of formulated fish feeds.

b) Describe types of fish food. **[4]**

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

a) Fish mortality.

b) Fish Farm as Cottage Industry.

c) Nutritive value of fish.

d) Characteristic of Molly fish.

e) Scope of Aquarium fishes.

f) Induced fish breeding.

Total No. of Questions : 5]

SEAT No. :

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T.Y.B.Sc. (Regular)

ZOOLOGY

ZO 3511 : Poultry Management

(2019 Pattern) (Semester-V) (351511) (Paper-VIII)

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

Instructions to the candidates:

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

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

a) Define Poultry.

b) What are Breeds of Poultry Birds?

c) What is culling?

d) Explain the term Incubation.

e) Name any 2 transport stratergies of Poultry Birds.

f) What is Grower feed?

Q2) a) Describe Breeds & strains of Broiler chicken. **[6]**

OR

Describe general aspects of Breeding for Better egg production and Body weight gain of chicken.

b) Write note on Importance of poultry farm in India. **[4]**

Q3) a) Describe in detail female reprodcutive system with the help of neat labelled diagram of chicken. **[6]**

OR

Explain transmission, symptoms and economic significance of infectious bronchitis and chronic Respiratory Diseases in Poultry Birds.

b) Explain controls of internal parasites of poultry birds. **[4]**

P.T.O.

Q4) a) Explain feed ingredient and feed prosessing in poultry feeding management. **[6]**

OR

Describe digestive system and digestion mechanism of chicken with neat labelled diagram.

b) Explain Broiler Housing Management. **[4]**

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

a) Egg powder

b) Lighting schedule for Poultry

c) Slaughtering of chicken

d) Control of external parasite of Poultry Birds

e) Vaccination for Poultry Birds

f) Poultry feathers as by product.

Total No. of Questions : 5]

SEAT No. :

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T.Y. B.Sc. (Regular)

GEOLOGY

GL - 311 : Geology of India - I

(2019 Pattern) (Semester-V) (35161)

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 Five) **[5]**

a) Name any two Precambrian mobile belts of India.

b) Name the cratons on which Dongargarh granite and Erinpura granite occur.

c) Give lithology of Sargur Group.

d) Give subdivisions of Bhilwara Supergroup.

e) Give lithostratigraphic subdivisions of Delhi Supergroup.

f) Give economic importance of Dharwar craton.

Q2) Write notes on :

a) Stratigraphic succession of Bhilwara Supergroup. **[6]**

b) Singhbhum Granite. **[4]**

P.T.O.

Q3) Write notes on :

a) Lithostratigraphic classification of Vindhyan Supergroup. **[6]**

b) Stratigraphic succession of Dharwar Supergroup. **[4]**

Q4) Write notes on :

a) Sausar group. **[6]**

b) Charnockite series. **[4]**

Q5) Answer the following. (Any Five) **[10]**

a) Lithologic succession of Raipur group of Chattisgarh basin.

b) Lithologic succession of Bhima group.

c) Stratigraphic succession of Cuddapah Supergroup.

d) Mineral deposits of Dharwar craton.

e) Mineral deposits of Aravalli craton.

f) Iron ore series.

Total No. of Questions : 5]

SEAT No. :

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[6467]-557
T.Y. B.Sc. (Regular)
GEOLOGY
GL-312: Mineral Resources
(2019 Pattern) (Semester - V) (35162)

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 in 2-3 sentences. (Any five) **[5]**

a) Name 2 minerals of hypothermal type.

b) Gangue minerals.

c) Name important ore minerals of Mn.

d) Residual deposits.

e) Zone of oxidation.

f) Name two important oxides of Iron.

Q2) Explain the following.

a) Early magmatic concentration deposits. **[6]**

b) Solution cavity filling deposits. **[4]**

Q3) Explain the following.

a) Geological and geographical distribution of Copper deposits in India. **[6]**

b) Late magmatic deposits. **[4]**

Q4) Explain the following.

a) Describe the oxidation and supergene enrichment process. Add a note on False gossan. **[6]**

b) Give the geographical distribution and uses of Uranium and Thorium deposits. **[4]**

P.T.O.

Q5) Write short notes. (Any five) **[10]**

a) Metalliferous deposits.

b) Mesothermal deposits.

c) Saddle reefs.

d) Residual concentration.

e) Give the geographical distribution of Gold deposits in India.

f) Residual liquid injection.

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Total No. of Questions : 5]

SEAT No. :

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[6467]-558

T.Y. B.Sc. (Regular)

GEOLOGY

GL - 313 : Marine Geology

(2019 Pattern) (Semester-V) (Paper - III) (Revised) (35163)

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

Instructions to the candidates:

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

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

a) Enlist the various types of continental shelve based on different sediments of terrestrial origin.

b) Give the composition of Harzburgite.

c) Name any two large marginal/regional seas of Indian Ocean.

d) Define manganese nodules.

e) Name the two significant sources of calcium carbonate biogenous ooze.

f) Where does the mercury in the ocean come from?

Q2) Answer the following :

a) Explain the Evolution of Indian Ocean. **[6]**

b) Describe the continental rise & slope of Indian Ocean. **[4]**

P.T.O.

Q3) Answer the following :

a) Describe the exclusive economic zone of India and give the importance of EEZ. **[6]**

b) Explain the Mercury & Minamata disease. **[4]**

Q4) Answer the following :

a) Define Biogenous sediments. Give its origin and composition in detail. **[6]**

b) Explain sewage sludge & give its any one case study. **[4]**

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

a) Oceanic deeps/Trenches.

b) Lherzolite.

c) Composition of Oceanic Crust.

d) Origin of Lithogenous sediments.

e) Stromatolites.

f) Resolved disputes of EEZ.

Total No. of Questions : 5]

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[6467]-559
T.Y. B.Sc. (Regular)
GEOLOGY
GL - 314 : Engineering Geology
(2019 Pattern) (Semester-V) (35164)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question 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) Define Arch dam.

b) Name two types of dams & bridges.

c) What are highway aggregates?

d) Define Porosity.

e) Durability of a rock.

f) Write in brief about Sardar Sarovar Dam.

Q2) Answer the following :

a) Describe in detail the factors controlling engineering properties of a rock. **[6]**

b) What are aggregates? State their properties. **[4]**

P.T.O.

Q3) Answer the following :

a) What are the essential geotechnical investigations carried out while selection of a dam site? **[6]**

b) Write a note on bridges and its types. **[4]**

Q4) Answer the following :

a) Describe tunneling in bedded and folded rocks. **[6]**

b) Explain the residual stress and shear stress in rocks. **[4]**

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

a) Role of Groundwater in tunneling.

b) Types of dams.

c) Elasticity of rocks.

d) Absorption.

e) Importance of weathering in engineering geology.

f) Hydroelectric projects of India.

Total No. of Questions : 5]

SEAT No. : ____

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[6467]-560
T.Y.B.Sc. (Regular)
GEOLOGY
GL - 315 : Hydrogeology
(2019 Pattern) (Semester - V) (35165)

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

Instructions to the candidates:

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

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

a) Define Hydrogeology.

b) What is capillary water?

c) Define storativity.

d) What is 'Lamellar Flow'?

e) What is piezometric surface?

f) Enlist major cations in ground water.

Q2) Answer the following.

a) What is well inventory? Exlain the procedure. **[6]**

b) Explain saline water intrusion in coastal aquifer. **[4]**

Q3) Answer the following.

a) What is Darcy's Law? Explain its validity. **[6]**

b) Explain W.H.O. standards of drinking water. **[4]**

P.T.O.

Q4) Answer the following.

a) Enlist major ions in water. Explain tracers in ground water studies. **[6]**

b) What is groundwater contamination? Explain geogenic contamination in detail. **[4]**

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

a) Vadose Zone

b) Aquiclude

c) Perched watertable

d) Turbulent groundwater flow.

e) APT

f) Anthropogenic groundwater contamination.

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Total No. of Questions : 5]

SEAT No. : ____

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[6467]-561
T.Y. B.Sc. (Regular)
GEOLOGY
GL-316: Applied Geophysics
(Revised 2019 Pattern) (35166) (Semester - V) (Paper-VI)

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 No 2 to 5 carry equal marks.***

Q1) Attempt any five of the following questions in 2-3 lines: **[5]**

a) Enlist the types of gravimeter.
b) What are body waves and give its types.
c) Define free air correction.
d) Give principle of electromagnetic method.
e) Write a difference between self potential and induced polarization method.
f) Define Ionisation potential.

Q2) Answer the following.

a) What is gravity method? Explain its principle and field procedure with suitable diagram. **[6]**
b) Give differences between wenner array and schlumberger array. **[4]**

Q3) Answer the following.

a) Explain induced polarization method with neat labeled diagram. **[6]**
b) What is magnetometer? Explain its types. **[4]**

Q4) Answer the following.

a) Explain electromagnetic method. Give its principle and applications. **[6]**
b) Explain the different arrangements of electrodes in resistivity method with neat labeled diagram. **[4]**

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

a) Resistivity method.
b) Self potential method.
c) Seismic waves.
d) Magnetic anomaly.
e) Bouguer anomaly.
f) Schlum berger array.

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Total No. of Questions : 5]

SEAT No. :

PD677

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[6467]-562
T.Y. B.Sc. (Regular)
GEOLOGY
SEC - I : Geotechnology
(2019 Pattern) (Semester-V) (Paper - VII) (351610)

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

Instructions to the candidates:

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

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

a) Enlist the deep foundations.

b) Define RQD with formula.

c) Define surveying.

d) Enlist the uses of surveying.

e) Give any two types of Bench marks.

f) Enlist the parameters of bore log.

Q2) Answer the following :

a) Explain standard penetration test in brief. **[6]**

b) Explain the consistency limits of soil in brief. **[4]**

P.T.O.

Q3) Answer the following :

a) Give an account of udden wentworth classification of soil grade scale in brief. **[6]**

b) Explain the core cutter method of unit weight measurement. **[4]**

Q4) Answer the following :

a) Define levelling and explain objective of levelling and uses of levelling. **[6]**

b) Explain the rise and fall method of calculating reduced level. **[4]**

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

a) What is foundation enlist the types of foundation.

b) Give the Indian standard nomenclature of grain sizes.

c) Define shrinkage limit of soil.

d) Enlist types of levelling staff.

e) Define reduced level and vertical line.

f) Define arbitrary bench marks.

Total No. of Questions : 5]

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T.Y.B.Sc. (Regular)

GEOLOGY

SEC II : Gemology and Gem Testing

(2019 Pattern) (Semester-V) (Revised Syllabus) (351611)

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

Instructions to the candidates:

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

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

a) Name the main species of gem-quality garnets.

b) Define Gemology.

c) Enlist the various basic properties of gemstones.

d) Give the use of 10x loupe.

e) Define Dichroscope.

f) Give the use of polariscope.

Q2) Answer the following:

a) Explain methods of specific gravity determination. **[6]**

b) Write a note on organic gemstone. **[4]**

Q3) Answer the following:

a) Explain Gem synthesis & distinguish between synthetic & natural gemstones. **[6]**

b) Give the physical & optical properties of Garnet. **[4]**

P.T.O.

Q4) Answer the following:

a) Explain physical & optical properties of Feldspar gem species. **[6]**

b) Describe specific gravity in gemstones & give its uses. **[4]**

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

a) Walker's Steelyard method

b) Causes of colours in gemstones

c) Fluroscent colours shown by various gemstones

d) Opaque gem varieties

e) Rare gemstones

f) Inclusions in gemstones

Total No. of Questions : 4]

SEAT No. :

PD679

[Total No. of Pages : 2

[6467]-564
T.Y. B.Sc. (Regular)
STATISTICS (Principal)
ST - 351 : Distribution Theory - I
(2019 Pattern) (Semester-V) (Paper - I) (35171)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of 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) If the probability density function of the first order statistic X(n) of a random sample of size n drawn from distribution of random variable X is

i) $nf(x)\left[1-\mathrm{F}(x)\right]^{n-1}$ ii) $n\left[1-\mathrm{F}(x)\right]^{n-1}$

iii) $nf(x)\left[\mathrm{F}(x)\right]^{n-1}$ iv) $n\left[\mathrm{F}(x)\right]^{n-1}$

b) If $\mathrm{X} \sim \chi^2_{50}$ and we draw the random sample of 200 then expected value of S_{200} is

i) 2,000 ii) 1,000

iii) 10,000 iv) 20,000

c) If $\mathrm{X} \sim \mathrm{C}(5,6)$ then median of X is

i) 4 ii) 6

iii) 5 iv) 10

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

a) If X and Y be two independent standard exponential variates then $\mathrm{X}/\mathrm{Y} \sim Cauchy(0,1)$.

b) If $\mathrm{X} \sim \beta_2(3,2)$ then mode of the distribution is $\frac{3}{2}$.

P.T.O.

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

a) Define order statistic and for $X_1, X_2, X_3, ..., X_n$ i.i.d. random variables with pdf $f(x)$ and CDF $F(x)$ find the pdf of $X_{(1)}$.

b) If $X \sim \beta_2(m,n)$ then find the mean and variance.

c) Toss a fair coin 200 times. Use the central limit theorem to find an approximation for the probability that the number of heads is at least 120.

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

a) Examine whether WLLN for the sequence X_n such that, $\left(X_n = \frac{1}{\sqrt{n}}\right) = \frac{2}{3}$,

$P\left(X_n = -\frac{1}{\sqrt{n}}\right) = \frac{1}{3}$ is hold or not.

b) If $X \sim N(0,1)$ and $Y \sim N(0,1)$ where X and Y are independent then find the distribution of $\frac{X}{Y}$.

c) Let X be a continuous r.v. with pdf $f(x)$ then for any positive real no. k such that $P(|X-\mu| \geq k\sigma) \leq \frac{1}{k^2}$ or $P(|X-\mu| \leq k\sigma) \geq 1-\frac{1}{k^2}$.

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

a) i) Find the values of 'm' and 'n' if continuous random variable X has beta first kind distribution with mean 1/4 and variance 1/8. **[5]**

ii) $X \sim C(0,1)$ then find the distribution of $W = X^2$. **[5]**

b) Let $X_1, X_2, X_3, ..., X_n$ be a random sample from exponential distribution with mean θ find the distribution of $X_{(1)}$ also obtain its mean and variance. **[10]**

Total No. of Questions : 4]

SEAT No. : ____

PD680

[Total No. of Pages : 3

[6467]-565
T.Y. B.Sc. (Regular)
STATISTICS (Principal)
ST-352: Theory of Estimation
(2019 Pattern) (Semester - V) (35172) (Paper - II)

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

Instructions to the candidates:

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

Q1) Attempt each of the following. **[1 each]**

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

a) Let $X_1, X_2, ..X_n$ be a random sample from Normal (μ, σ^2) A statistic $T = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n}$ is used to estimate σ^2. The bias of T is

i) $\frac{2\sigma^2}{n-1}$

ii) $\frac{\sigma^2}{n}$

iii) $-\frac{\sigma^2}{n}$

iv) $-\frac{2\sigma^2}{n}$

b) Let X_1, X_2, X_3, X_4, X_5 is a random sample from a distribution with p.d.f.

