Roll No.

Total Pages : 04

GSM/J-21 1580

MATHEMATICS BM-241

Sequences and Series

Time : Three Hours]

[Maximum Marks : 27

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory.

Compulsory Question

1. (a)	Show that the set I of irrational numbers is not a
	neighbourhood of any real number. 1
(b)	Give an example of a finitely oscillating sequence.
	1
(c)	Prove that Greatest lower bound of a set, if it
	exists, is unique. 1
(d)	State Cauchy's root test for a series. 1
(e)	Show that the series $\frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \dots$ converges to
	1. 1
(f)	State Dirichlets test for the convergence of arbitrary
	series. 1
(2)L-1580	1

(g) Show that the infinite product
$$\prod_{n=1}^{\infty} \left(1 + \frac{1}{n}\right)$$
 is divergent.

Section I

2. (a) If S and T are non-empty bounded subsets of R,
then prove that
$$S \cup T$$
 is also bounded and : $2\frac{1}{2}$
 $\sup(S \cup T) = \max{\sup S, \sup T}$

(b) Prove that the intersection of a finite number of open sets is an open set.
$$2\frac{1}{2}$$

3. (a) If A and B are subsets of R, then :
$$2\frac{1}{2}$$

 $(A \cup B)' = A' \cup B'$

Prove that the derived set of any set is a closed set. (b) 21/2

Section II

4. (a) If $\langle a_n \rangle$ is a sequence of positive terms and $\lim_{n\to\infty} \langle a_n \rangle^{1/n} \text{ and } \lim_{n\to\infty} \frac{a_{n+1}}{a_n} \text{ both exist finitely or }$ 21⁄2 infinitely, then prove that : $a_{n+1}^{1/n} - \lim \frac{a_{n+1}}{n}$

$$\lim_{n \to \infty} (a_n)^{1/n} = \lim_{n \to \infty} \frac{a_{n+1}}{a_n}$$

(2)L-1580

(b) Prove that the sequence
$$\langle a_n \rangle$$
 defined by $a_1 = \sqrt{2}$,
 $a_{n+1} = \sqrt{2 + a_n}$ converges to the positive root of
the equation $x^2 - x - 2 = 0$.
 $2\frac{1}{2}$

5. (a) Show that the sequence $\left\langle 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} \right\rangle$ is not convergent, while :

$$\left\langle \frac{1}{n} \left(1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} \right) \right\rangle$$

is convergent.

21/2

(b) Discuss the convergence of the series : $2\frac{1}{2}$

$$\sum_{n=1}^{\infty} \sqrt{n^4 + 1} - \sqrt{n^4 - 1}$$

Section III

6. (a) Examine the convergence or divergence of the following series with x > 0: $2\frac{1}{2}$

$$\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \dots$$

(b) Test the convergence of the series : $2\frac{1}{2}$

$$\sum_{n=1}^{\infty} \frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{2 \cdot 4 \cdot 6 \dots 2n} \cdot \frac{x^{2n+1}}{2n+1}, (x > 0)$$

(2)L-1580

7. Using Cauchy's condensation test, discuss the (a) convergence of the series : 21/2

$$\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}$$

(b) State and prove Cauchy's Integral test for the convergence of infinite series. 21/2

Section IV

Test the convergence and absolute convergence of 8. (a) the series : 21/2

$$\sum_{n=1}^{\infty} \frac{\left(-1\right)^{n-1}}{\sqrt{n+1}}$$

(b) If
$$\sum_{n=1}^{\infty} a_n$$
 is convergent and the sequence $\langle b_n \rangle$ is
monotonic and bounded, then prove that $\sum_{n=1}^{\infty} a_n b_n$
is convergent. $2\frac{1}{2}$

- 9. Show that the Cauchy product of the convergent (a) series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{\sqrt{n}}$ with itself is not convergent. 2½ Prove that the infinite product $\prod_{n=1}^{\infty} \left(1 + \frac{x}{n}\right) e^{-x/n}$ is (b)
 - absolutely convergent for all real x. 21/2

Roll No.

Total Pages : 04

GSM/M-21 1581

MATHEMATICS

Special Functions and Integral Transforms Paper : II BM-242

Time : Three Hours]

[Maximum Marks : 26

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory.

(Compulsory Question)

- 1. (a) Write the Bessel function $J_0(x)$ in the form of series. $1\frac{1}{2}$
 - (b) Verify that Legendre polynomial $P_3(x) = \frac{x}{2}(5x^2 3)$ satisfies the Legendre's equation with the parameter *n* is equal to 3. 11/2

(c) Evaluate
$$L\left[\frac{e^{-t}\sin t}{t}\right]$$
. 1½

(5)L-1581

(d) Find Fourier transform of
$$f(x) = \begin{cases} \frac{1}{2} \in, & \text{for } |x| \le \epsilon \\ 0, & \text{otherwise} \end{cases}$$
.
1¹/₂

Section I

$$\frac{d^2 y}{dx^2} + x\frac{dy}{dx} + y = 0.$$
 2¹/₂

(b) Solve
$$(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = 0$$
 in series about $x = 0$. $2\frac{1}{2}$

3. (a) Find the solution of
$$x \frac{d^2 y}{dx^2} + \frac{dy}{dx} + \frac{1}{4}y = 0$$
 in terms

of Bessel's function.
$$2\frac{1}{2}$$

(b) Show that :

$$J_{4}(x) = \left(\frac{48}{x^{3}} - \frac{8}{x}\right) J_{1}(x) + \left(1 - \frac{24}{x^{2}}\right) J_{0}(x). \qquad 2\frac{1}{2}$$

Section II

4. (a) Show that :

$$(n+1)P_{n+1}(x) + n P_{n-1}(x) = (2n+1)x P_n(x).$$
 2½

(5)L-1581

(b) Prove that :

$$\int_{-1}^{1} x P_n(x) P_{n-1}(x) = \frac{2n}{4n^2 - 1}.$$
 2¹/₂

5. (a) Show that
$$H_n(-x) = (-1)^n H_n(x)$$
. 2¹/₂

(b) Evaluate
$$\int_{-\infty}^{\infty} x e^{-x^2} H_m(x) H_n(x) dx$$
. 2½

Section III

6. (a) Find the Laplace transform of the function :

$$f(t) = \begin{cases} t, & 0 \le t < 2\\ 3, & t > 2 \end{cases}$$
 2¹/₂

(b) Using Convolution theorem, evaluate :

$$\mathrm{L}^{-1}\left[\frac{1}{s^2\left(s^2+a^2\right)}\right].$$
 2½

7. (a) Solve the integral equation :

$$f(t) = 1 + \int_0^t f(u) \sin(t - u) du$$

and verify your solution. $2\frac{1}{2}$ Solve the following equation by using Laplace

(b) Solve the following equation by using Laplace
transform :
$$\frac{d^2y}{dt^2} + y = 6\cos 2t$$
, where $y'(0) = 1$,
 $y(0) = 3$. $2\frac{1}{2}$

(5)L-1581

Section IV

8. (a) Find the sine transform of :

$$f(x) = \begin{cases} \sin x, & 0 < x < a \\ 0, & x > a \end{cases}$$
 2¹/₂

(b) Using Parseval's identity, show that :

$$\int_0^\infty \frac{x^2 dx}{\left(x^2 + 1\right)^2} = \frac{\pi}{4}.$$
 2¹/₂

9. (a) Solve
$$\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$$
, if $u(0,t) = 0$, $u(x,0) = e^{-x}$,

x > 0, u(x,t) is bounded when x > 0, t > 0. 2¹/₂

$$\int_0^\infty f(x)\cos sx \, dx = \begin{cases} 1-s, & \text{for } 0 \le s \le \\ 0, & \text{for } s > 1 \end{cases}$$
 21/2

(5)L-1581

Roll No.

Total Pages : 03

GSM/J-21 1582

MATHEMATICS BM-243

Programming in C and Numerical Methods

Time : Three Hours]

[Maximum Marks : 20

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

Compulsory Question

- 1. (a) Draw a flowchart to find the area of a circle.
 - (b) Give the syntax of goto statement.
 - (c) Differentiate between Jacobi's method and Gauss Seidal's method.
 - (d) Define pointers.
 - (e) What is a bit ? $1,\frac{1}{2},1,\frac{1}{2}$

Unit I

- 2. (a) What is an algorithm ? What are its merits and demerits ?
 - (b) What are general characteristics of C ? 2,2

(2)L-1582

- 3. (a) What do you mean by data types ? What are various data types used in C language ?
 - (b) Explain the following terms :
 - (i) Operators and operands
 - (ii) & and &&
 - (iii) < and >>
 - (iv) + + and - 2,2

Unit II

- **4.** (a) What is nested if statement ? Explain with the help of example.
 - (b) Differentiate between switch and else- if ladder. 2,2
- 5. (a) Explain the difference between Local and Global variable in C with the help of example.
 - (b) Differentiate between function and function prototype. 2,2

Unit III

- 6. (a) How is the end of a string recognized in C?
 - (b) Explain the difference between call by value and call by reference. 2,2
- 7. (a) Find a root of $x^3 x 1 = 0$ using Regula-False method correct to three decimal.