$f(x|\theta) = \theta x^{-2}$ $\quad 0 \le \theta \le x < \infty$

$= 0$ $\quad o.w.$

the most likely value of θ for the observed values $X_1 = 13$, $X_2 = 2$, $X_3 = 4$, $X_4 = 9$. $X_5 = 7$ are

i) 2

ii) 13

iii) 4

iv) 9

P.T.O.

c) Property of statistic which contains all information about θ contained in the sample observation (X_1, X_2,...X_n), provided such statistic exist is

i) Consistency

ii) Efficiency

iii) Sufficiency

iv) Unbiasedness

B) In each of the following, state whether the given statement is true or false: **[1 each]**

a) For a uniform distribution on [0, θ], the maximum likelihood estimator for θ is the sample mean.

b) If T is an unbiased estimator of θ, then T^3 is also unbiased estimator of θ^3.

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

a) Let X_1, X_2, ...X_n be a random sample from *Poisson*(λ) then show that $T = \bar{X}^2 - \frac{\bar{X}}{n}$ is unbiased estimator of λ^2.

b) Suppose that X_1, X_2, ...X_n be a random sample from $N(\mu, \sigma^2)$ distribution, Show that sample mean $\bar{X}_n$ is consistent estimator of μ.

c) Let $X \to N(\mu, \sigma^2)$. Find maximum likelihood estimator of σ^2 when μ is known.

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

a) A random sample is drawn from a gamma distribution with parameter α and λ. Derive the method of moments estimators for α and λ.

b) Let X_1, X_2, ...X_n be a random sample of size n from a distribution with variance σ^2. Show that $T = \frac{1}{2(n-1)} \sum_{i=1}^{i=n-1} (X_{i+1} - X_i)^2$ is unbiased for σ^2.

c) The p.d.f of random variable X is given by

$f(x, \theta) = \theta^x (1 - \theta)^{1-x}$ $\quad x = 0, 1, \theta \in (0, 1)$

$= 0$ $\quad o.w.$

Show that $\sum_{i=1}^{i=n} X_i$ is sufficient for θ. Check whether $\bar{X}$ is sufficient?

Q4) Attempt any one of the following.

a) i) Show that $\bar{X}$ is Minimum Variance Bound Unbiased Estimator (MVBUE) for parameter μ of $N(\mu,\sigma^2)$ when σ^2 is known. **[5]**

ii) If probability density (mass) function can be written in Pitman-Koopman form **[5]**

$$f(x,\theta) = \exp\{U(\theta)V(x) + A(\theta) + B(x)\}$$

then prove that the statistic $T = \sum_{i=1}^{i=n} V(X_i)$ is sufficient for θ.

b) i) Prove that Minimum Variance Bound Unbiased Estimator (MVBUE) is necessarily a sufficient estimator. **[5]**

ii) Let $X \to U(-\theta,\theta)$. Find maximum likelihood estimator of θ. **[5]**

ⓘⓘⓘⓘ

Total No. of Questions : 4]

SEAT No. :

PD681

[Total No. of Pages : 2

[6467]-566
T.Y. B.Sc. (Regular)
STATISTICS (Principal)
ST - 353 : Design and Analysis of Experiments
(2019 Pattern) (Semester-V) (Paper - III) (35173)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates 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) In Latin square design, for 6 treatments, the error degrees of freedom will be

i) 5 ii) 30

iii) 35 iv) 20

b) In 2^2 experiment effect of factor B at first level a_0 of A is given by

i) $(ab)-(a)$ ii) $(b)-(1)$

iii) $(ab)-(b)$ iv) $(a)-(1)$

c) The confounded effect in the following replicatedivided into two block is

(1)	ab	ac	bc
a	b	c	abc

i) ab ii) bc

iii) ac iv) abc

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

a) The basic purpose of analysis of variance is to test the homogeneity of several variances.

b) In m^n factorial experiment it means that an experiment with n factors each at m levels.

P.T.O.

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

a) Describe the procedure for testing the equality of two specified treatment effects using critical difference method for Randomized Block Design (RBD).

b) Show that mean sum of squares due to error is unbiased estimator of error variance σ^2 in Completely Randomised Design (CRD).

c) Explain Yate's procedure to obtain factorial effect totals in 2^3 factorial experiment.

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

a) Explain about partial confounding in factorial experiments.

b) Obtain an expression for efficiency of LSD over corresponding CRD.

c) Describe the basic principles of design of experiments.

Q4) Attempt any one of the following :

a) i) Define factorial experiments. Provide analysis of variance (ANOVA) table for 2^3 factorial experiments. **[5]**

ii) State the model for Randomized Block Design (RBD) with assumptions. State the least squares estimators of parameters involved in this model. **[5]**

b) i) Define and explain with example Linear Treatment contrasts and orthogonal treatment contrasts. **[5]**

ii) Describe how model for Completely Randomized Design (CRD) can be considered as a particular case of regression model. **[5]**

Total No. of Questions : 4]

SEAT No. :

PD682

[Total No. of Pages : 2

[6467]-567
T.Y. B.Sc. (Regular)
STATISTICS (Principal)
ST - 354 : Statistical Process and Product Control
(2019 Pattern) (Semester-V) (Paper - IV) (35174)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates 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) Which of the following is not one of the eight dimensions of quality?

i) Performance ii) Value

iii) Aesthetic iv) Durability

b) Which of the following control chart types is applicable to monitor the number of errors per page in a printed document?

i) $\bar{X}$ chart ii) R chart

iii) c chart iv) X - MR chart

c) Which of the following indicates that the spread of the specification limits is greater than the spread of the process?

i) $Cp = 1$ ii) $Cp = 0$

iii) $Cp < 1$ iv) $Cp > 1$

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

a) If the Lower Control Limit (LCL) for a *p*-chart comes out to be negative, then LCL is taken as 0.

b) Natural tolerance limits are specified for averages and not individual observations, and hence are plotted on control charts.

P.T.O.

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

a) Explain the construction of P-chart for fixed sample size when standards are not given.

b) A control chart indicate that the current process fraction nonconforming is 0.02. If 50 items are inspected each day, what the probability of detecting a shift in the fraction non conforming to 0.04 on the first day after the shift?

c) Explain the working of a Double Sampling Plan. Also state the expression for evaluating the probability that a lot will be accepted under a Double Sampling Plan.

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

a) Distinguish between control charts for variables and control charts for attributes. Explain the construction of *c*-chart when the standard of the process is specified.

b) Distinguish between assignable causes and chance causes of variations.

c) Write a note on acceptance sampling plan with rectification.

Q4) Attempt any one of the following :

A) a) For a continuous production process with size n = 6, k = 30, $\sum \overline{X}_i = 18,000$ and $\sum R_i = 300$. Assuming the process is in statistical control, estimate the process average and process standard deviation. Also calculate control limits for R and $\overline{X}$ chart. **[6]**

b) Define the following terms with respect to a Single Sampling Plan : **[4]**

i) Acceptable Quality Level

ii) Average Total Inspection

iii) Producers risk (α)

iv) Consumers risk (β)

B) a) What is quality? Explain in brief the dimensions of quality. Also explain in brief Pareto chart as a Process Control (PC) tool. **[6]**

b) If specification limits are given as 40 ∓ 2, $\overline{\overline{X}} = 41$, $\sigma = 2.5$. Find Cp and Cpk. Also interprete it. **[4]**

Total No. of Questions : 4]

SEAT No. : ____

PD683

[Total No. of Pages : 3

[6467]-568
T.Y.B.Sc. (Regular)
STATISTICS (Principal)
ST-355 : Operations Research - I
(2019 Pattern) (Semester - V) (Paper - V) (35175)

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

Instructions to the candidates:

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

Q1) Attempt each of the following. **[1each]**

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

a) Vogel's approximation method is connected with

i) Assignment problem ii) Inventory problem

iii) Transportation problem iv) PERT

b) A set of values of decision variables that satisfies the linear constraints and non-negativity conditions of an L.P.P. is called its:

i) Unbounded solution ii) Optimum solution

iii) Feasible solution iv) Basic solution

c) The optimal value of the objective function is attained at the points

i) given by intersection of lines representing inequations with axes only

ii) given by intersection of lines representing inequations with X-axis only

iii) given by corner points of the feasible region

iv) at the origin

B) In each of the following, state whether the given statement is true or false. **[1each]**

a) If you have to solve a transportation problem with m rows and n columns using the simplex method, you formulate the problem with m variables and n constraints.

b) The right-hand side coefficient of same constraint in a primal LP problem appears in the corresponding dual as a coefficient in the objective functions.

P.T.O.

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

a) Solve the following Linear Programming Problem (LPP) using the Simplex Method:

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

Subject to $3x_1 + x_2 + 4x_3 \leq 600$

$2x_1 + 4x_2 + 2x_3 \geq 480$

$2x_1 + 3x_2 + 3x_3 = 540$

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

b) Define the following terms used in LPP.

i) alternate solution.

ii) feasible solution.

iii) basic solution.

iv) degenerate solution.

v) unbounded solution.

c) Explain North-West Corner Method to find the initial basic feasible solution for TP.

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

a) State a transportation problem in general terms and explain the problem of degeneracy and how to overcome it?

b) Obtain the dual of the following LPP.

Minimize $Z = x_1 - 3x_2 - 3x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 - 4x_2 \geq 12$

$-4x_1 + 3x_2 + 8x_3 = 10$

$x_1, x_2 \geq 0$, x_3 unrestricted in sign

c) A furniture dealer deals in only two items-tables and chairs. He has Rs. 50,000 to invest and has storage space of at most 60 pieces. A table costs Rs. 2,500 and a chair Rs. 500. He estimates that from the sale of one table, he can make a profit of Rs. 250 and that from the sale of one chair a profit of Rs. 75. He wants to know how many tables and chairs he should buy from the available money so as to maximize his total profit, assuming that he can sell all the items which he buys. Formulate the given LPP.

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

a) i) What is unbalanced assignment problem. How unbalanced assignment problem is solved using Hungarian method. **[5]**

ii) Find an initial basic feasible solution of the following T.P. by Vogel's approximation method. **[5]**

Destination / Source	D1	D2	D3	D4	Supply
S_1	2	3	11	7	6
S_2	1	0	6	1	11
S_3	5	8	15	9	10
Demand	7	5	3	2	

b) A small project involves seven activities and their time estimates are listed in the following table.

Activity	Time Estimates		
	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

i) Using the information given, construct the project network diagram. **[5]**

ii) Find the expected time estimates and variance of each activity. **[5]**

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Total No. of Questions : 4]

SEAT No. :

PD684

[Total No. of Pages : 2

[6467]-569
T.Y. B.Sc. (Regular)
STATISTICS (Principal)
ST - 356 : Regression Analysis
(2019 Pattern) (Semester-V) (Paper - VI) (35176)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates 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) In each of the following cases, choose the correct alternative : **[1 each]**

a) In multiple linear regression model, $\underline{y} = x\beta + \in$, the least square estimator of β is given by :

i) $(xx')x'\underline{y}$ ii) $x'(x'x)^{-1}\underline{y}$

iii) $(x'x)^{-1}x'\underline{y}$ iv) $x(xx')^{-1}\underline{y}$

b) Under null hypothesis of regression, the distribution of ratio of regression mean squares and the residual mean squares is,

i) t distribution ii) Normal distribution

iii) χ^2 distribution iv) F distribution

c) In a regression model, standardised residual is calculated by,

i) $e_i / \sqrt{\text{SSR}}$ ii) $e_i / \sqrt{\text{MS}_{res}}$

iii) e_i / MS_{res} iv) $\sqrt{\text{MS}_{res}} / e_i$

B) In each of the following, state whether the given statement is true or false : **[1 each]**

a) The variance-covariance matrix of the residuals is given by, $\sigma^2(\text{I} - \text{H})$.

b) The outward funnel pattern in residual plot indicates that variance of error is constant.

P.T.O.

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

a) Describe 'model deviance' used in logistic regression.

b) Write a short note on forward selection method.

c) For a simple linear regression model, $y = \beta_0 + \beta_1 x + \in$, where the intercept β_0 is known, find the least squared estimator of β_1. Also find its variance.

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

a) Explain the procedure for detection and treatment of outliers.

b) For a multiple regression model, $\underline{y} = x\underline{\beta} + \underline{\in}$, construct $100(1-\alpha)\%$ confidence interval for the regression coefficient β_j, j = 0, 1, 2, ..., k.

c) Given that S_{xx} = 1106.56, S_{xy} = –41112.65, $\bar{x} = 13.36$ and $\bar{y} = 2131.35$, fit a simple linear regression model for the given data. Hence find expected value of response variable when x = 30.

Q4) Attempt any one of the following :

a) i) Describe the terms 'AIC' and 'BIC'. **[5]**

ii) Write univariate logistic regression model. Explain the procedure of fitting the model. **[5]**

b) i) With usual notations, prove that, $E(MS_{res}) = \sigma^2$. **[5]**

ii) In a simple regression problem with sample size of 25, the slope was estimated to be 1.12 and the standard error estimate $(\hat{\sigma})$ is equal to 8.65. The quantity $\left[\sum_{i=1}^{n} x_i^2 - n\bar{x}^2\right] = 327.52$. Find the standard error of the regression coefficient (β_1). Also test whether the regression coefficient is different from zero at a significance level 0.05. **[5]**

Total No. of Questions : 5]

SEAT No. :

PD685

[Total No. of Pages : 2

[6467]-570

T.Y. B.Sc. (Regular)

GEOGRAPHY

GG - 351 : Regional Geography of India - I

(2019 Pattern) (Semester-V) (35181)

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

Instructions to the candidates:

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

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

a) Write the any two names of eastern neighboring countries of India.

b) Write the name of highest peak of Western Ghat.

c) Which is the largest river of the peninsular India.

d) Write any two species of Decidious forest.

e) Explain the meaning of climate.

f) Write a names of Himalayan Mountain ranges.

Q2) a) Describe Narmada river system. **[6]**

OR

Explain the importance of Himalayan Mountain system.

b) Explain the characteristic of Alluvial Soil. **[4]**

P.T.O.

Q3) a) Discuss the rainfall characteristic of rainfall season in India. **[6]**

OR

Explain the importance of North Indian Plain.

b) Explain the importance of conifer forest. **[4]**

Q4) a) Describe benefits of soil conservation. **[6]**

OR

Explain the Ganga river system.

b) Explain the Advantages of India's location. **[4]**

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

a) Union territories of India.

b) India's Water Frontier.

c) Characteristic of summer season.

d) Narmada River.

e) Pre monsoon rainfall.

f) Lakshadweep Islands.

Total No. of Questions : 5]

SEAT No. :

PD686

[Total No. of Pages : 2

[6467]-571
T.Y. B.Sc. (Regular)
GEOGRAPHY
GG352: Geography of Economic Activities - I
(2019 Pattern) (Semester - V) (35182)

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

Instructions to the candidates:

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

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

a) What is resource?

b) Give two example of tertiary economic activities.

c) Write any two benefit of energy resources.

d) What is renewable resources?

e) Give two example of non - renewable resources?

f) Which are the type of natural resources?

Q2) a) Describe the characteristics of Primary economic activities. **[6]**

OR

Describe the role of energy resources in economic development.

b) Explain the distribution of energy resources in India. **[4]**

Q3) a) Explain the Pre and Post industrilization development of economic activities. **[6]**

OR

Explain the labour and capital role in economic activities.

b) Describe the indices of network analysis. **[4]**

P.T.O.

Q4) a) Discuss the Economic and Technological factor affecting economic activities. **[6]**

OR

Discuss the flow theory of network analysis.

b) Write the criticism of Weber's model of industrial location. **[4]**

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

a) Manmade resources.

b) Quinary economic activities.

c) Range of good and treshold.

d) Administrative Principle (K-7)

e) Central place.

f) Global energy crisis.

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Total No. of Questions : 5]

SEAT No. :

PD687

[Total No. of Pages : 2

[6467]-572

T.Y. B.Sc. (Regular)

GEOGRAPHY

GG - 353 : Fundamental of Tourism

(2019 Pattern) (Semester-V) (35183)

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

Instructions to the candidates:

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

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

a) What is tourism?

b) What is tourist?

c) Write the full form of I.T.D.C.

d) Give two types of tourism.

e) What do you mean by leisure?

f) Write any two name of the famous hill station in India.

Q2) a) Describe the relationship between Tourism and Geography. **[6]**

OR

Describe the nature and scope of tourism Geography.

b) Explain the concept of Recreation. **[4]**

P.T.O.

Q3) a) Explain the Natural Tourism potential of India. **[6]**

OR

Explain the Cultural Tourism development of India.

b) Describe the concept of Geotourism. **[4]**

Q4) a) Discuss the changing nature of international tourism in COVID Pendemic Periods. **[6]**

OR

Discuss the Positive and Negative impact of environment on tourism.

b) Explain the role of MICE in tourism. **[4]**

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

a) Medical Tourism.

b) Heritage Tourism.

c) Adventure Tourism.

d) Sport Tourism.

e) Agro Tourism.

f) Positive impact of Tourism.

Total No. of Questions : 5]

SEAT No. :

PD688

Total No. of Pages : 2

[6467]-573
T.Y. B.Sc.(Regular)
GEOGRAPHY
GG-354: Geography of Soil-I
(2019 Pattern) (Semester - V) (35184)

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

Instructions to the candidates:

1) ***Question 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 soil.
b) Mention the types of weathering.
c) What is soil Salinity?
d) Mention the types of soil structure.
e) Define the soil compaction.
f) What is soil profile?

Q2) a) Describe the pedogenetic process of soil formation. **[6]**

OR

Explain the biological factors of soil formation.

b) Explain the nature of soil geography. **[4]**

Q3) a) Describe the biological properties of the soil. **[6]**

OR

Explain the chemical properties of the soil.

b) Discuss the relationship between soil water and soil air. **[4]**

Q4) a) Discuss the scope of soil geography. **[6]**

OR

Explain the importance of soil studies in soil geography.

b) Discuss the importance of soil moisture. **[4]**

P.T.O.

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

a) Soil organic matter.
b) Soil component.
c) Pedology.
d) B Horizon of the soil profile.
e) Soil temperature.
f) Humification.

Total No. of Questions : 5]

SEAT No. : [ ]

PD689

[Total No. of Pages : 2

[6467]-574
T.Y.B.Sc. (Regular)
GEOGRAPHY
GG- 355 : Management of Natural Disaster
(2019 Pattern) (Semester - V) (35185)

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

Instructions to the candidates:

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

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

a) Define the term hazard.

b) Name any two states affected by Tsunami in India.

c) What is Geo - physical disaster?

d) What do you understand by the term drought?

e) Write two places where earthquakes have occured in India?

f) Mention any two impact of flood.

Q2) a) Discuss in detail the concept of disaster management. **[6]**

OR

Explain the cause, effect and distribution of Tsunami in India.

b) Write in brife about landslides in India. **[4]**

Q3) a) Describe in detail the concept of disaster risk reduction **[6]**

OR

Discuss the application of GIS in disaster planning and management.

b) Write in brief about impact of flood in India. **[4]**

P.T.O.

Q4) a) Discuss the role of NGO's and their responsibilities in mitigation to disaster. **[6]**

OR

Describe the causes and impact of earthquake in India.

b) Write in brief about survival and medicinal kit in disaster risk reduction. **[4]**

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

a) Mitigation to disaster.

b) Risk vulnerability.

c) Warning and alarm system.

d) Cyclone.

e) Atmospheric disaster.

f) Community based disaster management.

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Total No. of Questions : 5]

SEAT No. : ____

PD690

[Total No. of Pages : 2

[6467]-575
T.Y.B.Sc. (Regular)
GEOGRAPHY
GG-356: Geoinformatics-I
(2019 Pattern) (Semester -V) (35186)

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

Instructions to the candidates:

1) ***Que. 1 is Compulsory.***
2) ***Solve any three questions from Que. 2 to Que. 5.***
3) ***Que. 2 to Que. 5 carry equal marks.***

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

a) What is sarveying?

b) Name any two software's used in GIS.

c) What are satellite images?

d) Define the term spatial data.

e) What do you understand by the term edge matching?

f) What is GIS?

Q2) a) Discuss scope and importance of Geoinformatics. **[6]**

OR

Explain GIS task in detail.

b) Write in brief about query analysis in GIS. **[4]**

Q3) a) Distinguish between raster data and vector data. **[6]**

OR

Explain various data sources used in GIS.

b) Write in brief about GIS data editing with example. **[4]**

P.T.O.

Q4) a) Discuss the concept of topology building. **[6]**

OR

Explain various errors occured in GIS data editing.

b) Write in brief about Non-spatial data analysis. **[4]**

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

a) Buffer analysis

b) DEM

c) Satellite images

d) Overlay analysis

e) Digital terrain model

f) Multicriteria analysis

Total No. of Questions : 5]

SEAT No. :

PD691

[Total No. of Pages : 2

[6467]-576
T.Y. B.Sc. (Regular)
GEOGRAPHY
GG - 3510 : Research Methodology - I
(2019 Pattern) (Semester-V) (351810)

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

Instructions to the candidates:

1) ***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) Write any two objectives of research.

b) What is research methodology?

c) Meaning of conceptual research.

d) Define hypothesis.

e) Define research problem.

f) What is research design?

Q2) a) Describe applied and fundamental research. **[6]**

OR

Describe characteristics of good research.

b) Describe steps in research process. **[4]**

P.T.O.

Q3) a) Explain the purpose of research design. **[6]**

OR

Describe importance of research design.

b) Write a short note on research design. **[4]**

Q4) a) Explain techniques involved in defining a research problem. **[6]**

OR

Describe objectives of assumptions about the research problem.

b) Write in short on sources of research problem. **[4]**

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

a) Meaning and definition of research.

b) Empirical research.

c) Exploratory research design.

d) Hypothesis formulation.

e) Objectives of research Methodology.

f) Descriptive research.

Total No. of Questions : 5]

SEAT No. :

PD692

[Total No. of Pages : 2

[6467]-577

T.Y.B.Sc. (Regular)

GEOGRAPHY

GG 3511 : Elementary Surveying (SEC)

(2019 Pattern) (Semester-V) (351811)

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

Instructions to the candidates:

1) ***Question No.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 EDM.

b) Define Surveying.

c) State any two advantages of theodolite surveying.

d) Mention any two features of prismatic surveying.

e) Write any two sources of errors in plane table surveying.

f) Write the methods of dumpy level surveying.

Q2) a) Describe the setting up of total station. **[6]**

OR

Explain the various parts of total station.

b) Write the different parts of theodolite instrument. **[4]**

Q3) a) Explain the merits & demerits of DGPS surveying. **[6]**

OR

Discuss the functions & methods of plane table surveying.

b) Write about the geodetic surveying. **[4]**

P.T.O.

Q4) a) Describe the demerits of total station surveying. **[6]**

OR

Explain the various methods of total station surveying.

b) Write the various methods of surveying. **[4]**

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

a) Rise and fall method.

b) Merits of prismatic compass surveying.

c) Importance of surveying.

d) Theodolite instrument.

e) Angle measurement in total station.

f) Merits of drone surveying.

Total No. of Questions : 5]

SEAT No. : ____

PD693

[Total No. of Pages : 2

[6467]-578
T.Y.B.Sc. (Regular)
MICROBIOLOGY
MB 351: Medical Microbiology-I
(2019 Pattern) (Semester -V) (35191)

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

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

a) Amoebic dysentry is an example of _____

i) Food water intoxication

ii) Local rash

iii) Periodontitis

iv) Bleeding

b) Define otitis media

c) State:True or False:HBV is a causative agent of pneumonia

d) _____causes typhoid fever

e) What is carrier & write one example

f) What is the causative agent of scrub typhus

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

i) Viral diseases of central nervous system

ii) Antigenicity of salmonella

iii) Lab diagnosis of Leprosy

b) Diagramatically describe structure of liver and its infections. **[4]**

P.T.O.

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

i) Various measures for prevention & control of diseases

ii) Symptoms of urogenital infections

iii) Pathogenicity of Clostridium tetani

b) Explain in detail design of concurrent parallel & crossover trials. **[4]**

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

i) Upper respiratory tract infection

ii) Diseases caused by Pseudowonas aeruginosa

iii) Prophylaxis & chemotherapy of Mycobacterium tuberculosis

b) Discuss in detail pathogenesis, symptoms & lab diagnosis of Treponema **[4]**

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

a) Spotted fever

b) Pathogens associated with central nervous system

c) Transmission of infections

d) Lab diagnosis of Neisseria meningitidis

e) Leptospirosis

f) Causative agents & symptoms of gastrointestinal infections

Total No. of Questions : 5]

SEAT No. :

PD694

[Total No. of Pages : 2

[6467]-579
T.Y. B.Sc. (Regular)
MICROBIOLOGY
MB-352: Immunology - I
(2019 Pattern) (Semester - V) (35192)

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 diagram wherever necessary.***

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

a) Define ADCC.

b) State True / False: Sandwich ELISA is used for detection of antigen.

c) Write any one application of RIA.

d) Define cell mediated immunity (CMI).

e) Write the long form of HAT medium.

f) Define isoantigen with example.

Q2) a) Describe any two in detail. **[6]**

i) Isotypic antigenic determinants in immunoglobulin.

ii) Applications of monoclonal antibody.

iii) Structure of MHC - II molecule.

b) Describe in detail the activation of the alternative complement pathway. **[4]**

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

i) Functions of light and heavy chain domains.

ii) The process of phagocytosis.

iii) Principle of agglutination inhibition technique.

b) Diagrammatically illustrate the dialysis equilibrium experiment. **[4]**

P.T.O.

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

i) Structure and function of TLRs (Toll like receptors)

ii) Prevention of allograft rejection.

iii) Mixed lymphocyte reaction.

b) Discuss in detail direct and indirect immunofluorescence. **[4]**

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

a) Polymorphonuclear leukocytes (PMNLs)

b) Lymphatic system

c) T-independent antigens

d) Defensins

e) Hapten

f) Antibody affinity

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Total No. of Questions : 5]

SEAT No. :

PD695

[Total No. of Pages : 2

[6467]-580
T.Y. B.Sc. (Regular)
MICROBIOLOGY
MB - 353 : Enzymology
(2019 CBCS Pattern) (Semester-V) (35193)

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

Instructions to the candidates:

1) ***Q. 1 is compulsory.***
2) ***Solve any 3 questions from Q.2, Q.3, Q.4 and Q.5.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat labelled diagrams wherever necessary.***

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

a) Define Vmax.

b) Dialysis is a method used for enzyme purification. State true or false.

c) Enzymes required for _____ are present in mitochondria.

i) Glycolysis ii) Photosynthesis

iii) Electron transport chain iv) DNA replication

d) Define Katal.

e) Name the ring present in Vit B_1.

f) Enlist any two examples of ligands used in adsorption chromatography.

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

a) Define Isoelectric pH. How it is used in enzyme purification.

b) What is feedback inhibition? Describe with suitable example.

c) Enlist various methods used for enzyme immobilization. Describe any one in detail.

B) Describe various methods of enzyme purification based on solubility differences. **[4]**

P.T.O.

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

a) Derive L.B. equation. Give its significance.

b) Diagramatically describe Ion Exchange Chromatography.

c) Enlist role of enzymes in PDH as multienzyme complex.

B) Enlist various chemical methods to determine amin acid residues at active site. Describe any one in detail. **[4]**

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

a) What are isozymes? Enlist it's properties.

b) What are the principles of enzyme assays? Write down formula to calculate specific activity.

c) Elaborate concept and use of initial velocity.

B) Describe the biochemical function of Thiamine Pyrophosphate. **[4]**

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

a) X-ray crystallography.

b) Affinity chromatography.

c) KM.

d) Zymogens.

e) Applications of immobilized enzymes.

f) Salting in & salting out.

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Total No. of Questions : 5]

SEAT No. :

PD696

Total No. of Pages : 2

[6467]-581
T.Y. B.Sc. (Regular)
MICROBIOLOGY
MB-354 : Genetics
(2019 Pattern) (Semester - V) (35194)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three question from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Draw neat and labelled diagrams wherever necessary.***

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

a) Define 'Bidirectional Replication.
b) What is sigma (σ) factor? mention its role.
c) What are exons?
d) Define 'Transformation, a process of genetic recombination.
e) What are λ Pbio?
f) State true or false : Map unit is the unit of mapping gene linkage.

Q2) a) Describe in detail (any two) **[6]**

i) 'TUS' Proteins

ii) 3'- polyadenylation of eukaryotic mRNA

iii) tRNA structure.

b) Diagrammatically explain in detail gene mapping by cotransformation. **[4]**

Q3) a) Explain in detail (any two) **[6]**

i) Natural Transformation in H. Influenzal

ii) Generalized Transduction in S. Typhi

iii) Mating types of E. Coli based on F Plasmid.

b) Diagrammatically explain Initiation of Translation in Prokaryotes. **[4]**

P.T.O.

Q4) a) Explain in detail (any two) **[6]**

i) Priming of DNA Replication process.

ii) Role of Eukaryotic RNA polymerase II

iii) Formation of F' cell.

b) Explain with suitable diagram Discovery of conjugation by Lederberg and Tatum. **[4]**

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

a) Significance of ori ‘C’ site.
b) Gene linkage.
c) Function of lac ‘O’ gene
d) Repression in lac operon.
e) Development of competence in S. Pneumoniae.
f) Specialized transduction in E. Coli.

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Total No. of Questions : 5]

SEAT No. : ____

PD697

[Total No. of Pages : 2

[6467]-582
T.Y.B.Sc. (Regular)
MICROBIOLOGY
MB - 355 : Fermentation Technology - I
(2019 Pattern) (CBCS) (Semester - V) (35195)

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) Define revertants.

b) What is media optimization?

c) What is sterilization?

d) What is distillation?

e) What is patent?

f) Define pyrogen.

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

i) Describe batch distillation process.

ii) Describe enzymatic method of quantification of fermentation product.

iii) Explain objectives of scale up.

b) Explain penicillin enrichment method for isolation of mutants. **[4]**

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

i) Use of filtration technique for isolation of mutant.

ii) Explain cell disruption methods.

iii) Scaleup window.

b) Explain in detail Plackett & Barman design. **[4]**

P.T.O.