(2)L-1582

(b) Find the order of convergence of Newton-Raphson's Method. 2,2

Unit IV

8. (a) Solve the following equations by Gauss-Jorden method :

$$2x + y + 4z = 12$$

$$4x + 11y - z = 33$$

$$8x - 3y + 2z = 20$$

(b) Solve the equation by Crout's method : 2,2

x + y + 2z = 42x + 3y + 4z = 93x + 4y + 5z = 11

9. Solve the following equations by Jacobi's method : 4 10x + y + 2z = 44 2x + 10y + z = 51x + 2y + 10z = 61

(2)L-1582

Roll No.

Total Pages : 04

GSM/J-21 1613 MATHEMATICS Sequences and Series BM-241

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory.

(Compulsory Question)

- (a) Define limit point of a set and give an example of a set which has two limit points.
 - (b) Define convergence of a sequence and give an example of a convergent sequence.
 - (c) Discuss the convergence of the series $\sum_{n=1}^{\infty} \cos \frac{1}{n}$.

(d) Test the absolute convergence of the infinite series

$$\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n}.$$
 2

(5)L-1613

Section I

2.	(a)	Define closed set. Prove that arbitrary intersection
		of closed sets is a closed set. 4
	(b)	State and prove Archimedean property of reals. 4
3.	(a)	Define interior of a set. Prove that interior of a set
		is an open set. 4
	(b)	Show that intersection of any family of compact
		sets is compact. 4

Section II

4. (a) Prove that every bounded sequence has a cluster point. 4

(b) Discuss the convergence of the sequence
$$\langle a_n \rangle$$

where $a_n = 1 + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} \dots + \frac{1}{2n-1}$.

- 5. (a) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{x^n + x^{-n}}, \ x > 0.$
 - (b) Discuss the convergence of the series :

$$\frac{1}{2} + \frac{\sqrt{2}}{5} + \frac{\sqrt{3}}{10} \dots + \frac{\sqrt{n}}{n^2 + 1} + \dots \qquad 4$$

(5)L-1613

Section III

- 6. (a) State and prove Gauss test for the convergence of an infinite series.4
 - (b) Test the convergence of infinite series :

$$(\log 2)^k x^2 + (\log 3)^k x^3 + (\log 4)^k x^4 + \dots, x > 0.$$
 4

7. (a) State and prove Cauchy Integral test for the convergence of an infinite series.4

(b) Test the convergence of
$$\sum_{n=1}^{\infty} \left(1 + \frac{1}{n}\right)^n x^n$$
, $x > 0$.

Section IV

(a) Discuss the absolute convergence of the series
$$\sum_{n=1}^{\infty} \frac{x^n}{n!} \cdot \frac{4}{n!}$$

(b) Discuss the convergence of
$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\csc\left(\frac{a}{n}\right)}$$
, where

$$\alpha > 0$$

4

4

(5)L-1613

8.

9. (a) Test the convergence of
$$\sum_{n=1}^{\infty} \frac{\sin nx}{n^p}$$
. $p > 0$. 4

(b) Show that
$$\prod_{n=0}^{\infty} \left[1 + \left(\frac{1}{2}\right)^{2n} \right]$$
 converges to 2. 4

4

_

Roll No.

Total Pages : 04

GSM/M-21 1614

MATHEMATICS

Special Functions and Integral Transforms BM-242

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

(Compulsory Question)

1. (a) Show that
$$J_{-\frac{1}{2}}(x) = J_{\frac{1}{2}}(x) \cot x$$
. 2

(b) Prove that
$$\int_{-1}^{1} P_n(x) (1-2tx+t^2)^{-\frac{1}{2}} dx = \frac{2t^n}{2n+1}$$
. 2

(c) Find the Laplace transform of
$$\int_{0}^{1} \frac{\sin u}{u} du$$
. 2

(d) If $\overline{f}(s)$ is the Fourier transform of f(x), then show that $e^{-ias}\overline{f}(s)$ is the Fourier transforms of f(x-a).

(5)L-1614

Unit I

2. (a) Solve
$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (x^2 - 1)y = 0$$
 in series. 4

(b) Prove that
$$\int x J_0^2(x) dx = \frac{x^2}{2} \Big[J_0^2(x) + J_1^2(x) \Big] + c$$
. 4

3. (a) By the use of the substitution $y = \frac{u}{\sqrt{x}}$, show that the solution of the equation :

$$x^{2} \frac{d^{2} y}{dx^{2}} + x \frac{dy}{dx} + \left(x^{2} - \frac{1}{4}\right)y = 0,$$

can be written in the form $y = c_1 \frac{\sin u}{\sqrt{x}} + c_2 \frac{\cos x}{\sqrt{x}}$. 4

(b) Solve the equation
$$x \frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + \frac{1}{2} xy = 0$$
 in
terms of Bessel's function

terms of Bessel's function.

Unit II

4. (a) Prove that
$$(1-2xt+t^2)^{-\frac{1}{2}} = \sum_{n=0}^{\infty} t^n P_n(x); |x| \le 1,$$

 $|t| < 1.$ 4

(5)L-1614

(b) Prove that :

$$\int_{-1}^{1} (1-x^2) P'_m(x) P'_n(x) dx = \begin{cases} 0, & \text{if } m \neq n \\ \frac{2m(m+1)}{2m+1}, & \text{if } m = n \end{cases}$$

5. (a) Show that
$$H'_n(x) = 2nH_{n-1}(x); n \ge 1$$
. 4

(b) Prove that
$$H'_{2n}(0)$$
 and $H'_{2n+1}(0) = \frac{(-1)^n (2n+1)!}{n!}$.

Unit III

6. (a) Find the Laplace transform of
$$\sinh 3t \cos^2 t$$
. 4
(b) Find the inverse Laplace transform of $\log \frac{s^2 + 1}{(s-1)^2}$.
4

7. (a) Convert the differential equation :

 $f''(t) - 3f'(t) + 2f(t) = 4\sin t,$ into an integral equation where f(0) = 1,f'(0) = -2. 4

(5)L-1614

(b) Solve the simultaneous equations :

$$\frac{dx}{dt} = 5x + y; \quad \frac{dy}{dt} = x + 5y, \text{ when } x \quad (0) = -3,$$

y (0) = 7 using Laplace transform method. 4

Unit IV

8. (a) Find the Fourier cosine transform of
$$\frac{1}{1+x^2}$$
 and deduce the sine transform of $\frac{x}{1+x^2}$. 4
(b) Find the inverse Fourier transform of $\overline{x}(x)$ = $\frac{1}{1+x^2}$

(b) Find the inverse Fourier transform of $\overline{f}(s) = e^{-|s|y}$, where $y \in (-\infty, \infty)$.

9. (a) Using Parseval's identity, prove that :

$$\int_{0}^{\infty} \frac{\sin ax}{x(a^{2} + x^{2})} dx = \frac{\pi}{2} \left(\frac{1 - e^{-a^{2}}}{a^{2}} \right).$$
 4

(b) Using the Fourier sine transform, solve the differential equation $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$ with the boundary condition (i) $u = u_0$ when x = 0, t > 0 and the initial condition (i) u = 0 when t = 0, x > 0. 4

(5)L-1614

_

Total Pages : 03

GSM/J-21 1615 PROGRAMMING IN C AND NUMERICAL METHODS BM-243

Time : Three Hours]

Roll No.

[Maximum Marks : 30

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory.

(Compulsory Question)

1.	(a)	Define Keywords. Give two examples.	1
	(b)	Write the syntax of FOR loop.	1
	(c)	What are library functions in C language ?	1
	(d)	What is an array ?	1
	(e)	What is the purpose of break statement ?	1
	(f)	How function is declared in C language ?	1

Section I

2. (a)	Draw	a flo	wchart	to	find	the	greatest	among	three
		numbe	ers.							3
(b)	What	is an	escape	se	quen	ce?	What is	its purp	oose?
										3
(5)L-1	615					1				

3.	(a)	What	is	the	purpose	of	scanf()	and	printf	0
		functio	ns?	Hov	v is it use	ed w	ithin a C	prog	ram?	3
	(b)	Descri	be tl	he siz	k assignm	ent	operators	. What	at is th	ıe

purpose of each operator ? 3

Section II

4.	(a)	Explain	the	syntax	of	switch	statement	by	an
		example	•						3
	(1)	D '0		1.		•1 1	1 1 1 1		•

- (b) Differentiate between while and do-while loop. 3
- 5. (a) Write a program to check whether a number is armstrong or not.3
 - (b) What is recursion ? How recursion is implemented in C language ? Illustrate through a suitable example.