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

i) Full factorial design

ii) Process of batch sterilization

iii) Drying of fermentation product.

b) Discuss in detail different types of metabolic regulations. **[4]**

Q5) Write short notes (any four) **[10]**

a) Gradient plate technique.

b) RSM.

c) Scale down.

d) Bioburden test.

e) Significance of sop.

f) Scale up of sterilization.

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Total No. of Questions : 5]

SEAT No. : ____

PD698

[Total No. of Pages : 2

[6467]-583
T.Y.B.Sc. (Regular)
MICROBIOLOGY
MB-356: Agricultural Microbiology
(2019 Pattern) (Semester -V) (35196)

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

Instructions to the candidates:

1) ***Que. 1 is Compulsory.***
2) ***Solve any three questions from Que. 2 to Que. 5.***
3) ***Que. 2 to Que. 5 carry equal marks.***

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

a) Define infection.

b) What is monocyclic disease? Write example.

c) Write names of any two phosphate solubilizing bacteria.

d) Write long form of IPM in agricultural microbiology.

e) Enlist methods of dissimination of microorganisms.

f) Write any two examples of antisense RNA technology in plant disease control.

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

i) Any two methods of plant disease control

ii) Biofilm in rhizosphere

iii) Technology of BT resistant crops

b) Describe in detail the role of microorganisms in soil health **[4]**

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

i) Microorganisms as tools in plant genetic engineering

ii) Disease triangle

iii) Advantages of forecasting of plant disease

b) Explain applications of plant biofilms **[4]**

P.T.O.

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

i) Edible vaccines

ii) Role of soil microorganisms in sustainable agriculture

iii) Symptoms of Downey mildew

b) Discuss in detail the RNAi technology in plant disease control **[4]**

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

a) Canker

b) Use of plant viruses in genetic engineering

c) Herbicide resistant crops

d) Diazotrophy

e) Polycyclic disease

f) Insectiside resistant transgenic crops

Total No. of Questions : 5]

SEAT No. :

PD699

[Total No. of Pages : 2

[6467]-584
T.Y. B.Sc. (Regular)
MICROBIOLOGY
MB-3510 : Marine Microbiology
(2019 Pattern) (CBCS) (Semester-V) (351910)

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 & labelled diagrams wherever necessary.***

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

a) Define marine snow.

b) What is hydrocarbon?

c) Define extremophiles.

d) Write different habitats for marine environment.

e) What is oil spill?

f) Define estuaries.

Q2) a) Describe in detail (Any Two) : **[6]**

i) Role of marine microorganisms in nutrient cycling.

ii) What is barophile? Write examples.

iii) Mangroves habitat.

b) Explain water sampling method & draw neat labelled diagram of Niskin sampler. **[4]**

P.T.O.

Q3) a) Explain in detail (Any Two) : **[6]**

i) Significance of marine fungi & give examples.

ii) Polar habitat.

iii) Coastal ecosystem.

b) Write a note on mats from vents & estuarine sample cultivating methods. **[4]**

Q4) a) Explain in detail (Any Two) : **[6]**

i) Coral reef habitat.

ii) Bioremediation of extremophiles.

iii) Hydrothermal vent ecosystem.

b) Write in detail role of Archaea in biodegradation & its significance. **[4]**

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

a) Marine Loop.

b) Salt marshes.

c) VBNC culturing method.

d) Adaptation in archaebacteria for bioremediation in marine environment.

e) Box cover.

f) Metabolic delivery in marine microbes.

Total No. of Questions : 5]

SEAT No. :

PD700

[Total No. of Pages : 2

[6467]-585
T.Y.B.Sc. (Regular)
MICROBIOLOGY
MB 3511 : Dairy Microbiology
(2019 Pattern) (Semester-V) (351911)

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

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Draw neat & labelled diagrams wherever necessary.***

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

a) What is GRAS?

b) Defined tonned milk.

c) Enlist any two components of milk.

d) Define ropiness

e) Name the pathogen responsible for mastitis.

f) pH of milk is _____.

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

i) Difference between colostrum & milk

ii) Homogenized milk

iii) Physical methods of milk preservation

b) Compare the different methods of pasteurization. **[4]**

P.T.O.

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

i) Importance of microflora of milk

ii) Composition of milk from different animals.

iii) Thermisation

b) Explain in detail succession of microorganisms in milk leading to spoilage. **[4]**

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

i) Flavour detects in milk

ii) Any two milk borne diseases

iii) Good manufacturing practices

b) Describe in detail applications of HACCP in dairy industry. **[4]**

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

a) Quality assurance of milk products

b) Dye reduction test

c) Dehydrated milk

d) Contamination of milk

e) Stormy fermentation of milk

f) Role of immunoglobulin

Total No. of Questions : 5]

SEAT No. :

PD-701

[Total No. of Pages : 2

[6467]-586
T.Y. B.Sc.
NANOSCIENCE & NANOTECHNOLOGY
N.S.-351 : Polymer and Composite
(2019 Pattern) (Paper - I) (Semester - V) (35261)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any THREE Questions from Q(2) to Q.(5).***
3) ***Draw neat and labelled diagram wherever necessary.***
4) ***Question 2 to 5 carry equal marks.***
5) ***Figures to right indicate full marks.***

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

a) Define Thermosetting matrices.

b) What is polymer modification.

c) Define short fiber and long fiber reinforcement.

d) What is Pyrrolytic technique.

e) Define melt mixing.

f) What is Particulate fiber.

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

i) Explain functionalisation and nucleating effect.

ii) Explain the methods of preparation of composites (any two).

b) Explain in detail in-situ polymerisation. **[4]**

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

i) Give the advantages of composite material.

ii) Distinguish between for SWCNT and MWCNT in polymer nanocomposites.

b) Explain in detail functionalization of carbon nanotubes using nitric-acid oxidation and DBD plasma. **[4]**

P.T.O.

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

i) Explain in detail concepts of polymer nanocomposites.

ii) Explain fiber as a reinforcement material and their advantages.

b) Explain benefits of composites. **[4]**

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

a) Ceramic - matrix nanocomposites.

b) Short fiber reinforcement

c) Thermoplastics.

d) Epoxy (Epoxide)

e) Precipitation

f) Polymer modification with carbon nanotubes.

Total No. of Questions : 5]

SEAT No. :

PD-702

[Total No. of Pages : 2

[6467]-587
T.Y. B.Sc.
NANOSCIENCE AND NANOTECHNOLOGY
NS - 352 : Nanophysics
(2019 Pattern) (Semester - V) (Paper - II) (35262)

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

Instructions to the candidates :

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

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

a) Define quantum well?

b) Write the properties of Nanocluster.

c) Draw the diagram of X-ray absorption fine structure.

d) Define microcanonical ensemble?

e) Write application of X-ray absorption fine structure.

f) Define quantum dots?

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

i) Define and Explain binomial distribution.

ii) Explain quantum size effect.

b) Explain Insulator and semiconductor. **[4]**

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

i) Explain working principle and experimental set up of X-ray photo electron spectroscopy.

ii) Explain instrumentation of ESR spectroscopy.

b) Explain NMR spectroscopy with working principle and Experimental setup. **[4]**

P.T.O.

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

i) Explain working Principle and Experimental set up of EMR.

ii) Explain working principle and Experimental set up of dynamic light.

b) A vessel of volume 'V' is mentally divided into two equal parts. The vessel contains 6 molecules. Calculate probabity distribution using binomial and Gaussian distribution into passes graphically. **[4]**

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

a) Write uses of Nanocluster.

b) Draw block diagram of ESR spectroscopy.

c) Explain the fermi - Dirac (F-D) statistics.

d) Explain quantum distribution function.

e) Draw the diagram of quantum well.

f) Draw the diagram of quantum dots.

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Total No. of Questions : 5]

SEAT No. : ____

PD-703

[Total No. of Pages : 2

[6467]-588
T.Y. B.Sc.
NANOSCIENCE & NANOTECHNOLOGY
NS-353 : Nanobiotechnology
(2019 Pattern) (Paper - III) (Semester - V) (35263)

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

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

a) Define the term protein.

b) Write the use of glucose in the body.

c) How ion channels are used?

d) Define the term plasmid.

e) What are carbohydrates?

f) Write the name of cane sugar.

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

i) How monosacchrides are classify?

ii) What are homopolysacchrides? Give examples and uses of it.

b) Write short account on cofactors. **[4]**

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

i) What are Enzymes? Explain the mechanism of action of enzymes.

ii) Explain Cosmid in detail.

b) Write short note on Lipoproteins. **[4]**

P.T.O.

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

i) With the help of diagram Explain lytic cycle.

ii) What are quantum dots? How they are synthesize.

b) Write about uses of restriction Enzymes in details. **[4]**

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

a) Ferritin.

b) Phospholipids.

c) Carbon nano tubes.

d) Amino acids.

e) Exosomes.

Total No. of Questions : 5]

SEAT No. : ____

PD-704

[Total No. of Pages : 2

[6467]-589
T.Y. B.Sc.
NANOSCIENCE & NANOTECHNOLOGY
NS-354 : Carbon Based Nanomaterials
(2019 Pattern) (Paper - IV) (Semester - V) (35264)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any THREE Question from Q.2 to Q.5.***
3) ***Question 2 to 5 carry equal marks.***
4) ***Draw neat and labelled diagram wherever necessary.***
5) ***Figures to right indicate full marks.***

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

a) Give the example of allotropes of carbon.

b) Give the names of two forms of Graphite.

c) Give the introduction of carbon.

d) Give the names of methods for production of carbon nanotubes.

e) What is dielectric constant? Give its value for diamond.

f) What is particulate fiber?

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

i) Explain catalytic application of nanoforms of carbon.

ii) Explain purification and separation of CNT'S.

b) Explain preparation of nanodiamond by method. **[4]**

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

i) Explain detail Balistic transport of CNT'S.

ii) Explain in detail Laser ablation method.

b) Distinguish between SWCN'TS and MWCNT'S. **[4]**

P.T.O.

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

i) Explain Pyrrolytic Technique.

ii) What is the steps for purification and separation of CNT'S.

b) Draw the flow chart of CNT purification. **[4]**

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

a) Arc-discharge method.

b) Super capacitor

c) Carbon nanotubes

d) Fullerens

e) CNT'S

f) Properties of diamond

Total No. of Questions : 5]

SEAT No. :

PD705

[Total No. of Pages : 2

[6467]-590
T.Y.B.Sc. (Regular)
DEPARTMENT NANOSCIENCE AND NANOTECHNOLOGY
NS-355 Energy Conversion Devices and Applications
(2019 Pattern) (Semester - V) (Paper-V) (35265)

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

Instructions to the candidates:

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

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

a) Define kinetics.

b) Define photovoltaic Solar cell.

c) Write equation of fill factor.

d) Write equation of photon energy.

e) Define artificial photosynthesis.

f) What is energy of right with a wavelength of 662nm?

Q2) A) Attempt any ONE of the following. **[6]**

a) Explain introduction and construction of DSSCs.

b) Explain design and working of perovskite solar cell.

B) Explain and design Thin film solar cell. **[4]**

Q3) A) Attempt any ONE of the following. **[6]**

a) Explain mechanism of photon absorption and power generation.

b) Explain bulk hetrojunction solar cell.

B) Explain properties of working photoelectrode. **[4]**

P.T.O.

Q4) A) Attempt any ONE of the following. **[6]**

a) Explain construction and working of P3HT : PCBM solar cell.

b) Explain greenhouse effect.

B) A certain source emit radiation of wavelength 500nm. What is energy in KJ of 1 mole of Photon of these radiation. [Given : Avagadro's number = 6.022×10^{23}/mole] **[4]**

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

a) Explain properties of dyes.

b) Explain planer heterojunction solar cell.

c) Explain properties of sunlight.

d) Explain hydrid solar cell.

e) Explain History of perovskite solar cells.

f) Explain losses of solar cell.

* * *

Total No. of Questions : 5]

SEAT No. : ____

PD706

[Total No. of Pages : 2

[6467]-591

T.Y.B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS - 356 : Environmental Nanotechnology and Applications

(2019 Pattern) (Semester -V) (Paper-VI) (Elective-I) (35266)

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

Instructions to the candidates:

1) ***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) ***Draw neat and labelled diagram wherever necessary.***
5) ***Figure to the right indicate full marks.***

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

a) List the physiochemical properties of waste water.

b) Define ultrafine dust particles.

c) Give source of Air pollution.

d) What is seive effect?

e) Define water pollution.

f) Source of water pollution.

Q2) A) Attempt any ONE of the following. **[6]**

a) Explain in detail water pollution.

b) Explain in brief water and waste water treatments.

B) Write a note on Activated sludge. **[4]**

Q3) A) Attempt any ONE of the following. **[6]**

a) Explain 'Air pollution' in detail.

b) Explain pollution control equipment in detail.

B) Explain 'Hierarchy of solid structure and adsorption. **[4]**

P.T.O.

Q4) A) Attempt any ONE of the following. **[6]**

a) Explain nanocomposites for environmental applications.

b) Explain in detail Advantages of Nanomaterial.

B) Explain toxicity due to air born nanomaterials. **[4]**

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

a) Fabric filters.

b) Sugar industry.

c) Gaseous contaminants.

d) Oxidation ponds.

e) Waste water collection.

f) Oxidation ditenes.

Total No. of Questions : 5]

SEAT No. :

PD707

[Total No. of Pages : 2

[6467]-592

T.Y. B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS - 3510 : Basic Instrumentation Skills

(2019 Pattern) (Semester-V) (352610)

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

Instructions to the candidates:

1) ***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 indicates full marks.***

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

a) Define CRO.

b) What is Q-meter?

c) Define Accuracy.

d) Define Precision.

e) Define Resolution.

f) What is signal generators?

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

i) What is Error? Explain its different types.

ii) What is digital instrument? Explain the construction and working of digital instrument.

b) Explain the specification of digital multimeter. **[4]**

P.T.O.

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

i) Explain construction and working of digital storage oscilloscope.

ii) Explain construction and working of function generator.

b) Explain the screen phosphor of CRT. **[4]**

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

i) Explain basic controls of CRO.

ii) Write down measurement of distortion.

b) Explain working of basis of LCR meter. **[4]**

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

a) Explain the measurement of Q-meter.

b) Explain characteristics and terminology of Pulse.

c) Explain difference between square wave and pulse.

d) Write down applications of DSO.

e) Explain characteristics of digital instrument.

f) Explain basics of Pulse generator.

Total No. of Questions : 5]

SEAT No. :

PD708

[Total No. of Pages : 2

[6467]-593

T.Y.B.Sc. (Regular)

NANOSCIENCE AND NANOTECHNOLOGY

NS-3511 : C-Programming

(2019 Pattern) (Semester-V) (352611)

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

Instructions to the candidates:

1) ***Question No.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) State different programming language.

b) What is algorithm?

c) What is keywords?

d) What is integer constant?

e) What is use of initgraph?

f) Write syntax to draw line.

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

a) Write C-program to find factorial of given number.

b) Write short note on constant in C.

c) State and explain different datatypes.