3

Section III

- 6. (a) What is meant by concatenation ? What function is used to achieve this operation ? Write a program to concatenate the two strings.3
 - (b) How can a structure variable be declared and initialized ?3

(5)L-1615

- 7. (a) Find the order of convergence of Newton-Raphson method. 3
 - (b) Find the real root of the equation $x^3 4x 9 = 0$ by Regula-Falsi method, correct up to three decimal places. **3**

Section IV

8. Solve the following equations by triangularization (LU Decomposition) method : 6

2x + y + z = 2x + 3y + 2z = 23x + y + 2z = 2.

9. Solve the following system of equations using Cholesky method : 6

$$x + y + z = 5$$

 $x + 2y + 2z = 6$
 $x + 2y + 3z = 8$.

(5)L-1615

Roll No.

Total Pages : 03 1620

GSM/M-21

PHYSICS

Statistical Physics

Paper : VII

Time : Three Hours][Maximum Marks : 40Note : Question No. 1 is compulsory. Attempt *four* more

questions, selecting *one* question from each Unit. Use of scientific (non-programmable) calculator is allowed.

- (a) Explain the meaning of thermodynamic probability of a macrostate in system of particles by taking an example.
 2
 - (b) Discuss the limits on volume of a cell in phase space in classical and quantum statistics. 2
 - (c) Discuss the limitations of Einstein's model for specific heat of a solid.
 - (d) Distinguish between Bose-Einstein and Fermi-Dirac statistics.2

Unit I

2. (a) Derive a relation for probability of a macrostate having a deviation 'x' from the probability of most

(5)L-1620

1

probable macrostate of a distribution of 'n' distinguishable particles into two identical compartments and analyse it graphically. 5

- (b) What are laws of addition and multiplication of probabilities ? Explain with examples. 3
- 3. (a) Discuss the general distribution of 'n' distinguishable particles into 'R' compartments of unequal sizes and derive relation for thermodynamic probability of a macrostate of the system.
 - (b) Derive condition for thermal equilibrium of two systems of particles in thermal contact. Derive relation between entropy and thermodynamic probability of a system of particles.

Unit II

- Using Maxwell-Boltzmann law of distribution of speeds, derive expressions for most probable, average and root mean square speeds of molecules of a gas. Obtain relation between these.
- 5. Derive Maxwell distribution law of speeds for 'n' molecules of a gas enclosed in a chamber at temperature 'T'. Depict the relation graphically. Explain the peak in the graph.
 8

(5)L-1620

Unit III

6.	(a)	Derive	an	expression	for	the	most	probable
		distribut	ion	of particles f	for a	system	n obey	ing Bose-
		Einstein	sta	tistics.				6

- (b) Show that Maxwell-Boltzmann distribution is a limiting case of Bose-Einstein distribution. 2
- 7. What is Fermi gas ? Obtain a relation for the energy of this gas at absolute zero temperature. Give its physical significance.8

Unit IV

- 8. (a) Discuss Dulong-Petit law of specific heat of solids and the experimental observations for the variation of specific heat of a solid with temperature. Also, derive the relation for the specific heat of a solid on the basis of classical theory.
 - (b) What are the assumptions of Einstein's theory of specific heat of solids ?
- 9. Discuss Debye theory and obtain a relation for specific heat of solids on the basis of this theory. Also, discuss the result at high and low temperature conditions as obtained from this theory.
 8

(5)L-1620

Roll No.

Total Pages : 03

GSM/J-21 1621 PHYSICS Paper VIII Wave and Optics-II

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. Attempt *four* more questions selecting *one* question from each Unit. Use of scientific (Non-programmable) calculator is allowed.

1. (a) What is Double Refraction ? Define ordinary and extra ordinary ray. 2

- (b) Define Fourier theorem. 2
- (c) What is translation matrix and system matrix ? 2
- (d) Explain longitudinal and lateral chromatic aberration.

2

Unit I

2. (a)	Explain Brewster's law and prove that refract	ed ray
	and reflected ray are mutually perpendicular t	o each
	other.	4
(b)	State and explain the Law of Malus.	4
(3)L-1621	1 1	

- 3. (a) Describe the construction and working of a Bi-quartz arrangement in polarimeter.5
 - (b) Calculate the specific rotation of sugar solution from the following data length of the tube containing solution = 10 cm, volume of solution = 40 c.c., Amount of sugar in solution = 3 gm and Angle of rotation = 4°57'.

Unit II

4.	(a)	State and prove Fourier integral theorem.	6
	(b)	Define complex form of Fourier series.	2
5.	(a)	Apply the Fourier theorem to analyse a square wa	ve
		into its simple harmonic components.	5
			-

(b) Derive Fourier series for an even function in the interval $(-\pi, \pi)$. 3

Unit III

6.	(a)	Derive the convolution theorem for Fourier	r
		transform.	4
	(b)	Find the Fourier transform of $f(x) = e^{-x^2/2}$.	4
7.	(a)	Define nodal points. Prove that nodal plane coincide	e
		with unit planes when media on either side o	f
		optical system have same refractive index.	5

(3)L-1621

 (b) If a ray is initially given by (2×1) matrix, then show that the effect of translation through a distance D is a homogenous of refractive index μ is completely

given by (2×2) matrix
$$T = \begin{pmatrix} 1 & 0 \\ D/\mu & 1 \end{pmatrix}$$
. 3

Unit IV

- 8. Explain what is chromatic aberration. How is it connected with dispersive power ? Derive the condition for achromatism for two thin lenses in contact.
 8
- 9. (a) What is Optical Fiber ? Define and explain the following terms : 5
 - (i) Acceptance angle
 - (ii) Total internal reflection
 - (iii) Numerical aperture
 - (iv) Normalized frequency.
 - (b) Calculate the critical angle between two material with indices of $\mu_1 = 1.45$ and $\mu_2 = 1.40$. **3**

Roll No.

Total Pages : 04

GSM/M-21 1622 CHEMISTRY Inorganic Chemistry Paper : XI CH-204

Time : Three Hours]

[Maximum Marks : 32

- Note : Attempt *Five* questions in all, selecting *two* questions from each Section. Q. No. 1 is compulsory. Marks are indicated against each question.
- 1. (i) Name the most stable lanthanide nitrate.
 - (ii) What happens when Ce(III) nitrate is treated with alkaline $KMnO_4$?
 - (iii) Which of the following has maximum number of unpaired electrons ?

Th⁴⁺, U³⁺, Pu³⁺, Pa⁴⁺.

(iv) Complete the following reaction :

$$_{92} \text{U}^{238} + ? \longrightarrow _{99} \text{Es}^{247} + 5_0^1 n$$

- (v) Lanthanides do not form double salts with 24 water molecules as in alums. Why ?
- (vi) What is Original Solution ?

(5)L-1622

(vii) Write down the structure of Nickel (II) dimethylglyoximate.

(viii) What is Magnesia Mixture ? 1×8=8

Section A

2. (a) Lanthanides show +3 as a common oxidation state but only few of them exhibit +2 and +4. Explain. 2 (b) The spectra of lanthanides show sharp line-like bands. Give reasons for your answer. 2 (c) Lanthanides prefer to form ionic compounds. Why? 2 3. Write down the electronic configuration of samarium (a) (Z = 62) and Europium (Z = 63). 2 (b) Discuss briefly any two methods for the separation of lanthanides. 3 Which actinides are used as Nuclear fuel ? 1 (c) 4. (a) Why heavier members of actinide series to not 2 form oxocations ? What is Nuclear fission ? Give reactions for it. 2 (b) Why is chemistry of actinides more complex as (c) compared to lanthanides ? 2

(5)L-1622

5.	(a)	Why do magnetic propeties of actinides appear m	nore
		difficult to interpret than both transition metals	and
		lanthanides ?	2
	(b)	Is there an actinide contraction similar to	the
		lanthanide contraction ? Explain.	2
	(c)	Name two important minerals of lanthanides.	2

Section B

6.	(a)	What is Sodium Carbonate Extract ? How is it
		prepared ? 2
	(b)	What is the role of HCl detection of group II basic
		radicals ? 2
	(c)	What is solubility product ? How does it differ
		from ionic product ? 2
7.	(a)	What are the group reagents for group IV and V. $\boldsymbol{2}$
	(b)	Complete the following reactions : 2
		(i) $\operatorname{FeSO}_4 + \operatorname{NO}_2 + \operatorname{H}_2 \operatorname{SO}_4 \longrightarrow ? + ?$
		(ii) $Na_2S + Na_2[Fe(CN)_5 NO] \longrightarrow ?$
	(c)	How will you detect CO^{2+} in the presence of Ni^{2+} ?
		2
8.	(a)	(i) Why conc. HN ₃ is added in group III
		analysis ?
		(ii) Why Zn^{2+} does not precipitate with Cd^{2+} in
		group II ? 2

(5)L-1622

	(b)	(i) Explain the chemistry of Match stick test for
		sulphates.
		(ii) Name the cation which give bluish green
		colour to the flame. 2
	(c)	How does pH of the solution affect solubility of
		precipitates ? 2
9.	(a)	Why is H ₂ S gas passed in acidic medium to
		precipitate cations of group II ? 2
	(b)	What is simultaneous precipitation ? 2
	(c)	How will you test for Ca^{2+} ion ? 2

(5)L-1622

Roll No.