P.T.O.

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

i) # include <stdio.h>

ii) main ()

iii) gm

OR

a) Write C-program to draw circle, line, ellipse, rectangle, arc using graphics programming. **[6]**

b) Explain difference between do ..... while and while loop. **[4]**

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

a) Find integration of an eq^{n} $\frac{1}{x}$ using trapezoidal rule (given x_0=1, x_n=2, n=4)

b) Draw the flow chart to find factorial of given number.

c) What is constant? Explain declaration of constant in C-program.

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

a) Output function used in C.

b) Identifiers

c) Break statement

d) Variables used in C

e) goto statement

Total No. of Questions : 5]

SEAT No. : ____

PD-709

[Total No. of Pages : 2

[6467]-594
T.Y. B.Sc.
ELECTRONICS SCIENCE
EL-351 : Paper - I : Digital Design Using Verilog
(2019 CBCS Pattern) (Semester - V) (35221) (Credit 2)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Question 2 to Question 5 solve any three.***

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

a) Verilog HDL is suitable for design of _____.

b) List the various abstraction level are used in verilog.

c) Which is the most basic statement in data flow modeling?

d) What is the main advantage of logic synthesis tool?

e) What are the two types of arithmetic operators?

f) // X = 4'b1010, i) &X = ? ii) |X = ?

Q2) Attempt the following :

a) i) Draw the symbol of basic but/not gate primitive. **[2]**

ii) Write down instantiation for and, or, nand, Xnor gates with its symbols. **[4]**

b) Write a short note on keywords and identifiers used in verilog. **[4]**

Q3) Attempt the following :

a) i) What is result of following bit wise operation. **[2]**

I) // X = 4'b1010, Y = 4'b1101

II) ~X

III) X & Y

ii) Write a short note on equality operators with suitable example. **[4]**

b) Compare VHDL and Verilog HDL. **[4]**

P.T.O.

Q4) Attempt the following :

a) i) List the three looping statement in verilog with its syntex. **[2]**

ii) Explain with suitable diagram Programmable Logic Array (PLA) **[4]**

b) Write short note on FPGA. **[4]**

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

a) Draw the flowchart for logic synthesis from RTL to gate.

b) Write a short note on CPLD.

c) Write a verilog code in data level modeling for 2:1 multiplexer.

d) Write short note on blocking statement in verilog.

e) Write brief note on Programmable Array Logic (PAL)

f) Explain in brief impacts of logic synthesis.

Total No. of Questions : 5]

SEAT No. :

PD-710

[Total No. of Pages : 2

[6467]-595
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL - 352 : Microcontroller Architecture & Programming
(2019 Pattern) (CBCS) (2 Credits) (Semester - V)
(Paper - II) (35222)

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

Instructions to the candidates :

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

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

a) Write the full form of CISC.

b) What is an assembly language?

c) Define Algorithm.

d) Write the role of PORTB register.

e) What do you mean by 'delay - ms(200);'?

f) State the role of 'RS' pin in LCD.

Q2) **Attempt the following :**

a) i) Write short note on SRAM of AVR ATMega 16. **[2]**

ii) Explain any four assignment operators with example in C. **[4]**

b) Draw the interfacing diagram for LED and switch connected at pin PB1 and pin PC7 respectively. Write AVR C program to make LED on, if switch is closed and off otherwise. **[4]**

Q3) **Attempt the following :**

a) i) What is pointer? Give an example. **[2]**

ii) Write AVR C program to display character 'X' on LCD. **[4]**

b) Explain 8-bit format of TCCRO register. **[4]**

P.T.O.

Q4) **Attempt the following :**

a) i) Give the name and function of ADMUX and ADCSRA registers. **[2]**

ii) Draw and explain interfacing diagram of keyboard matrix. **[4]**

b) Draw the functional block diagram of AVR architecture. **[4]**

Q5) **Attempt the following : (Any four)** **[10]**

a) Give any three features of AVR AT mega 16.

b) Explain 'for' loop with simple example.

c) Give the size and range of any 3 data types.

d) What is the role of DDRB register? Give an example.

e) Write the AVR 'C' program for logic AND operation between two numbers and store the result to PORTC.

f) Draw the interfacting diagram of LCD with AVR ATmega 16.

♦ ♦ ♦

Total No. of Questions : 5]

SEAT No. :

PD-711

[Total No. of Pages : 2

[6467]-596
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL-353 : Analog Circuit Design and Applications
(CBCS) (2019 Pattern) (Semester - V) (Paper - III) (35223)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any THREE questions from Q2 to Q5.***
3) ***Question 2 to Question 5 carry equal marks.***

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

a) Define trip point of a comparator.

b) Which parameter of the op-amp is taken into the consideration for amplifying an input signal in microvolts.

c) Draw the circuit for positive small-signal half-wave rectifier.

d) State the formula for frequency of oscillation (fo) of triangular wave generator using op-amp as a comparator and integrator as first and second circuit.

e) In case of IC8038 for $R_A = R_B$, what is the duty cycle of square wave generator?

f) How many number of pins are used in IC 7805 voltage regulator?

Q2) Attempt the following :

a) i) Determine the time for the quasi-stable state (T_{return}) of monostable multivibrator using op-amp 741. Given R_2 = 18kΩ, R_1 = 2kΩ, C = 0.1μf, R = 3.3kΩ, **[2]**

ii) Derive the relation for UTP and LTP and hence V_H in case of inverting Schmitt trigger. **[4]**

b) Determine the nominal frequency at the output of VCO. For VCO using IC566, +V = 12V, R_2 = 1kΩ, $R_1 = R_3$ = 9kΩ & C= 0.001μf. **[4]**

P.T.O.

Q3) Attempt the following :

a) i) Determine the frequency of oscillation of a Wien-bridge oscillator circuit having resistor of 10kΩ & capacitance of 1nF. **[2]**

ii) Draw and explain the block diagram of frequency multiplier using PLL. **[4]**

b) With proper circuit diagram, explain the working of a peak-detector using op-amp. **[4]**

Q4) Attempt the following :

a) i) Define the term line regulation in percentage and state its ideal value. **[2]**

ii) Design an adjustable voltage regulator using IC LM317 for output voltage V_0 = 5 to 12 volts. Given R_1 = 240Ω **[4]**

b) Draw the circuit diagram of offset nullifying circuit used for op-amp as inverting amplifier and explain it. **[4]**

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

a) Draw the circuit diagram of square wave generator using op-amp.

b) What is the range of output-voltage for adjustable voltage regulator ICLM 317?

c) Draw the equivalent circuit of crystal and write the formulae for series and parallel resonating frequency.

d) What precausions are taken to minimize electromagnetic noise catched by input pins of op-amp.

e) Define the terms of sample and hold circuit

i) Hold period

ii) Sample period

f) Define the term load regulation in percentage and state the ideal value of it.

Total No. of Questions : 5]

SEAT No. : ____

PD-712

[Total No. of Pages : 2

[6467]-597
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL-354 : Nanoelectronics
(2019 CBCS Pattern) (Semester - V) (Paper - IV) (35224)

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 5 carry equal marks.***

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

a) Define nanoscale.

b) What is quantum well.

c) List various tools used for characterization of nanomaterials.

d) What is STM?

e) What is graphene?

f) List applications of Inorganic semiconductor.

Q2) Attempt the following :

a) i) What is flash memory? State its - applications. **[2]**

ii) Explain Top-down and botton-up approach with examples. **[4]**

b) Explain 0-D, 1-D, 2-D and 3-D nanomaterials with examples. **[4]**

Q3) Attempt the following :

a) i) Draw schematic diagrams for density of states of electrons in 0-D, 1-D, 2-D and 3-D. **[2]**

ii) State working principle of SEM. **[4]**

b) What is XRD? State its working principle. **[4]**

P.T.O.

Q4) Attempt the following :

a) i) State different operating modes in AFM. **[2]**

ii) What are carbon nanotubes? Mention its structure. **[4]**

b) Write short note on quantum well lasers. **[4]**

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

a) What are limitations of light microscope?

b) Compare AFM with STM.

c) Explain single electron transistor (SET)

d) State difference between quantum dot laser and quantum well laser.

e) What is organic semiconductor? State its applications.

f) Explain structure of fullerene? Who discovered fullerene?

Total No. of Questions : 5]

SEAT No. : ____

PD713

[Total No. of Pages : 2

[6467]-598
T.Y.B.Sc. (Regular)
ELECTRONIC SCIENCE
EL - 355 : Signals and Systems
(Revised 2019 Pattern) (Semester - V) (Paper - V) (35225)

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

Instructions to the candidates:

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

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

a) State Nyquist rate for sampling of a signal.

b) State the condition for periodicity of CT signal.

c) Define a signal.

d) Define a quantization error.

e) Give at least two examples of DT system.

f) Define Laplace transform of a function.

Q2) Attempt the following:

a) i) Find Laplace transform of $\sin 4t$. **[2]**

ii) Classify the signals and explain CT and DT signals with proper waveforms. **[4]**

b) Explain CT static and dynamic systems in brief. **[4]**

Q3) Attempt the following:

a) i) What is aliasing effect in sampling of a signal? **[2]**

ii) Find Laplace transform of $f''(t)$. **[4]**

b) State and prove the first shifting property of Laplace transform. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) Define Nyquist frequency in sampling of a signal. **[2]**

ii) Find Laplace transform of 1. **[4]**

b) Write a note on the role of anti-aliasing filter in sampling process. **[4]**

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

a) Draw a block diagram of DSP system.

b) If $\mathrm{L}\{\cos 2t\} = \frac{s}{s^2+4}$, find $\mathrm{L}\{e^{3t}.\cos 2t\}$.

c) Define DT static and dynamic systems.

d) Find Laplace transform of $f'(t)$.

e) Define CT and DT non-linear systems.

f) Define inverse Laplace transform of a function.

* * *

Total No. of Questions : 5]

SEAT No. : ____

PD714

[Total No. of Pages : 2

[6467]-599

T.Y.B.Sc. (Regular)

ELECTRONIC SCIENCE

EL 356 (A) : Optics and Fiber Optic Communication

(2019 Revised Pattern) (Semester -V) (Paper-VI (A)) (35226 A)

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.***

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

a) Define numerical aperture of optical fiber.

b) State any two applications of optical fiber.

c) What do you mean by absorption loss in optical fiber?

d) What is non-coherent source?

e) Define the term quantum efficiency.

f) State advantages of OTN.

Q2) Attempt the following.

a) i) State the function of synchronous optical networking. **[2]**

ii) What is attenuation? Explain the method for measurement of attenuation in optical fiber. **[4]**

b) List the types of optical fiber based on index profile. Explain propagation of light through it with suitable diagram. **[4]**

Q3) Attempt the following.

a) i) Explain ring network topology with suitable diagram. **[2]**

ii) Describe the fiber connectors used in fiber optic communication. **[4]**

b) Explain the working principle of Avalanche photodiode with suitable diagram. State its parameters. **[4]**

P.T.O.

Q4) Attempt the following.

a) i) Distinguish between single mode and multi-mode optical fiber. **[2]**

ii) Explain concept of modal dispersion and waveguide dispersion **[4]**

b) When 5×10^{11} photons each with wavelength of 0.8μm are incident on a photodiode on average 2.2×10^{11} electrons are collected at the terminal of the device calculate quantum efficiency of photodiode. **[4]**

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

a) Determine critical angle of an optical fiber if refractive index of core is 1.55 and refractive index of cladding is 1.50.

b) State selection criteria of the material used in optical fiber.

c) A Multimode graded index fiber exhibits total pulse broadening of 0.08μs over a distance of 10km. Calculate maximum possible bandwidth and pulse dispersion per unit length.

d) Explain in brief the lasing action in P-N Junction LASER diode with suitable diagram.

e) State the types of Network topology.

f) State the function of SDH.

Total No. of Questions : 5]

SEAT No. : ____

PD715

[Total No. of Pages : 2

[6467]-600

T.Y.B.Sc. (Regular)

ELECTRONICS SCIENCE

EL - 356(B) : Electronic Product Design and Entrepreneurship

(2019 Pattern) (CBCS) (Semester -V) (Paper-VI) (35226 B)

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

Instructions to the candidates:

1) ***Que. 1 is Compulsory.***
2) ***Solve any three question from Que. 2 to Que. 5.***
3) ***Que. 2 to Que. 5 carry equal marks.***

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

a) Define MTTF?

b) What is brochure?

c) Give the meaning of technical presentation

d) What do you mean by prototyping?

e) What is EMC?

f) Define entrepreneurship development.

Q2) Attempt the following:

a) i) What is the purpose of troubleshooting in product development? **[2]**

ii) Discuss any four steps in electronic product designing. **[4]**

b) Explain Four functions of entrepreneur. **[4]**

Q3) Attempt the following.

a) i) What do you mean by proposal? Explain in short. **[2]**

ii) Explain the role of entrepreneur in economic development. **[4]**

b) What are the different forms of documentation? Explain any one. **[4]**

P.T.O.

Q4) Attempt the following:

a) i) Explain the term:Product integration. **[2]**

ii) Explain how the documentation is integral to any product. **[4]**

b) Explain why bill of material is important. **[4]**

Q5) Attempt the following (Any four) **[10]**

a) Write any five application of ergonomics.

b) Explain logic analyzer by giving diagram.

c) Explain bath-tub curve with the helf of diagram.

d) Write in short techno-commercial feasibility of product.

e) Explain the process of simulation in Software designing.

f) Write any five uses of DSO in hardware testing.

Total No. of Questions : 5]

SEAT No. :

PD716

[Total No. of Pages : 2

[6467]-601

T.Y. B.Sc. (Regular)

ELECTRONIC SCIENCE

ELSEC - 351 : Electronic Design Automation Tools

(CBCS 2019 Pattern) (Semester-V) (Paper-X) (352210)

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 PSPICE.

b) What is DC analysis in PSPICE?

c) What is the purpose of voltage marker tool in PSPICE?

d) What is the use of Circuit Mod Software?

e) State the name of tool used in multisim, which provides family of component.

f) Define DCR.

Q2) Attempt the following :

a) i) Enlist three circuit simulation softwares available free of cost. **[2]**

ii) Write a note on Multisim and explain the steps involved in it for circuit simulation. **[4]**

b) Write a short note on Proteus. Which type of analysis are possible in Proteus. **[4]**

P.T.O.

Q3) Attempt the following :

a) i) What are the features of LTSPICE Simulator. **[2]**

ii) Write a short note on PSPICE. **[4]**

b) Which files are needed for circuit simulation? Describe each one in detail. **[4]**

Q4) Attempt the following :

a) i) What are the features of Circuit Mode Simulation Software? **[2]**

ii) Write a note on waveform data files used in Simulation Software. **[4]**

b) What is net list details and DRC in circuit simulation. **[4]**

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

a) Write a short note on EDA tools.

b) Explain model editor used in PSPICE.

c) What is the role of simulate menu in Multisim?

d) What is schematic capture in multisim?

e) Write a short note on ISIS in Proteus.

f) What is the role of schematic capture in Proteus?