Total Pages : 04

GSM/J-21 1623 CHEMISTRY Paper XII (CH-205) Physical Chemistry (Theory)

Time : Three Hours]

[Maximum Marks : 32

- Note : Attempt *Five* questions in all, selecting *two* questions from each Section. Q. No. 1 is compulsory. Use of calculator and log table is allowed.
- (a) State and explain Carnot Theorem. How can efficiency of a heat engine be increased ?
 - (b) Justify the statement "Entropy of Universe is Increasing".
 - (c) Explain, why KCl is used as electrolyte in salt bridge ?
 - (d) What is a reversible cell ? How do you measure its E.M.F. ? 2
 - (e) What is standard electrode potential ? Explain. 1

1

(3)L-1623

Section A

2. (a) What is Carnot Cycle ? Calculate the efficiency of a Carnot engine working between temperatures T_1 and T_2 . 3

(b) Derive Gibbs-Helmholtz equation in the form as below : 3

$$\left[\frac{\partial \left(\Delta G/T\right)}{\partial T}\right]_{P}=-\frac{\Delta H}{T^{2}}$$

- 3. (a) Explain the term Entropy. Show that entropy is a state function.3
 - (b) Calculate the molar entropy change of mixing 0.6 mole of Nitrogen and 0.2 mole of Helium at 298 K assuming that they are ideal gases. 3
- 4. (a) Prove that in a reversible process net entropy change for the system and surrounding is zero. 2
 - (b) 5 moles of an ideal gas expands reversibly from a volume of 6 dm³ to 60 dm³ at a temperature of 25°C. Calculate the change in entropy.
 2
 - (c) What is Residual Entropy ? What is its origin and How can it be calculateed ? 2

(3)L-1623

- 5. (a) Derive the relationship : $1\frac{1}{2}$ $\Delta S = C_p ln \frac{P_1}{P_2}$
 - (b) State and explain Nernst Heat Theorem. 2
 (c) State third law of thermodynamics. How absolute entropy of a substance can be determined from the heat capacity data. 2¹/₂

Section **B**

- 6. (a) What are reversible electrodes ? Explain the following electrodes :
 - (i) Metal-Metal Ion Electrode
 - (ii) Hydrogen Electrode. **3**
 - (b) A zinc electrode is placed in 0.1 m solution of zinc sulphate at 25°C. If the degree of dissociation of salt at this concentration is found to be 0.95, calculate the electrode potential of the electrode at 25°C. Given that $E_{Zn^{2+},Zn}^0 = -0.76$ volt. **3**
- 7. (a) Explain the construction and working of electrochemical cell.3

(3)L-1623 3

(b) Calculate the standard E.M.F. of a cell which involves the following cell reaction :

 $\begin{aligned} &Zn + 2Ag^+ \rightarrow Zn^{2+} + 2Ag \\ &Given \quad that \quad E^0_{Zn,Zn^{2+}} = 0.76 \text{ volt} \qquad \text{and} \\ &E^0_{Ag,Ag^{2+}} = -0.80 \text{ volt} . \end{aligned}$

- (c) What is Liquid Junction Potential ? How can it be minimized ?
- 8. (a) Derive an expression for EMF of electrode concentration cell without transference.3
 - (b) Calculate the free energy change of the following cell at 25°C :

$$\operatorname{Sn} \left| \operatorname{Sn}^{2+} (a = 0.6) \right| \left| \operatorname{Pb}^{2+} (a = 0.3) \right| \operatorname{Pb}$$

Standard EMF of cell is 0.014 volt.

- 9. (a) Derive Nernst equation for the potential of Hydrogen electrode. 3
 - (b) Discuss the applications of E.M.F. measurement in potentiometric titrations :

HCl acid vs. NaOH Base. 3

(3)L-1623

Roll No.

Total Pages : 04

GSM/J-21 1624 CHEMISTRY Paper XIII (CH-206) Organic Chemistry (Theory)

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Attempt *two* questions each from Section A and Section B.

- 1. Attempt any *eight* of the following :
 - (a) Name the units in which absorption bands are expressed in IR spectroscopy ?
 - (b) Mention any two solvents used in IR spectroscopy.
 - (c) Among primary, secondary and tertiary amines which cannot form intermolecular hydrogen bond.
 - (d) Give IUPAC name of Triethyl amine.
 - (e) Write Blomstrand formula and its modified form for benzene diazonium chloride.
 - (f) Write *two* evidences in support of Blomstrand formula of benzene diazonium chloride.

(3)L-1624

- (g) Give the type of hybridization of carbon atom in carbonyl group.
- (h) What is the necessary condition for aldol condensation in aldehydes and ketones ?
- (i) Prepare CH_3CHO from CH_3COCI . $8 \times 1=8$

Section A

- 2. (a) Define scissoring and rocking vibrations.
 - (b) Define and explain Hooke's law for calculation of vibrational frequency.
 - (c) Calculate number of fundamental absorption bands in CO_2 molecule. $3 \times 2=6$
- **3.** (a) Define overtones and coupling peaks in IR spectroscopy.
 - (b) What is the effect of resonance and inductive effect on vibrational frequency of a group ?
 - (c) Oxidation of 2-Propanol to 2-Propanone is being carried out. How will you study the progress of reaction by IR spectrum ? 3×2=6
- 4. (a) How will you prepare primary amines by Gabriel Phthalimide reaction ?

(3)L-1624 2

- (b) Give method of separation of pri., sec. and tert. amines by Hofmann's method.
- (c) Compare basic characters of ethyl amine and aniline.

3×2=6

- 5. (a) Convert Aniline into *p*-Nitroaniline.
 - (b) Write reaction of pri. aliphatic and aromatic amines with nitrous acid.
 - (c) Give structure of Trimethyl amine. $3 \times 2=6$

Section **B**

- 6. (a) Give preparation of diazonium salt and write mechanism of diazotization.
 - (b) Convert benzene diazonium chloride into :
 - (i) Iodobenzene
 - (ii) Benzene.
 - (c) Define Coupling Reaction. Write coupling reaction of benzene diazonium chloride with tert. amines.

3×2=6

- 7. (a) Convert Nitrobenzene into *m*-Dichlorobenzene.
 - (b) What is Sandmeyer Reaction ?
 - (c) What is Sarett Reagent ? Give disadvantages of using the reagent in oxidation of alcohols. $3 \times 2=6$

(3)L-1624

- **8.** (a) What is Benzoin Condensation ? Write mechanism also.
 - (b) Write a short note on Wolff-Kishner reduction.
 - (c) Convert CH₃COCH₃ into its :
 - (i) Oxime
 - (ii) Phenyl hydrazone. $3 \times 2=6$

9. (a) Compare relative reactivity of aldehydes and ketones in nucleophilic addition reactions.

- (b) Write a short note on Tollen's Reagent test for aldehydes.
- (c) What is Cannizzaro Reaction ? Give mechanism also. 3×2=6

Roll No.

Total Pages : 03

1627

GSM/J-21 BOTANY Paper I

Biology and Diversity of Seed Plants-II

Time : Three Hours]

[Maximum Marks : 40

- **Note** : Attempt *Five* questions in all, selecting *two* questions from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.
- **1.** (a) What is Syncarpous Ovary ?
 - (b) What is Alpha Taxonomy ?
 - (c) What is an herbarium ?
 - (d) What are Flavonoids ?
 - (e) Name the Indian Scholar and the book in which he classified the plants of medicinal importance in 1st Century A.D.
 - (f) What is infundibuliform of Corolla ?
 - (g) Define a Taxon.
 - (h) Where is the Central National Herbarium situated ?1×8=8

(3)L-1627

Unit I

2.	Defir	e taximetrics and explain the principles, merits	and
	deme	erits of it.	8
3.	(a)	Explain the various Rules of Nomenclature.	4
	(b)	Role of Cytology in relation to taxonomy.	4
4.	Writ	notes on the following :	
	(a)	Special types of Inflorescence	5
	(b)	Diplostamenous Condition.	3
5.	Brief	ly explain the following :	
	(a)	Concept of Species	4
	(b)	Principle of Priority.	4

Unit II

6.	Expla	ain Engler and Prantl's system of classification of)f
	Plant	s. Also discuss its merits and demerits.	8
7.	(a)	Give the floral description, floral formula, flora	al
		diagram of sunflower.	4
	(b)	Economic importance of the family Poaceae.	4

(3)L-1627

8.	Write notes on the following :					
	(a)	Diagnostic features and economic importance	of			
		family Malvaceae.	5			
	(b)	Corolla of family Leguminosae.	3			
9.	Give the botanical name, floral formula and floral diagram					
	(a)	Modor/AV	1			
	(a)	Madai/AK	4			
	(b)	Arind/Castor.	4			

Roll No.

Total Pages : 02

GSM/M-21 1628 BOTANY Paper II (Option II) Plant Embryology

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *two* questions from each Unit. Q. No. **1** is compulsory. Draw neat and well labelled diagrams where they are necessary.

1. Define the following :

- (a) Palynology
- (b) Protogyny
- (c) Hypostase
- (d) Sorosis
- (e) Polyembryony
- (f) Pollinium
- (g) Geitonogamy
- (h) Triple fusion. 1×8=8

Unit I

2.	Justify	the	statement	"Flower	is	a	modified	shoot".	8
(3)L	-1628			1					

3.	Draw and describe the development of male gametophyte				
	in angiosperms. 8				
4.	Explain the genetic basis of self-incompatibility. Give				
	various methods to overcome self-incompatibility. 8				
5.	(a) Write a note on Tapetum and its functions. 4				
	(b) Distinguish between self and cross-pollination. 4				
	Unit II				
6.	Draw and describe the structure of an anatropous ovule. 8				
7.	Describe the various types of embryo-sacs. 8				
8.	(a) Describe the various ways for pollen tube to enter				
	in an ovule. 4				
	(b) Write a note on Anemochory. 4				
9.	Describe the development of a typical dicotyledonous				
	embryo with suitable diagrams. 8				

(3)L-1628

Roll No.

Total Pages : 03

1629

GSM/M-21

ZOOLOGY

Paper I

Life and Diversity of Chordates-II

Time : Three Hours]

[Maximum Marks : 40

- Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Attempt *two* questions each from Section A and Section B. Support your answer with neat and labelled diagram(s) wherever necessary.
- 1. Explain the following terms in about 20 words each :
 - (a) Bidder's canal
 - (b) Down feathers
 - (c) Diastema
 - (d) Pterosaurs
 - (e) Furcula
 - (f) Spiral valve
 - (g) Hemipenes
 - (h) Arbor vitae
 - (i) Metachrosis
 - (j) Migration.

1×10=10

(3)L-1629

Section A

2.	Write	Write notes on the following :				
	(a)	Laryngo-tracheal chamber of Frog	3			
	(b)	Parental care in amphibians. 43	/2			
3.	(a)	Draw well labelled diagram of V.S. Eye of)f			
		Hemidactylus. 4	/2			
	(b)	Enlist the differences between poisonous and nor	1-			
		poisonous snakes.	3			
4.	(a)	Describe evolutionary tree of amphibians.	3			
	(b)	Explain pulmonary respiration in Frog. 4	/2			
5.	Desc	ribe the internal structure of heart of Hemidactylu	s.			
		71	/2			

Section B

6.	Explain the digestive system of Pigeon.					71⁄2	
7.	Write	Write short notes on the following :					
	(a) Air sacs in Pigeon					31/2	
	(b)	Morphological	Adaptations	for	flight	in	Birds.
							4
(3)I	1629		2				

8.	(a)	Describe Adaptive Radiations in Eutherians.	31/2
	(b)	Draw well labelled diagram of Female Reproduc	tive
		System of Rat.	4

9.	Classify the class Mammalia upto Order level giving	the
	characters and examples of each group.	71⁄2

(3)L-1629

Roll No.

Total Pages : 03

GSM/M-21 1630 ZOOLOGY Paper II Mammalian Physiology

Time : Three Hours]

[Maximum Marks : 40

 $1\frac{1}{2} \times 10 = 15$

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Attempt *two* questions each from Section A and Section B. Support your answer with neat and labelled diagram(s) wherever necessary.

(Compulsory Question)

- 1. Explain the following in about 20 words each :
 - (a) Haemopoiesis
 - (b) Anticoagulants
 - (c) Cardiac Output
 - (d) Chloride Shift
 - (e) Osmoregulation
 - (f) Uricotelism
 - (g) Medulated Nerve Fibre
 - (h) Neurotransmitters
 - (i) Hormone
 - (j) Parturition.

(3)L-1630

Section A

2.	What is Heart Beat ? Describe origin and conduction of				
	heart	beat.	6¼		
3.	(a)	Define tidal volume, residual volume and	vital		
		capacity of lungs. Give their average value in no	ormal		
		human adult.	3¼		
	(b)	Explain exchange of respiratory gases at the	level		
		of lungs and at tissue level.	3		
4.	Describe the composition and functions of blood. $6\frac{1}{4}$				
5.	Write	short notes on the following :			
	(a)	Structure of nephron	3¼		
	(b)	Ornithine cycle.	3		
		Section B			
6.	What	is Synapse ? Explain conduction of nerve imp	pulse		
	throu	gh a synapse.	6¼		
7.	Name	e the various hormones and their functions sect	reted		
	by P	tuitary Gland.	6¼		

2

(3)L-1630

8.	What is S	Spermatogenesis	? Describe	the m	echanism of	
	spermatogenesis.					
9.	Write short notes on the following :					
	(a) Salt	atory conduction			31/4	
	(b) Mec	chanism of action	n of steroid	hormo	ones. 3	

(3)L-1630

Roll No.

Total Pages : 03

GSM/M-21 1633 ELECTRONICS Paper I (Theory) Oscillators and Multivibratiors

Time : Three Hours]

[Maximum Marks : 40

- **Note** : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.
- (a) What are the input and output impedances for an ideal voltage amplifier and an ideal current amplifier ?
 - (b) What is the difference between a class-A and class-B amplifier ? 2
 - (c) What do you mean by the stability in oscillators ? 2
 - (d) What are breakdown devices ? Give two examples.

2

Unit I

2. What do you understand by an ideal current amplifier ? What should be the input and output impedances in a practical current amplifier w.r.t. source and load impedances. Explain with the help of a circuit diagram.

8

(3)L-1633

What is current series feedback topology ? Explain the effect of negative current series feedback on input and output impedance of an amplifier (with the help of a block diagram).

Unit II

- 4. (a) A power amplifier is always preceded by a voltage amplifier. Why ?
 2 (b) Explain the working of single ended power amplifier in class A operation with the help of circuit diagram
 - 6
- 5. (a) Explain the difference between a voltage amplifier and a power amplifier. 2
 - (b) Explain the following terms in connection with power amplifier : **6**
 - (i) Efficiency of a power amplifier
 - (ii) Collector dissipation rating
 - (iii) Harmonic Distortion.

and output waveforms.

Unit III

 Explain the working of Colpitt oscillator with the help of its circuit diagram. Derive an expression for frequency and condition for it to produce sustained oscillations. 8

(3)L-1633

 Explain the working of RC Phase-Shift Oscillator with the help of its circuit diagram. Derive an expression for frequency and condition for it to produce sustained oscillations.

Unit IV

- 8. What is a Multivibrator ? Explain the working of Astable Multivibrator with the help of its circuit diagram. Write the equation for frequency generated by it in terms of the components used. What are its applications ?
 8
- 9. (a) What is a SCR ? Explain the working of SCR with the help of its two transistor analogy and VI characteristics.
 6
 - (b) What is a Schmitt Trigger Circuit ? Where is it used ? 2

Roll No.

Total Pages : 03

GSM/M-21 1634 ELECTRONICS Paper I (Theory) OP-AMP and Linear Integrated Circuit-II

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

(Compulsory Question)

- **1.** (a) Why a voltage amplifier has high input resistance and low output resistance ?
 - (b) Calculate gain of an amplifier with positive feedback.
 - (c) Differentiate between Bistable and Astable Multivibrator.
 - (d) A power supply is rated at 15 volts/1.5 A. Calculate the value of the load resistance that can be connected without being damaged.2 each

Unit I

2. (a) Draw the block diagram of four different types of feedback topologies.

(3)L-1634

	(b)	Show that input resistance increases in voltage series	ies
		negative feedback system.	4
3.	(a)	Discuss the effect of negative feedback on harmon	nic
		distortion of an amplifier.	4
	(b)	Derive an expression of close loop current gain	in

Unit II

current amplifier with negative feedback.

4

4.	(a)	Explain conditions for sustained oscillation. 2				
	(b)	Discuss RC phase-shift oscillator. Find the condition				
		for sustained oscillation and expression for its				
		frequency of oscillation. 6				
5.	(a)	Draw the circuit diagram of Colplitt's oscillator.				

5. (a) Draw the circuit diagram of Colplitt's oscillator.
Explain its operation and derive the expression for frequency of oscillation for the same.
6

(b) Crystal oscillators are highly stable. Comment. 2

Unit III

6.	(a)	Draw	the	circuit	diagram	of	Astable	Multivibrator
		and e	xplai	in its w	orking.			4

(b) Write a short note on Silicon Controlled Rectifier (SCR).

(3)L-1634

 Draw the Block diagram of IC555. Discuss circuit diagram of Monostable Multivibrator using IC555 and derive the expression for pulse width.