Total No. of Questions : 5]

SEAT No. :

PD717

[Total No. of Pages : 2

[6467]-602

T.Y.B.Sc. (Regular)

ELECTRONIC SCIENCE

ELSEC 352 : Internet of Things & Applications

(Revised 2019 Pattern) (Semester-V) (Paper-XI) (352211)

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

Instructions to the candidates:

1) ***Question No.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 IoT.

b) What is mean by TCP?

c) Define smart grids.

d) How IoT is used in smart agriculture?

e) What is real example of smart grid device in IoT?

f) What is Raspberry Pi?

Q2) Attempt the following.

a) i) What is the application layer in IoT protocol? **[2]**

ii) Write difference between Arduino & Raspberry Pi. **[4]**

b) What are the architecture constraints of RESET based communication API? **[4]**

P.T.O.

Q3) Attempt the following.

a) i) Explain domain specific IoTs in smart energy. **[2]**

ii) Write a program to interface LED on/off from Raspberry Pi. **[4]**

b) Write advantages & disadvantages for IoT smart homes. **[4]**

Q4) Attempt the following.

a) i) How Raspberry Pi used in IoT? **[2]**

ii) Determine the IoT levels for designing home automation system including smart lightening & intrusion detection. **[4]**

b) Describe an example of IoT service that uses publish-subscribe communication model. **[4]**

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

a) Write advantages of IoT.

b) What is the use of SPI & I2C interface on Raspberry Pi?

c) Why there is a need for an IoT management?

d) Write the IoT protocols.

e) Which sensors are required for IoT application in agriculture?

f) What are the examples of IoT?

Total No. of Questions : 5]

SEAT No. :

PD-718

[Total No. of Pages : 2

[6467]-603
T.Y. B.Sc.
PSYCHOLOGY
Cognitive Psychology
(2019 Pattern) (New) (Semester - V) (35201) (Paper - I)

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

Instructions to the candidates:

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

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

a) Define Cognitive Psychology.

b) Define Sensation.

c) Define Learning.

d) Define Perception.

e) Define Memory.

f) Define Conditioning.

Q2) a) Explain the various gestalt principles of perception. **[6]**

OR

Describe the components of classical conditioning with experiments.

b) Critically analyse the piagets cognitive developmental theory. **[4]**

Q3) a) Discuss the various types of cognitive process. **[6]**

OR

Compare the various functions & types of memory.

b) Analyze the various types of problem. **[4]**

P.T.O.

Q4) a) Describe the Vygotsky's sociocultural theory. **[6]**

OR

Explain the different types of determinants of attention.

b) Analyze the various types of memory improvement techniques. **[4]**

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

a) Application of Cognitive Psychology.

b) Process of Sensation.

c) Trial & error method of learning.

d) Types of learning.

e) Problem solving cycle.

f) Process of memory.

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Total No. of Questions : 5]

SEAT No. :

PD-719

[Total No. of Pages : 2

[6467] - 604
T.Y. B.Sc.
PSYCHOLOGY
Psychopathology - I
(Paper-II) (2019 Pattern) (Semester - V) (35202)

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

Instructions to the candidates:

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

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

a) What is generalised anxiety?

b) Define Depression.

c) What is abnormal behaviour?

d) State the criteria of abnormal behaviour.

e) Define stress.

f) What is intellectual disability?

Q2) a) Discuss the symptoms of Mania. **[6]**

OR

Explain the pre DSM classification of abnormal behaviour.

b) Critically evaluate the Diathesis-stress Model. **[4]**

P.T.O.

Q3) a) Explain the psychotherapeutic interventions of schizophrenia. **[6]**

OR

Explain in detail the symptoms of schizophrenia.

b) Critically evaluate the clinical signs of brain damage. **[4]**

Q4) a) Discuss the causes of Abnormal behaviour. **[6]**

OR

Explain the concept and criteria of abnormal behaviour.

b) Explain the psychodynamic model of abnormality. **[4]**

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

a) DSM - 5

b) Panic disorder

c) Cognitive disorder

d) Mood disorder

e) Biological model

f) Intellectual disability

Total No. of Questions : 5]

SEAT No. : ____

PD-720

[Total No. of Pages : 2

[6467]-605

T.Y. B.Sc.

PSYCHOLOGY

Statistical Methods (Paper - III)

(2019 Pattern) (Semester - V) (35203)

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

Instructions to the candidates:

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

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

a) Define percentile.

b) Define correlation.

c) What is descriptive statistics?

d) Define normal probability.

e) Define variability.

f) State the types of central tendency.

Q2) a) Explain the various modes of graphical representation of data. **[6]**

OR

Calculate the standard deviation for the following data.

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	27	10	07	05	04	02

b) Distinguish between continuous and discrete variables. **[4]**

P.T.O.

Q3) a) Enumerate the needs and importance of statistics in the fields of education and psychology. **[6]**

OR

Find the correlation coefficient between the following two sets of score using the product moment method and interpret the coefficient.

Subjects	a	b	c	d	e	f	g	h
Test X	15	18	22	17	19	20	16	21
Test Y	40	42	50	45	43	46	41	41

b) Evaluate the advantages of graphical representation. **[4]**

Q4) a) Find rank order correlation coefficient from the following data **[6]**

Individuals	A	B	C	D	E	F	G	H
Marks in X	30	40	50	20	10	45	22	18
Marks in Y	55	75	60	12	11	38	25	15

OR

Describe the wages of graphical represention.

b) Differentiate between frequency polygon and frequency curve. **[4]**

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

a) Used of median

b) Types of correlation

c) Advantages of pie diagram

d) Advantages of Nominal Scale

e) Utility of percentiles

f) Parameters of statistics

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Total No. of Questions : 5]

SEAT No. :

PD-721

[Total No. of Pages : 2

[6467]-606

T.Y. B.Sc.

PSYCHOLOGY

Organizational Behaviour (Paper - IV)

(2019 Pattern) (Semester - V) (35204)

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

Instructions to the candidates:

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

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

a) Define Emotional Intelligence.

b) What is organizational planning?

c) Define leader

d) Define job stress

e) Define conflict

f) What is time management?

Q2) a) What are the challenges of organizational behaviour. **[6]**

OR

Explain the process of motivation.

b) Examine the consequences of conflicts. **[4]**

Q3) a) Discuss the consequences of job stress. **[6]**

OR

Describe the behavioural approache to leadership.

b) Discuss any two theories of motivation. **[4]**

P.T.O.

Q4) a) Examine various factors affecting on job satisfaction. **[6]**

OR

Discuss the Management Grid.

b) Distinguish between intrinsic & exterinisic motivation. **[4]**

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

a) Flexi - plan

b) Group dynamic

c) Types of Leadership

d) Causes of conflicts

e) Time management - Tips

f) Incentive system

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Total No. of Questions : 5]

SEAT No. : ____

PD722

[Total No. of Pages : 2

[6467]-607
T.Y.B.Sc. (Regular)
PSYCHOLOGY
Positive Psychology
(2019 Pattern) (Semester - V) (Paper - V) (35205)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any 3 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 positive psychology.

b) Define happiness.

c) Define well-being.

d) What is emotion?

e) Define self realization.

f) Define resilience.

Q2) a) Explain the hedonic basis of happiness. **[6]**

OR

Describe the relationship between positive emotion and well-being.

b) Evaluate the goals of positive psychology. **[4]**

Q3) a) Elaborate the importance of significance of positive psychology as newly emerging branch of psychology. **[6]**

OR

Explain in details the 7 'C' of resilience.

b) Analyze the relationship of positive emotions and Health. **[4]**

P.T.O.

Q4) a) Explain the relationship of positive psychology with Health, clinical and developmental psychology. **[6]**

OR

Compare the hedonic & eudaimonic happiness.

b) Relate the positive traits & virtues in happiness. **[4]**

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

a) Assumptions of positive psychology.

b) Types of positive emotions.

c) Subjective well-being & happiness.

d) Component of well-being.

e) Trauma and resilience.

f) Human virtues.

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Total No. of Questions : 5]

SEAT No. : ____

PD723

[Total No. of Pages : 2

[6467]-608
T.Y.B.Sc. (Regular)
PSYCHOLOGY
Counselling Psychology
(2019 Pattern) (Semester -V) (35206) (Paper-VI)

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.***

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

a) Which is Eclectic approach.

b) State the types of psychological tests.

c) What is directive counselling.

d) Define positive regard.

e) What are the applications of psychological tests.

f) Define inital Disclosure.

Q2) a) Explain the stages of positive regards in counselling **[6]**

OR

Explore the existential approach of counselling.

b) Differentiate between premarital and marital counselling **[4]**

Q3) a) Describe the advantages and challenges of family counselling **[6]**

OR

Discuss the application and limitations of psychological test in counseling

b) Differentiate between directive and Non directive counselling **[4]**

P.T.O.

Q4) a) Explain the main concepts of humanistic approach. **[6]**

OR

Describe the process of diagnosis of problems during counselling.

b) Justify the implication of behaviouristic approach in counselling **[4]**

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

a) Limitations of diagnosis

b) Challenges in building trust during counselling

c) Challenges following ethics in counselling

d) Genuineness

e) Advantages of career counselling

f) Test interpretation in counselling

Total No. of Questions : 5]

SEAT No. :

PD724

[Total No. of Pages : 2

[6467]-609
T.Y. B.Sc. (Regular)
PSYCHOLOGY
SEC - I : Basic Counselling Skills
(2019 Pattern) (Semester-V) (352010)

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

Instructions to the candidates:

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

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

a) What is non directive counselling?

b) State the types of listening.

c) Why is eye contact important in counseling?

d) Define paraphrasing.

e) Define self disclosure.

f) Define Concreteness.

Q2) a) Explain the importance and tips of active listening in counseling. **[6]**

OR

Describe the types of questions ask by counselor in counseling.

b) Analyze the purpose of counseling. **[4]**

P.T.O.

Q3) a) Justify which type of counseling is more effective. **[6]**

OR

Describe the various relationship skills among counselors.

b) Critically evaluate the important components of communication skills. **[4]**

Q4) a) Explain the major steps of confrontation in counseling. **[6]**

OR

Describe the types of empathy.

b) Analyze the different signs of showing attention and interest to the clients. **[4]**

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

a) Goals of Counseling.

b) Facial expression of Counselor.

c) Self disclosure.

d) Paraphrasing of questions.

e) Addictive empathy.

f) Advantages of relation skills.

Total No. of Questions : 5]

SEAT No. :

PD725

[Total No. of Pages : 2

[6467]-610
T.Y.B.Sc. (Regular)
PSYCHOLOGY
SEC-II : Personality Development
(2019 Pattern) (Semester-V) (352011)

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

Instructions to the candidates:

1) ***Question No.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) What is team building?

b) Define etiquettes.

c) Define goal setting.

d) Define communication.

e) Define personality.

f) State the types of written communication.

Q2) a) Explain the barriers of communication. **[6]**

OR

Describe the different skills required in team work. **[6]**

b) Analyze the various determinants of personality development. **[4]**

P.T.O.

Q3) a) Explain the types of personality with characteristics. **[6]**

OR

Describe the various types of interview.

b) Analyze the various characteristics of effective team. **[4]**

Q4) a) Explain the self assessment techniques and challenges in self assessment. **[6]**

OR

Discuss the various types of non verbal communication.

b) Compare the etiquettes in social and official setting. **[4]**

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

a) Interview mistakes

b) SWOT analysis

c) Telephone Etiquettes

d) Process of communication

e) Need of goal setting

f) Career planning

Total No. of Questions : 5]

SEAT No. : ____

PD-726

[Total No. of Pages : 2

[6467]-611

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS - 351 : Terrestrial Ecosystem and Management

(2019 Pattern) (Semester - V) (Paper - I) (35241)

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

Instructions to the candidates:

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

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

a) Define the term Carbon Sequestration.

b) Explain various methods of vegetation sampling.

c) What is meant by Keystone species.

d) Enlist various causes for terrestrial ecosystem degradation.

e) Define the term Biome.

f) Explain effects of Forest Fires.

Q2) a) Write short note on Biogeographic zones found in India. **[6]**

b) Applications of GIS and Remote sensing in Terrestrial Ecosystem Management. **[4]**

Q3) a) Explain about Terrestrial Ecosystem Services. **[6]**

b) Explain Community based Forest Management. **[4]**

Q4) a) Write short note on Sustainable Management of Terrestrial Ecosystem. **[6]**

b) Importance of Government in Protection of Terrestrial Ecosystem Management. **[4]**

P.T.O.

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

a) Biogeographic realms of world.

b) Line and Belt transect method of vegetation sampling.

c) Management techniques of Forest Fires.

d) Traditional methods of Terrestrial Ecosystem Management.

e) Carbon Pool.

f) Structure of Terrestrial Communities.

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Total No. of Questions : 5]

SEAT No. : ____

PD-727

[Total No. of Pages : 2

[6467] - 612
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
EVS-352: Wildlife Biology and Management
(2019 Pattern) (Semester - V) (Paper-II) (35242)

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

Instructions to the candidates:

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

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

a) What is Algae?

b) What is Angiosperms?

c) What is mean by landscape?

d) Write about monocot

e) What is mean by Arachnids?

f) What is pteridophytes?

Q2) Answer the following :

a) Explain deforestation in detail. **[6]**

b) Write co-relation between agriculture expansion and wildlife destruction **[4]**

P.T.O.

Q3) Answer the following

a) Explain various reasons of biodiversity formation **[6]**

b) Write a note on block count technique **[4]**

Q4) Answer the following

a) What is ecotourism? Explain its importance in wildlife management. **[6]**

b) Write a note on exploitation of animals **[4]**

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

a) Describe habitat destruction in short **[2½]**

b) Explain grassland habitat **[2½]**

c) What is Bio-telemetry? **[2½]**

d) How wildlife biology important in conservation of wildlife? **[2½]**

e) Explain forest habitat in brief **[2½]**

f) What is dicot? **[2½]**

Total No. of Questions : 5]

SEAT No. : ____

PD-728

[Total No. of Pages : 2

[6467]-613

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS-353 : Water and Soil Quality (Paper - III)

(2019 Pattern) (Semester - V) (35243)

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

Instructions to the candidates:

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

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

a) Write any two physical characteristics of water.

b) What is sewage water?

c) Define : Eutrophication.

d) Write the full forms of WHO & ICMR.

e) Differentiate between Macro and Micro plant nutrients.

f) Name the pollutants causing soil sickness.

Q2) **Answer the following :**

a) Explain the various modes of transmission of communicable diseases. **[6]**

b) Discuss the impacts of soil aeration and plant growth. **[4]**

Q3) **Answer the following :**

a) Discuss National River Action Programe of India. **[6]**

b) Describe soil structure with diagram. **[4]**

P.T.O.

Q4) **Answer the following :**

a) Describe any two primary water treatment processes. **[6]**

b) Enumerate the role of GIS & RS in Soil resource management. **[4]**

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

a) Effects of oil spillage on sea life.

b) Sources and distribution of water resources.

c) Agrostological methods for soil conservation.

d) Soil pollution - sources & effects.

e) Ion-Exchange reactions in soil.

f) Soil pH analysis method.

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Total No. of Questions : 5]

SEAT No. :

PD-729

[Total No. of Pages : 2

[6467]-614

T.Y. B.Sc.