Unit IV

- 8. (a) Design a regulated power supply using Zener Diode as Shunt Voltage regulator and explain its operations. 5
 - (b) Define and explain Line Regulation and Load Regulation.3
- 9. (a) Explain a regulated power supply using op-amp. with zener diode as reference source. 5
 - (b) Derive an expression for percentage load regulation of regulated power supply using operational amplifier.3

(3)L-1634

Roll No.

Total Pages : 03

GSM/M-21 1635 ELECTRONICS Paper II (Theory) Advance Digital Electronics

Time : Three Hours]

[Maximum Marks : 40

- **Note** : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.
- 1. (a) Give two applications of DAC and ADC each.
 - (b) What is the advantage and disadvantage of flash type ADC ?
 - (c) Write a note on flash memory.
 - (d) Enlist the advantages of PLDS. $2 \times 4=8$

Unit I

- Explain working of R-2R ladder network of DAC with suitable circuit diagram and expression for its conversion. Also enlist its advantages.
 8
- **3.** (a) Define the following :
 - (i) Resolution
 - (ii) Accuracy
 - (iii) Monotonicity
 - (iv) Conversion Time with respect to DAC. 4

(3)L-1635

(b) A 10 bit DAC has a step size of 10 mV. Find full scale output voltage and percentage resolution. 4

Unit II

4.	(a)	With neat diagram, explain the flash type A/	D
		converter.	4
	(b)	What do you mean by quantization error in A to	D
		Converter ? How can it be minimized ?	4

5. (a) Compare R-2R and weighted resistor type ADC. 3
(b) Explain the working of Tracking Type ADC. What is the significance of using this type of ADC ? 5

Unit III

6.	(a)	A set	mi-conductor memory chip is specified 2K	× 8.
		(i)	How many bits can this chip store ?	
		(ii)	How many address lines are required to ad	cess
			this chip ?	2
	(b)	Desc	ribe the working principle of SRAM.	3
	(c)	Write	e a short note on Content Addressable Men	nory.
				3
(A) T	1.62.			

(3)L-1635

7.	(a)	Suppose the desired memory size is $2K \times 8$ bits
		and available memory size is 1 K \times 8 bits. How
		will you expand the memory capacity ? Explain in
		detail. 5
	(b)	Enlist and explain the characteristics of a Memory

(b) Enlist and explain the characteristics of a Memory device.3

Unit IV

8.	(a)	Design a 3 bit Binary to Gray Code Conver	ter
		using PLA.	5
	(b)	Write a short note on FPGA.	3
9.	(a)	Describe the operation of CPLD with the help	of
		block diagram.	5

(b) Describe the differences between PAL and PLA. 3

(3)L-1635

Roll No.

Total Pages : 03

GSM/J-21 1636 ELECTRONICS Paper II (Theory) Digital Electronics-II

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

(Compulsory Question)

- 1. (a) What are the advantages of a Universal Shift Register?
 - (b) Explain the difference between destructive and nondestructive memory.
 - (c) What are the merits of dual slope ADC over single slope ADC ?
 - (d) What is the difference between ROM and PROM ? 2 each

Unit I

2. (a) Discuss the working of Parallel-in Parallel-out (PIPO) shift register with circuit diagram.4

(3)L-1636

- (b) Explain, how a shift register can be used as Ring Counter ? 4
- **3.** (a) Draw the circuit diagram and discuss the working of a 4-bit Paralle-in Serial-out (PISO) Shift Register.
 - 4
 - (b) Draw the circuit of four bit bi-directional shift register, explain its working.

Unit II

- 4. (a) Define the following related to memory system :
 - (i) MAR
 - (ii) MBR
 - (iii) Access time
 - (iv) Write time
 - (v) Memory cycle time
 - (vi) Volatile memory. 5
 - (b) How many words can be stored in 8 K × 16 Memory Unit ? How many bits can be stored with this memory unit ? What are the size of MAR and MBR ?
 3
- (a) What are Random Access Memories ? Explain the differences between the bipolar RAM and MOS RAMs.
 - (b) Write a short note on Magnetic surface storage devices. 4

(3)L-1636

Unit III

6.	(a)	What is D/A converter ? Explain the working of						
		weighted register D/A converter with circuit						
		diagram. 5						
	(b)	A 5 bit resistive divider network has 10 volts full scale output, find output voltage for an input 10101.						
		3						
-	(-)	Frentain the modeling of single steps A/D consistent						
/.	(a)	Explain the working of single slop A/D converter						

with circuit diagram.4(b)Draw the circuit diagram of successive
approximation A/D converter and explain its

Unit IV

working.

8.	(a)	What do you mean by Asynchronous Data Transfer	?			
		Explain.	3			
	(b)	Describe, how the data is transferred through strok	e			
		control with timing diagram.	5			
9.	Disc	uss in brief the three possible modes of data transfe	r			
	to and from peripherals. 8					

(3)L-1636

3

Roll No.

Total Pages : 03

GSM/M-211637COMPUTER SCIENCEObject Oriented Programming with C++
Paper : I

Time : Three Hours]

[Maximum Marks : 40

 $4 \times 2 = 8$

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

- 1. Define the following :
 - (a) Inline Function
 - (b) Abstract Class
 - (c) New and delete operator
 - (d) Data hiding and encapsulation.

Unit I

2.	(a)	Differentiate between procedures oriented and object				
		oriented programming language. 4				
	(b)	Define scope resolution operator by giving its syntax				
		purpose and example. 4	ŀ			
(5)T	1627	1				

(5)L-1637

- 3. (a) What do you mean by static data member and member function ? Explain with suitable programming example.5
 - (b) Create a student class having roll no. and subjects as data member. Write a member function to display the result.3

Unit II

- 4. (a) Define console stream classes available in C++. Explain various manipulators available in console and manipulator classes with the help of suitable examples.
 - (b) Briefly explain the hierarchy of console stream classes.3
- Define Constructor and their purpose in a class. Explain constructor overloading by giving suitable example.

Unit III

- 6. (a) Define friend function. What are the rules for defining friend function ? Explain the benefits of friend function.4
 - (b) Write a friend function for finding largest of three numbers. 4

(5)L-1637 2

- 7. (a) Explain various string handling functions available in C++ with their syntax, purpose and example. 5
 - (b) Write a program to print reverse of a string using class.3

Unit IV

- 8. (a) Define Static polymorphism with its characteristics.
 3
 (b) Weite a superscript to conclude a site second sec
 - (b) Write a program to overload arithmetic operators (+, -, *, /) for complex numbers in C++. 5
- 9. Define Operators in C++. What are various types of operators in C++? Explain the precedence and associativity rules of operators in detail.
 8

Roll No.

Total Pages : 03

GSM/J-21 1638 COMPUTER SCIENCE Operating System Paper : II

Time : Three Hours]

[Maximum Marks: 40

Note: Attempt Five questions in all, selecting one question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1.	(a)	What is a difference between System Cell	and			
		System Program ?	2			
	(b)	What are different process states ?				
	(c)	Compare External and Internal Fragmentation.				
	(d)	What is File System ?	2			

Unit I

2.	Discuss the role of operating system as 'Resource'						
			8				
(5)L	-1638	1					

3.	Write	e notes on the follow	ving :			
	(a)	Multiprogramming	and	Time	Sharing	Operating
		System				4

(b) System Programs. 4

Unit II

4.	What is Processor Scheduling ? Explain scheduling cri	teria
	and level of scheduling.	8

5.	(a)	Diffe	erenatiate between the following : 4	ļ
		(i)	Process and Program	
		(ii)	Pre-emptive and Non-preemptive Scheduling	

(b) Explain deadlock detection and Recovery Method. 4

Unit III

6.	(a)	What do you mean by Race Condition ? Explain	in
		with example.	3
	(b)	Discuss Contiguous Memory allocation techniques.	5
7.	Write	notes on the following :	
	(a)	Virtual Memory	4
	(b)	Thrashing.	4
(5)L	-1638	2	

Unit IV

8.	(a)	What is File Management System ? W	/rite its			
		functions.	3			
	(b) Explain various File Access methods.					
9.	What	t is Disk scheduling ? Explain with examp	ples any			
	four	disk scheduling algorithms.	8			

Roll No.

Total Pages : 03

GSM/J-21 1639 COMPUTER APPLICATIONS Web Designing Using Advanced Tools Paper : I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. In addition to that attempt *four* more questions, selecting *one* question from each Unit.

(Compulsory Question)

- 1. (a) Write the advantages of CSS.
 - (b) Why XML is used ?
 - (c) Can XML be displayed ? How ?
 - (d) What is use of Mouseover in CSS ?
 - (e) What control structures are available in JavaScript?
 - (f) What is the purpose of option property in a form in JavaScript ?
 - (g) Name major methods of date object in JavaScript.
 - (h) What is the purpose of instance of and delete operator in JavaScript ?8×1=8

(5)L-1639

Unit I

2.	What is the need of dynamic web-sites ? How can y	ou
	create a dynamic web-site using DHTML ? Explain	by
	creating a web-site in DHTML.	8

3.	(a)	How tables can be formatted using	CSS ?	Explain
		using appropriate examples.		4

(b) What are the various styles and style inclusion methods in CSS ? 4

Unit II

4.	Explain	the	following	w.r.t.	XML	:	8
----	---------	-----	-----------	--------	-----	---	---

- (i) Flow Objects
- (ii) Embedding XML with HTML
- (iii) Document type declaration creation
- (iv) Rewriting HTML as XML.
- 5. (a) What is XML ? How is it compatible with others ? Discuss. 4
 - (b) Explain, how colours and background properties and used and handled in XML ? 4

Unit III

6. (a) What is JavaScript ? What are its major uses ? Explain by writing a sample script using JavaScript.

4

(5)L-1639

- (b) Describe various types of variable in JavaScript using appropriate examples.
- Describe various operators in JavaScript along with their hierarchy.
 8

Unit IV

- 8. What do you mean by DOM ? Explain by creating a script using user-defined and pre-defined objects in JavaScript.
 8
- 9. (a) What are the various properties of arrays object in JavaScript ? Explain in detail.4
 - (b) What is an exception ? How exceptions are handled in JavaScript ? Explain. 4
Roll No.

Total Pages : 02

GSM/J-211640COMPUTER APPLICATIONSProgramming in Visual BasicPaper : II

Time : Three Hours]

[Maximum Marks : 40

- Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.
- 1. (a) What is a form in visual basic.
 - (b) Describe the most flexible data type of Visual Basic.
 - (c) What is the working of select case statement in VB?
 - (d) What do you understand by collection in VB? $2 \times 4=8$

Unit I

2.	(a)	Compare	and	cor	ntrast	Visua	al	and	Non	-visual
		programm	ing.							4
	(b)	Define vis	sual b	asic	along	with	its	feat	ures.	4

How to develop an Application in Visual Basic ? Explain the steps in detail.
 8

1

(5)L-1640

Unit II

4.	How to declare variables ? Explain the types of variable
	declaration. How to convert and examine variable types ?

- 8
- Explain the various controls of Visual Basic with properties.
 8

Unit III

- 6. What are the looping statements in VB ? Explain its types with syntax and give examples.8
- Write a program to count number of prime elements in an array.
 8

Unit IV

- Explain the working of function and subroutine, with syntax and appropriate example.
 8
- Explain the argument passing mechanism with its types in VB.
 8

(5)L-1640

2

Roll No.

Total Pages : 02

GSM/J-211644BIOTECHNOLOGYBioinformaticsPaper : IX

Time : Three Hours]

[Maximum Marks : 40

Note : Question No. 1 is compulsory. Attempt *four* other questions, selecting *two* questions from each Unit. All questions carry equal marks.

(Compulsory Question)

- 1. Full form of the following : $4 \times 2=8$
 - (a) DNA
 - (b) BLAST
 - (c) NCBI
 - (d) FASTA.

Unit I

2.	(a)	Define Bioinformatics.	4
	(b)	Role of Bioinformatics in current situation	of
		Covid-19.	4

1

(5)L-1644

3.	(a)	Define Protein Sequence.	3
	(b)	Name and detail about a Protein Structural Databas	se.
			5
4	(2)	Define Genomics	3
т.	(a) (b)	Write a short note on Experimental approach	5
	(0)	white a short note on Experimental approach	10
		Genome Sequence Data.	5

Unit II

5.	(a)	(a) Write a short note on Pairwise sequence analysis. 4		
	(b)	Define Multiple Sequence Alignment.	2	
	(c)	How MSA is different from Pairwise S	Sequence	
		Alignment ?	2	
6.	Write (a) (b)	e short notes on the following : PDB PIR.	4×2=8	
7.	Diffe	rentiate between BLAST and FASTA.	8	

(5)L-1644

2

Roll No.

Total Pages : 03

1655

GSM/M-21

HINDI

(Compulsory)

(For B. Sc. Students)

Time : Three Hours]

[Maximum Marks : 40

नोट : सभी प्रश्न अनिवार्य हैं ।

1. निम्नलिखित में से किन्हीं दो गद्यांशों की सप्रसंग व्याख्या कीजिए :

6×2=12

- (क) शादी, शादी, शादी ! क्या शादी ही दुनिया में सब कुछ है ! घर में बच्चा मर रहा है और तुम्हें शादी सूझ रही है । आखिर तुम लोगों को हो क्या गया है ? वह अभी मृत्यु शैया पर पड़ी थी कि तुमने मेरी साली को लेकर शादी की बात चला दी । वह मर गई, मैं अभी रो भी न पाया कि तुम शगुन लेने पर जोर देने लगी ।
- (ख) बस हो चुका । बाबू रामस्वरूप, आपने मेरे साथ दगा किया ।
 आपकी लड़की बी. ए. पास है और आपने मुझसे कहा था
 कि सिर्फ मैट्रिक तक पढ़ी है । लाइए मेरी छड़ी कहाँ है !
 मैं चलता हूँ । (छड़ी ढूँढ़ कर उठाते हैं) बी. ए. पास ?
 उफ्फोह ! गजब हो जाता है । झूठ का भी कुछ ठिकाना है ।

(5)L-1655

- (ग) उसमें अधिक आकर्षण है । इसलिए तुम एक दूसरे के प्रति खिंचे । चाहे वह प्रेम था, चाहे वह घृणा थी; पर असल बात रक्त के खिंचाव की थी, वह होकर रही । काश कि⁻⁻⁻⁻⁻⁻मैं निर्मम हो सकती, काश कि मैं संस्कारों की दासता से मुक्त हो सकती ! हो पाती तो कुल, धर्म और जाति का भूत मुझे तंग न करता और मैं अपने बेटे से न बिछुड़ती ।
- (घ) यह निम्न स्तर की वृत्ति हमारे अंदर इस तरह से घर कर गई है कि हमारी जीवन संबंधी धारणा ही निम्न स्तर की होकर रह गई है । हम हँसते हैं तो वह हँसी निम्न स्तर की होती है । प्रेम करते हैं, तो वह प्रेम निम्न स्तर का होता है.........।
- लक्ष्मी नारायण लाल या विष्णु प्रभाकर में से किसी एक का साहित्यिक परिचय दीजिए ।
 6
- 3. निम्नलिखित में से किसी एक विषय पर निबन्ध लिखिए : 8
 - (i) शिक्षा और राजनीति
 - (ii) विज्ञान और पर्यावरण प्रदूषण
 - (iii) आकाशवाणी
 - (iv) गाँधी दर्शन
 - (v) कम्प्यूटर तथा इंटरनेट ।
- मुख्य सचिव हरियाणा सरकार की ओर से जिला उपायुक्त कुरुक्षेत्र को एक अर्द्ध-सरकारी पत्र लिखिए, जिसमें उनके द्वारा भिवानी जिले में बाढ़ से हुई क्षति की पूर्ति हेतु माँगी गई राहत राशि की प्रार्थना पर हो रही कार्यवाही की बात कही गई हो ।

(5)L-1655

अथवा

हरि सन्स, अम्बाला सिटी को तार भेजकर बनारसी सिल्क मगवाएँ।

- निम्नलिखित में से किन्हीं दस शब्दों के हिन्दी-तकनीकी अर्थ लिखिए :
 - (i) Indicator
 - (ii) Nucleus
 - (iii) Phenomenon
 - (iv) Inertia
 - (v) Parasite
 - (vi) Pharmaceutical
 - (vii) Intestine
 - (viii) Osmosis
 - (ix) Projection
 - (x) Plasma
 - (xi) Index
 - (xii) Ovary
 - (xiii) Vibration
 - (xiv) Virus
 - (xv) Sublimation
 - (xvi) Spectrum.

(5)L-1655

Roll No.

Total Pages : 3

1448

GSE/J-21

NUMBER THEORY AND TRIGONOMETRY Paper–BM-121

Time : Three Hours]

[Maximum Marks : 27

Note : Attempt *five* questions in all, selecting *one* question from each section. Question No. 1 is compulsory.

Compulsory Question

- 1. (a) If a is odd, show that $a^2 \equiv 1 \pmod{8}$. 1
 - (b) Evaluate $\mu(270)$. 1

(c) Prove that
$$i^{i} = e^{-(4n+1)\frac{\pi}{2}}$$
. 1

(d) Solve the equation : $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$.

(e) If
$$z = x + iy$$
, show that $\sin^2 z + \cos^2 z = 1$.

SECTION-I

2.	(a)	Prove that the number of primes is infinite.		3
	(b)	Find the remainder obtained on dividing 3 ¹⁸¹	by 17.	
			21/	2
144	8//KD	0/149	[P.T.C).