ENVIRONMENTAL SCIENCE

EVS-354 : Atmospheric and Global Climate Change

(2019 Pattern) (Semester - V) (Paper - IV) (35244)

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

Instructions to the candidates:

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

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

a) Write the composition of atmosphere. **[1]**

b) Define fronts. **[1]**

c) Give the name of any four green house gases. **[1]**

d) What is temperature inversion? **[1]**

e) Define carbon sequestration. **[1]**

f) Give any two examples of albedo forming surfaces. **[1]**

Q2) **Answer the following :**

a) Briefly explain earth energy balance with neat and labelled diagram. **[6]**

b) Explain the importance of kyoto protocol for combating the global warming. **[4]**

Q3) **Answer the following :**

a) What is atmospheric stability and height mixing. Add a note on the importance of metro logical parameters in it. **[6]**

b) What is impact of Global warming on weather pattern. **[4]**

P.T.O.

Q4) **Answer the following :**

a) Sketch a neat labelled diagram of atmospheric structure. Add a note on importance of stratosphere. **[6]**

b) What are the factors responsible for forming Asian brown cloud. **[4]**

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

a) Nebular Hypothesis **[2½]**

b) Types of air masses **[2½]**

c) EI- Nino **[2½]**

d) Plume behaviour **[2½]**

e) Salient - features of Montreal protocol **[2½]**

f) Tropical cyclone **[2½]**

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Total No. of Questions : 5]

SEAT No. : ____

PD730

[Total No. of Pages : 2

[6467]-615
T.Y.B.Sc. (Regular)
ENVIRONMENTAL SCIENCE
EVS - 355 : Environmantal Legislation and Policy
(2019 Pattern) (Semester - V) (35245)

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

Instructions to the candidates:

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

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

a) What is full form of CPCB.

b) What is Public liability?

c) Write the full form of SPCB.

d) What is the legal definition of Natural Resources?

e) When did kyoto protocol came into existence?

f) When did Environmental Protection Act came into existence?

Q2) Answer the following.

a) What are Hazardous Waste Management Rules, 2016? Discuss in detail about them. **[6]**

b) Write in short about the outcomes of Stockholm Conference 1972. **[4]**

Q3) Answer the following.

a) Write in detail about Rio Summit 1992. **[6]**

b) Write in short about Montreal Protocol 1987. **[4]**

P.T.O.

Q4) Answer the following.

a) Explain the Role of Ministry of Environment, Forest & Climate Change in Environmental Protection. **[6]**

b) Write a short note on Motor Vehicle Act 1988. **[4]**

Q5) Write a short note on Any Five of the following. **[5×2=10]**

a) Powers of State Pollution Control Board under Water Act 1974.

b) Elements of Environmental Governance.

c) Principles of Stockholm declaration.

d) Copenhagen Summit.

e) Objectives of Air (Prevention and Control of pollution) Act 1981.

f) Importance of Environmental Governance.

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Total No. of Questions : 5]

SEAT No. :

PD731

[Total No. of Pages : 2

[6467]-616
T.Y.B.Sc. (Regular)
ENVIRONMENTAL SCIENCE
EVS-356: Environmental Biotechnology-I
(2019 Pattern) (Semester -V) (Paper-VI) (35246)

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

Instructions to the candidates:

1) ***Que 1 is Compulsory.***
2) ***Solve any three questions from Que. No. 2 to Que 5.***
3) ***Que. 2 to Que. 5 carry equal marks.***

Q1) Attempt any Five of the following.

a) How is biotechnology used in environmental monitoring **[1]**

b) Which color is associated with environmental biotechnology **[1]**

c) What cannot be composted? **[1]**

d) Which species is not suitable for vermicomposting **[1]**

e) Which culture is used in micropropogation? **[1]**

f) Which instrument is used to view microbes? **[1]**

Q2) Answer the following.

a) Which methods are used in enumeration of microbes **[6]**

b) What is the applications of vermicompost **[4]**

Q3) Answer the following.

a) What are the parameter affecting the composting process? **[6]**

b) Which are the main source of biofertilizers **[4]**

Q4) Answer the following

a) What kind of treaty is cartagena protocol? **[6]**

b) What is the difference between dissolving & diluting. **[4]**

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

a) Bangalore method of composting **[2½]**

b) Functions of xenobiotic **[2½]**

c) Types of nutrition **[2½]**

d) Agricultural biotechnology **[2½]**

e) Application of GMO's **[2½]**

f) Objectives of Environmental Biotechnology **[2½]**

Total No. of Questions : 5]

SEAT No. :

PD732

[Total No. of Pages : 2

[6467]-617

T.Y. B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

SEC - EVS - 3511 : Remote Sensing, GIS and Modelling

(2019 Pattern) (Semester-V) (Paper-IV) (352410)

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

Instructions to the candidates:

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

Q1) Attempt any Five of the following :

a) What does spectral signature mean? **[1]**

b) What is Aerial photography? **[1]**

c) What does Spatial Data Mean? **[1]**

d) Define the term Remote Sensing. **[1]**

e) What is mean by skewness in statistics? **[1]**

f) Define the term GIS. **[1]**

Q2) Answer the following :

a) Explain EMR interaction with earth's surface & atmosphere with neat labelled diagram. **[6]**

b) Write the difference between Spatial and Non-Spatial Data. **[4]**

P.T.O.

Q3) Answer the following :

a) What are the applications of Remote Sensing in Water Resource Management? Explain a case study related to it. **[6]**

b) What are the components of GIS? **[4]**

Q4) Answer the following :

a) Discuss the Role & Importance of GIS in Environmental Studies. **[6]**

b) What are Satellites? Explain the role of Satellites in Remote Sensing. **[4]**

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

a) Advantages of Remote Sensing. **[2½]**

b) Disadvantages of GIS. **[2½]**

c) Satellites and Sensors. **[2½]**

d) Applications of GIS in Marine and Atmospheric Studies. **[2½]**

e) Parametric and Non-Parametric Tests in Statistics. **[2½]**

f) GPS Survey in GIS. **[2½]**

Total No. of Questions : 5]

SEAT No. :

PD733

[Total No. of Pages : 2

[6467]-618

T.Y.B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

EVS 3512 : Soil Health Management

(2019 Pattern) (Semester-V) (352411)

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

Instructions to the candidates:

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

Q1) Attempt any FIVE of the following:

a) What is soil composition? **[1]**

b) How shifting cultivation responsible for soil erosion? **[1]**

c) What are indicator of plant nutrient defficiency? **[1]**

d) Enlist important macronutrient used to prepare soil Health card. **[1]**

e) What are the common diseases of plant? **[1]**

f) What is agriculture drainage system? **[1]**

Q2) Answer the following.

a) What is pest? What type of pesticides are used to control pest? Give its environmental impacts? **[6]**

b) With suitable examples give brief account on Energy crop. **[4]**

P.T.O.

Q3) Answer the following.

a) What is concept of biofertilizers? Give types and importance of biofertilizers? **[6]**

b) Explain briefly Biological pest control methods are more environment friendly. **[4]**

Q4) Answer the following.

a) What components are present in soil? Discuss the major elements needed for good soilfertility. **[6]**

b) What factors affects soil fertility. **[4]**

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

a) Disease Triangle

b) Element defficiency

c) Percolation pond

d) Uses of Biofertilizers

e) Cropping system

f) Scheme for fertilizer

Total No. of Questions : 4]

SEAT No. :

PD-734

[Total No. of Pages : 1

[6467]-619

T.Y. B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS501 : Study of Disaster

(2019 Pattern) (Semester - V) (35231)

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

Instructions to the candidates :

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

Q1) **Define the following questions.** **[5]**

a) What is a natural disaster explained with an example?
b) What do you mean by manmade disaster?
c) What are Relief Operations?
d) What is a Cataclysm disaster?
e) Define Tsunami.

Q2) **Write short notes on (any two) :** **[10]**

a) Rescue Operations
b) Temporary Shelters
c) Earthquake

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

a) Explain the Meaning and Concept of Evacuation Plan and Relief Camps.
b) State the role of Information in Disaster Preparedness.
c) What is the disaster management cycle?

Q4) **Answer in details (any one) :** **[10]**

a) Describe in detail Post-disaster initiatives taken by the Government.
b) Describe in detail Meaning, Concept, Nature and Scope of Disaster Management.

Total No. of Questions : 4]

SEAT No. :

PD-735

[Total No. of Page : 1

[6467]-620
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-502 : United Nation Organization Part - I
(2019 Pattern) (Semester - V) (35232)

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

Instructions to the candidates:

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

Q1) Define the following questions : **[5]**

a) What is Dignity and equality?

b) What is the meaning of the General Assembly?

c) Security council.

d) International court of justice.

e) Who is the Secretary - General of the UN.

Q2) Write short notes on (any two) :

a) UNHCR **[10]**

b) UN Charter

c) UDHR

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

a) What are the main purpose of the UN?

b) State the role of the General Assembly.

c) How does a country become a Member of the United Nations?

Q4) Attempt in details (any one) : **[10]**

a) Describe in detail the UN Sustainable Development Goals.

b) What is the role of the Security Council in mainatining world peace?

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Total No. of Questions : 4]

SEAT No. :

PD-736

[Total No. of Page : 1

[6467]-621
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-503 : International Relations Part - I
(2019 Pattern) (Semester - V) (35233)

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

Instructions to the candidates:

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

Q1) Define the following questions : **[5]**

a) What is bipolar and multipolar world?

b) What is international economic relations?

c) What is a simple definition of idealism?

d) How do you define development?

e) What is the meaning of international relations?

Q2) Write short notes on (any two) :

a) Idealism **[10]**

b) Montevideo Convention

c) Unipolar

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

a) What is International Relations?

b) State the importance of the Study of Theories of International Relation.

c) What is development and why is it important?

Q4) Attempt in details (any one) : **[10]**

a) What is game theory explained in detail.

b) Why is the problem of deterrence especially important in international relations?

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Total No. of Questions : 4]

SEAT No. : ____

PD-737

[Total No. of Pages : 2

[6467] - 622
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS 504: Terrorism
(2019 Pattern) (Semester - V) (35234)

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

Instructions to the candidates:

1) ***A1l questions are compulsory***
2) ***Figures to the right indicate full marks.***

Q1) Define the following questions : **[5]**

a) What are human rights?

b) Define Left Wing Terrorism.

c) What is National Security?

d) What are the Causes of Terrorism?

e) What is terrorism?

Q2) Write short notes on (any two) : **[10]**

a) Profiling and the principle of non-discrimination.

b) Insurgency in North East India.

c) Religious Extremist Terrorism.

P.T.O.

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

a) What are the economic consequences of terrorism?

b) Explain the accountability and the human rights of victims.

c) State the Social Impact of Terrorism on National Development.

Q4) Answer in details (any one) : **[10]**

a) State the Impact of Terrorism on National Development.

b) Explain The impact of terrorism on human rights.

Total No. of Questions : 4]

SEAT No. : [ ]

PD738

[Total No. of Pages : 1

[6467]-623
T.Y.B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS - 505 : Research Methodology
(2019 Pattern) (Semester - V) (35235)

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

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is the research methodology?
b) What is methodology and give an example?
c) What is research formulation?
d) What is a limitation in research?
e) What is Research Formulation?

Q2) Write short notes on (any two). **[10]**

a) Research Report
b) Research Design
c) Research problem.

Q3) Attempt the following questions (any two) **[10]**

a) Explain the qualitative research methodology appropriate.
b) What are research aims and objectives to give examples?
c) State the Process of Problem Formulation.

Q4) Answer in details (any one) **[10]**

a) Describe in detail significance and characteristics of research.
b) What are research methodology questions?

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Total No. of Questions : 4]

SEAT No. : ____

PD739

[Total No. of Pages : 2

[6467]-624

T.Y.B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS 506(A) : Major Global Conflict-I

(2019 Pattern) (Semester -V) (35236A)

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

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is the conflict of oil?

b) What was the significance of World War I?

c) What is the question of Palestine?

d) What caused the Afghanistan issue?

e) Write the importance of kashmir.

Q2) Write short notes on (any two) **[10]**

a) Treaty of Versailles

b) Historical Background Israel Palestine

c) Suez Canal

Q3) Attempt the following questions (any two) **[10]**

a) Write examples of religious conflict?

b) State the largest global conflict?

c) State the Oil-Source of Conflict.

Q4) Answer in detail (any one) **[10]**

a) Explain in detail how we can reduce global conflict?

b) What is the significance of Kashmir in India's history?

P.T.O.

Total No. of Questions : 4]

PD739

[6467]-624

T.Y.B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS 506(B) : Regional Security System-I

(2019 Pattern) (Semester -V) (35236B)

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

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) Why was SEATO formed?

b) Full form of NATO.

c) Full form of CENTO.

d) Define Warsaw.

e) Full form of SAARC.

Q2) Write short notes on (any two) **[10]**

a) Objectives of ASEAN

b) Aims of WARSAW

c) Structure of SAARCe

Q3) Attempt the following questions (any two) **[10]**

a) Explain the Origin and Development of SAARC.

b) State the Structure of ASEAN.

c) Write the aims and objectives of seato.

Q4) Answer in detail (any one) **[10]**

a) What is the main reason for ASEAN development?

b) State the Objectives of the World Trade Organization.

Total No. of Questions : 4]

SEAT No. :

PD740

[Total No. of Pages : 2

[6467]-625
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS507A : India's Maritime Security - I
(2019 Pattern) (Semester -V) (35237A)

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

Instructions to the candidates:

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

Q1) Define the following questions : **[5]**

a) Who set the maritime security level in India?

b) Write the definition of Boundaries.

c) What is the meaning of coastal boundaries?

d) Who is responsible for maritime security?

e) Define Maritime Security.

Q2) Write short notes on (any two) : **[10]**

a) Territorial waters of India.

b) Exclusive Economic Zone.

c) Maritime safety and security.

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

a) What are the maritime security challenges in India?

b) State the Human and Drugs Trafficking, Piracy of India.

c) Write the aims of maritime security.

Q4) Answer in details (any one) : **[10]**

a) Explain the Duties, Responsibilities and Limitations of Indian Coast Guards.

b) What are the common security issues in the maritime industry?

P.T.O.

Total No. of Questions : 4]

PD740

[6467]-625
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS507B : Peace and Conflict Studies - I
(2019 Pattern) (Semester -V) (35237B)

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

Instructions to the candidates:

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

Q1) Define the following questions : **[5]**

a) What is the Post-Cold War?

b) Define classical approach.

c) What is regionalism?

d) Define functional approach.

e) What is Diplomacy?

Q2) Write short notes on (any two) : **[10]**

a) Regionalism.

b) Track II Diplomacy.

c) Confidence Building Measures.

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

a) Explain the Conceptual analysis of conflict and peace.

b) What is realism in international relations?

c) What is regionalism and how does it affect the country?

Q4) Answer in detail (any one) : **[10]**

a) What is the classical approach in international relations?

b) What is the realistic approach in international relations?

Total No. of Questions : 4]

SEAT No. :

PD741

[Total No. of Pages : 2

[6467]-626
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS508A : Chhatrapati Shivaji Maharaj Military System
(2019 Pattern) (Semester -V) (35238A)

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

Instructions to the candidates:

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

Q1) Define the following questions : **[5]**

a) Define Swarajya.

b) Which was the smallest unit in the Shivaji army?

c) Who was the first Maratha Raja?

d) What is Hindavi swaraj?

e) Write the meaning of Chhatrapati.

Q2) Write short notes on (any two) : **[10]**

a) Dadoji Kondev

b) Chhatrapati Shivaji Maharaj

c) Adil Shahi

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

a) State the Economic State of during Chhatrapati Shivaji Maharaja's time.

b) Explain the Battle of Pratapgad

c) Explain the Battle of Kolhapur.

Q4) Answer in details (any one) : **[10]**

a) What was decided in the treaty of purandar?

b) Which was the first military campaign of Shivaji?

P.T.O.

Total No. of Questions : 4]

PD741

[6467]-626
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS508B : Chhatrapati Shivaji Maharaj as Strategic Thinker
(2019 Pattern) (Semester -V) (35238B)

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

Instructions to the candidates:

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

Q1) Define the following questions : **[5]**

a) What is Forts?

b) What is Ship building?

c) Define Guerilla Leader.

d) What is foresight?

e) What is Organization?

Q2) Write short notes on (any two) : **[10]**

a) Chhatrapati Shivaji Maharaj

b) Strategic Thinker

c) Guerilla Leader

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

a) State the Structure of Maratha Army.

b) Explain the Ch. Shivaji as a Military Leader.

c) Explain the Leader of Guerrilla Warfare.

Q4) Answer in details (any one) : **[10]**

a) Explain in detail the Principles and Characteristics of Guerilla Warfare.

b) Explain in detail about Ch. Shivaji's foresight for developing the Navy.

Total No. of Questions : 4]

SEAT No. : ____

PD742

[Total No. of Pages : 2

[6467]-627

T.Y.B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS 509(A) : World Military History (1900-1945)

(2019 Pattern) (Semester -V) (35239 A)

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

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is the true meaning of war?

b) Why Did World War I Happen?

c) Define Balkan War.

d) What is the difference between defence and security?

e) What is Fascism?

Q2) Write short notes on (any two) **[10]**

a) Origins of World War I

b) World War II

c) Alliance Networks

Q3) Attempt the following questions (any two) **[10]**

a) Explain the Causes of War of World War I.

b) Explain the main causes of world war II.

c) Explain the Causes of the Cold war.

Q4) Answer in details (any one) **[10]**

a) What was the main goal of the Woodrow Wilson Peace Programme?

b) Write a Short History of World War I

P.T.O.

Total No. of Questions : 4]

PD742

[6467]-627
T.Y.B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS 509(B) : India's Foreign Policy
(2019 Pattern) (Semester -V) (35239 B)

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

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is Policy?

b) What is Foreign Policy?

c) Define India's Foriegn Policy.

d) What is a neighbourhood example?

e) Define Diplomacy.

Q2) Write short notes on (any two) **[10]**

a) Foreign Policy

b) India's Foriegn Policy

c) Look East Policy

Q3) Attempt the following questions (any two) **[10]**

a) What is foreign policy and why is it important?

b) State the Meaning and Concept Foreign Policy.

c) What is foreign policy and why is it important?

Q4) Answer in details (any one) **[10]**

a) Explain in detail the India's Neighbourhood First Policy.

b) What are the main goals of foreign policy?

Total No. of Questions : 4]

SEAT No. : ____

PD-743

[Total No. of Pages : 2

[6467]-628

T.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS510 : Introduction to Human Rights and Duties

(2019 Pattern) (Semester - V) (352310)

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

Instructions to the candidates:

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

Q1) **Define the following questions :** **[5]**

a) What is Human rights?

b) Who wrote the doctrine of natural rights?

c) Define Justice.

d) What is Dignity?

e) When was the Human Rights Council established?

Q2) **Write short notes on (any two) :** **[10]**

a) Human rights

b) Minorities

c) Women

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

a) How did the War Measures Act affect human rights?

b) What is the significance of moral values in human society?

c) Explain the Human Rights and Gender Issues.

P.T.O.

Q4) **Answer in details (any one) :** **[10]**

a) Explain in detail the Significance of Human Rights Education.

b) Are human rights legal rights? Explain in detail.

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Total No. of Questions : 4]

SEAT No. : ____

PD744

[Total No. of Pages : 1

[6467]-629
T.Y. B.Sc. (Regular)
DEFENCE AND STRATEGIC STUDIES
DS-511: Human Rights and UN
(2019 Pattern) (Semester - V) (352311)

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

Instructions to the candidates:

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

Q1) Define the following questions. **[5]**

a) What is Human Rights?

b) Do all countries have human rights?

c) What is the preamble?

d) Define mission.

e) Define liberty.

Q2) Write short notes on (any two) **[10]**

a) Human Rights.

b) Asylum rights.

c) UDHR.

Q3) Attempt the following questions (any two) **[10]**

a) How did human rights start?

b) State the Historical background of the Universal Declaration of Human Rights.

c) What is the most important Universal Declaration of Human Rights?

Q4) Answer in details (any one) **[10]**

a) How does slavery violate human rights?

b) Explain in detail the Prevention of discrimination.

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Total No. of Questions : 5]

SEAT No. :

PD-745

[Total No. of Pages : 2

[6467]-630

T.Y. B.Sc. (Vocational)

BIOTECHNOLOGY

VBt - 311 : Animal and Plant Tissue Culture

(2019 Pattern) (CBCS) (Semester - V) (35571) (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) ***Question 2 to 5 carry equal marks.***

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

a) Define plant tissue culture.

b) Give role of Auxin in Plant tissue culture.

c) Name any one breast cancer cell line.

d) Give full form of DMEM

e) What is cellus culture?

f) Which enzyme is used for animal tissue disaggregates.

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

i) Comment on Basic design of Animal Tissue culture lab.

ii) What is tissue culture contamination. Comment on two measures to eradicate them.

iii) With one example comment on cell fusion studies.

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

i) Give brief introduction to organogenesis. Give protocol for indirect organogenesis.

ii) Comment on advantages and disadvantages of somaclonal variations.

P.T.O.

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

i) Give brief introduction to history of Animal tissue culture.

ii) Give protocol in Flowchart for Invitro fertilization.

iii) Write a note on Artifical seed production.

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

i) Explain in detail various causes of somaclonal variation.

ii) Discuss in detail characterization of cell lines.

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

i) Distinguish between primary and secondary culture.

ii) Comment on Transplantation of cultured cells.

iii) Explain in detail Rhizogenesis.

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

i) Explain in detail production of monoclonal antibodies.

ii) Discuss any two methods for genetransfer.

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

a) Evolution of cell line

b) Caulogenesis

c) Hairy root culture

d) Somatic embroys

e) Secondary metabolites

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Total No. of Questions : 5]

SEAT No. : ____

PD746

[Total No. of Pages : 2

[6467]-631
T.Y. B.Sc. (Regular) (Vocational)
BIOTECHNOLOGY
VBt-312: Industrial Biotechnology
(2019 CBCS Pattern) (Semester - V) (35572)

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

Instructions to the candidates:

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

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

a) Why is aeration necessary in a fermenter?

b) Enlist any two parameters that must be measured and controlled during fermentation process.

c) Give any two examples of carbon sources used in fermentation media.

d) Define fermentation.

e) In which phase of growth are primary metabolites produced?

f) What is role of hops in production of beer.

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

i) Enlist the major components and minor components of fermentation Media. What do you understand by fermentation Media?

ii) Give the applications of industrial biotechnology.

iii) Distinguish between primary metabolites and secondary metabolites.

b) Describe in detail the component parts of a typical fermentation process. **[4]**

OR

With the help of well labelled diagram, explain the working of air-lift fermenter. **[4]**

P.T.O.

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

i) Write a short note on sporulation an solidified media method of inoculum development in fungi.

ii) Define major mutations. With the help of suitable example, explain how major mutations are useful in strain improvement?

iii) What is meant by screening? What do you understand by primary screening and secondary screening?

b) Define antifoaming agents. Give any three approaches to solve the problem of foaming. **[4]**

OR

Enlist the methods used for measuring temperature during fermentation process. Add a note on mercury in glass thermameter. **[4]**

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

i) Explain the process of production of amylase.

ii) Describe fed-batch fermenter in detail.

b) Describe any two methods involved in downstream processing. **[4]**

OR

Write a short on advantages and applications of batch fermenters. **[4]**

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

a) Role of inducers in fermentation media.

b) Objectives of inoculum development.

c) Applications of air-lift fermenters.

d) Role of chromophores for standardization of electrodes used in measuring dissolved oxygen during fermentation process.

e) Top fermenting and bottom fermenting yeast during production of beer.

f) Types of chromatography used in downstream processing.

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Total No. of Questions : 5]

SEAT No. : ____

PD-747

[Total No. of Pages : 2

[6467]-632

T.Y. B.Sc. (Vocational)

SEED TECHNOLOGY

ST - 3.1 : Seed Pathology & Entomology

(2019 Pattern) (CBCS) (Semester - V) (Paper - V) (35891)

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 seed pathology.

b) Define disease

c) Give any two names of storage pests.

d) What is Dehumidification

e) What is Plant quarantine.

f) Define seed health.

Q2) a) Comment on seed borne fungi-aspergillus sp. **[6]**

b) What are seed borne pathogens? **[4]**

Q3) a) Explain impact of seed borne virus on seed. **[6]**

b) Comment on impact of seed borne bacteria. **[4]**

Q4) a) Explain the characters of order. Hemptera. **[6]**

b) What are the objectives of seed health testing. **[4]**

P.T.O.

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

a) Seed Entromology.

b) Structure of seed storage

c) Economic importance of seed pathology in seal industry.

d) Seed treatment

e) Fiber crop insect pest

f) Washing test.

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Total No. of Questions : 5]

SEAT No. :

PD-748

[Total No. of Pages : 2

[6467]-633
T.Y. B .Sc. Vocational
SEED TECHNOLOGY
ST - 3.2 : Entrepreneurship Development (Paper - V)
(2019 Pattern) (CBCS) (Semester - V) (2 Credits)(35892)

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

Instructions to the candidates :

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

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

a) Write full form of TDS.

b) Define service Tax.

c) What is Entrepreneurship Development.

d) Enlist sources of loans.

e) What is Business organization.

f) Write full form of MIDC.

Q2) a) Define commercial and co-operative banks and give their role. **[6]**

b) Comments on different modes of employment. **[4]**

Q3) a) What is Marketing? Explain the scope and importance of marketing. **[6]**

b) Write key elements of entrepreneurship. **[4]**

P.T.O.

Q4) a) Define small scale industries and explain the types of small scale industries. **[6]**

b) Describe in detail tools of digital marketing. **[4]**

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

a) Scope of modern industry.

b) Role of consultancy organization.

c) Marketing channels.

d) Factory Act.

e) Patent Rules.

f) Pollution control Board.

Total No. of Questions : 5]

SEAT No. : ____

PD-749

[Total No. of Pages : 2

[6467]-634

T.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

IMB - 355 : Applications of Microbial Systems

(2019 Pattern) (CBCS) (Semester - V) (35825) (Paper - V)

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

Instructions to the candidates:

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

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

a) State example of N_2 fixing bacteria.

b) Define bioremediation.

c) Define BOD.

d) What is a starter culture?

e) What is sludge?

f) What is meant by floculation?

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

i) What is meant by analysis of wastewater?

ii) What are fermented dairy products. Give examples & state benefits.

iii) Discuss sustainable agriculture using microorganisms.

b) Write a short note on Activated sludge process. **[4]**

P.T.O.

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

i) What is preliminary treatment of wastewater?

ii) Draw a typical ETP. (Effluent Treatment Plant)

iii) What are functional foods? Explain.

b) Write a short note on Acrated Lagoons. **[4]**

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

i) Define Biofertilizers and state examples along with advantages.

ii) What steps are included in secondary treatment of wastewater?

iii) What is COD? Where is it used and give application.

b) Explain Trickling filter. **[4]**

Q5) Short notes (any Four) : **[10]**

a) Prebiotics and probiotics

b) Objectives of wastewater treatment

c) Biopesticides

d) Biofuels

e) Soil microorganisms

f) Disinfection of wastewater

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Total No. of Questions : 5]

SEAT No. :

PD-750

[Total No. of Pages : 2

[6467] - 635
T.Y. B.Sc. (Vocational)
INDUSTRIAL MICROBIOLOGY
IMB-356: Cell Culture Technology
(2019 Pattern) (Semester - V) (CBCS) (35826) (Paper - V)

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

Instructions to the candidates:

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

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

a) State composition of serum.

b) State an example of Fibroblast cell line

c) Which pH indicator is used in animal cell culture medium?

d) Why is CO_2 required for growth of animal cell culture?

e) What is the role of aminopterin in somatic cell hybridization technique?

f) What is ICSI?

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

i) Draw a well-labelled diagram for rollar Bottle culture.

ii) What is ECM? Enlist types & applications.

iii) Draw the flowchart for production of monoclonal antibody production.

b) Explain concept types and applications of stem cells. **[4]**

P.T.O.

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

i) Write protocol for Lymphocyte culturing in -vitro

ii) State any three aseptic techniques used in animal cell culture.

iii) Discuss raft method for organ culture

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

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

i) Discuss different growth requirements/factors for in-vitro animal cell culture

ii) Write short note on transgenic animal. Give an example for transgenic animal.

iii) What is the disadvantage of using antibiotics during cell culture?

b) Write a short note on recombinant proteins produced on large scale using ATC. **[4]**

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

a) Types of animal cell culture based on morphology

b) Contact inhibition

c) ATCC

d) Enzymatic disaggregation of tissues

e) Finite cell lines

f) Virus mediated transformation of embryonic stem cells.

Total No. of Questions : 5]

SEAT No. : ____

PD751

[Total No. of Pages : 2

[6467]-636
T.Y.B.Sc. (Regular)
INDUSTRIAL MICROBIOLOGY
IMB-3510 : Plant Tissue Culture
(2019 Pattern) (CBCS) (Semester -V) (358210)

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.***

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

a) What is Totipotency?

b) State an example of Cytokinin used for PTC.

c) What is dedifferenciation?

d) Optimal temperature required for PTC is____.

e) What is virus-free plant?

f) Surface sterilization of plant is carried out by using_____.

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

i) Draw a flow chart depicting callus culture.

ii) What is Flavr Savr Tomato?

iii) Describe advantages of PTC over conventional farming.

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

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

i) What is Ti plasmid? How it is used in transformation of plant cell?

ii) Write a short note on Edible vaccines.

iii) What is Protoplast fusion? State application of Protoplast fusion.

b) Enlist steps involved in micro propogation. **[4]**

P.T.O.

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

i) What is molecular pharming?

ii) Write short note on Gene gun method of transformation of plant cells.

iii) What are Haploid plants?

b) State Applications of Plant Tissue culture. **[4]**

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

a) Embryo Rescue

b) Syn-seeds

c) Types of Callus

d) Meristem in plants

e) Somatic embryo

f) Ri plasmid