- 3. (a) Show that $x^{12} y^{12}$ is divisible by 91, if x and y are coprime to 91. 3
 - (b) If $(p-1)! + 1 \equiv 0 \pmod{p}$, then show that p is a prime number. $2^{1/2}$

SECTION-II

- 4. (a) Find all integers that satisfy the congruences $x \equiv 1 \pmod{4}, x \equiv 0 \pmod{3}, x \equiv 5 \pmod{7}$ simultaneously.
 - (b) Show that $\phi(12^k) = 12^{k-1} \phi(12)$, where k is a positive integer. $2^{1/2}$
- 5. (a) Find all *n* such that d(n) = 10. Hence find the least such value of *n*. 3

(b) Evaluate
$$\left(-\frac{168}{11}\right)$$
. $2\frac{1}{2}$

SECTION-III

6. (a) Show that the roots of the equation $(x - 1)^4 + x^4 = 0$ are given by $x = \frac{1}{2} \left[1 + i \cot \frac{2r + 1}{8} \pi \right], r = 0, 1, 2, 3.$

(b) Prove that the four roots of the equation $16x^4 - 20x^2 + 5 = 0$ are $\pm \sin \frac{\pi}{5}$ and $\pm \sin \frac{2\pi}{5}$. $2\frac{1}{2}$

1448//KD/149

- 7. (a) If $\tan (\theta + i\phi) = \sin(x + iy)$, prove that $\coth y$. $\sinh 2\phi = \cot x \cdot \sin 2\theta$.
 - (b) If $\tan (\theta + i\phi) = \tan \alpha + i \sec \alpha$, show that

$$2\theta = n\pi + \frac{\pi}{2} = \alpha, \ e^{2\phi} = \pm \left(\cot\frac{\alpha}{2}\right). \qquad 2\frac{1}{2}$$

SECTION-IV

8. (a) If the principal values are considered, prove that $\frac{(1+i)^{1-i}}{(1-i)^{1+i}} = \sin(\log 2) + i\cos(\log 2).$ 3

(b) Solve the equation :
$$\cos^{-1} x + \sin^{-1} \frac{1}{\sqrt{5}} = \frac{\pi}{4}$$
. $2\frac{1}{2}$

- 9. (a) Separate $tanh^{-1}(x + iy)$ into real and imaginary parts. 3
 - (b) Find the sum of the series :

$$\sin \alpha + \frac{1}{2} \sin 2\alpha + \left(\frac{1}{2}\right)^2 \sin 3\alpha + \dots \text{ to } \infty. \qquad 2\frac{1}{2}$$

Roll No.

Total Pages : 4

1449

GSE/M-21

ORDINARY DIFFERENTIAL EQUATION Paper–Math-BM-122

Time : Three Hours] [Maximun

Note : Attempt *five* questions in all, selecting *one* question from each section. Question No. 1 is compulsory.

Compulsory Question

- 1. (a) What do you mean by general solution of a differential equation.
 - (b) Define Clairaut's equation.
 - (c) Solve $p = \tan (px y)$. 1
 - (d) Determine the complementary function of the differential equation $(D^3 + 1)y = 3 + 5e^x$. 1
 - (e) Write the auxialiary equation of the simultaneous differential equation

$$\frac{dx}{dt} + y = \sin t; \ \frac{dy}{dt} + x = \cos t.$$

SECTION-I

2. (a) Solve the differential equation

$$\frac{2x}{y^3}dx + \left[\frac{y^2 - 3x^2}{y^4}\right]dy = 0.$$
 2¹/₂

1449//KD/150

[P.T.O.

[Maximum Marks : 26

(b) Solve the differential equation

$$(x^2y^2 + xy + 1)y \, dx + (x^2y^2 - xy + 1)x \, dy = 0. \quad 2^{1/2}$$

3. (a) Solve the differential equation

$$p^{3} - p(x^{2} + xy + y^{2}) + xy (x + y) = 0.$$
¹/₂

(b) Reduce the differential equation (px - y) (x - py) = 2p to Clairaut's form by substitution $x^2 = u$ and $y^2 = v$ and find its complete primitive and its singular solution; if any. $2\frac{1}{2}$

SECTION-II

- 4. (a) Find the orthogonal trajectories of the $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda} = 1$, where λ is a parameter. $2\frac{y}{2}$
 - (b) Solve the differential equation

$$\frac{d^2 y}{dx^2} + 4y = e^x + \sin 3x + x^2.$$
 2¹/₂

5. (a) Solve the differential equation

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 3x^2e^{2x}\sin 2x.$$
 2¹/₂

(b) Solve the differential equation

$$(1+x)^2 \frac{d^2 y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4\cos\log(1+x). \qquad 2\frac{1}{2}$$

SECTION-III

6. (a) Solve the differential equation

$$(1-x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x(1-x^2)^{3/2}.$$
 2¹/₂

(b) Solve the equation by removing the first derivative :

$$\frac{d^2 y}{dx^2} - 2\tan x \,\frac{dy}{dx} + \left[n^2 + \frac{2}{x^2}\right]y = 0.$$
 2¹/₂

7. (a) Apply the method of variation of parameters to solve

$$\frac{d^2 y}{dx^2} + n^2 y = \sec nx. \qquad 2\frac{1}{2}$$

(b) Solve the equation by using the method of undetermined cofficients

$$(D^2 + 1)y = 2e^x + \cos x.$$
 $2\frac{1}{2}$

SECTION-IV

8. (a) Solve the simultaneous equation

$$\frac{d^2x}{dt^2} - 3x - 4y = 0 \text{ and } \frac{d^2y}{dt^2} + x + y = 0.$$
 2¹/₂

(b)
$$\frac{dx}{z(x+y)} = \frac{dy}{z(x-y)} = \frac{dz}{x^2 + y^2}$$
. 21/2

1449//KD/150

9. (a) Solve :

$$\frac{dx}{1} = \frac{dy}{-2} = \frac{dz}{3x^2 \sin(y + 2x)}.$$
 2¹/₂

(b) Solve the differential equation

$$(y^{2} + z^{2} - x^{2})dx - 2xydy - 2xzdz = 0.$$
 2¹/₂

Roll No.

Total Pages : 4

GSE/M-21

1450

MATHEMATICS (Vector Calculus) Paper–BM-123

Time : Three Hours]

[Maximum Marks : 27

Note : Attempt *five* questions in all, selecting *one* question from each section. Question No. 1 is compulsory.

Compulsory Question

- 1. (a) Find the volume of parallelopiped whose edges are represented by $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$.
 - (b) Interpret the symbol $\vec{a} \cdot \nabla$. 1

(c) Evaluate
$$\frac{d}{dt} \left[\vec{r} \frac{d\vec{r}}{dt} \frac{d^2\vec{r}}{dt^2} \right]$$
. 1

- (d) Show that $\iint_{S} \hat{n} \, ds = 0$ for any closed surface S. 1
- (e) Find the unit tangent vector at t = 2 on the curve $x = t^2 1$, y = 4t 3, $Z = 2t^2 6t$.

1450//KD/1113

SECTION-I

- 2. (a) Show that $\vec{a} \times (\vec{b} \times \vec{c})$, $\vec{b} \times (\vec{c} \times \vec{a})$, $\vec{c} \times (\vec{a} \times \vec{b})$ are coplanar.
 - (b) If \vec{a} , \vec{b} and \vec{c} are perpendicular to each other, then prove $[\vec{a}, \vec{b}, \vec{c}] = a^2 b^2 c^2$. $2\frac{1}{2}$
- 3. (a) If \vec{a} , \vec{b} , \vec{c} be three unit vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{1}{2}\vec{b}$, find the angles which \vec{a} makes with \vec{b} and \vec{c} where \vec{b} and \vec{c} non-parallel. $2\frac{1}{2}$

(b) Evaluate
$$\frac{d}{dt} \left[\vec{r} \times \left\{ \frac{d\vec{r}}{dt} \times \frac{d^2\vec{r}}{dt^2} \right\} \right]$$
. 2

SECTION-II

4. (a) Find the directional derivatives of f(x, y, z) = xy + yz + zx

in the direction of the vector $2\hat{i} + 3\hat{j} + 3\hat{k}$ at the point (3, 1, 2). 2

(b) If $d = x^2 y^3 z^4$, then find div (grad ϕ) i.e., $\nabla \cdot (\nabla \phi)$. $2\frac{1}{2}$

5. (a) Show that the function
$$\frac{1}{r}$$
,
where $r = |\vec{r}| = \sqrt{x^2 + y^2 + z^2}$

is harmonic function provided $r \neq 0$. $2\frac{1}{2}$

(b) Evaluate $\nabla \cdot (\vec{r} \times \vec{a})$, where \vec{a} is a constant vector and $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.

SECTION-III

6. (a) Let u = xy, $v = \frac{x^2 + y^2}{2}$, w = z. Show that u, v, w are not orthogonal. 2

- (b) If δ , ϕ , *z* are cylindrical coordinates show that $\nabla \phi$ and $\nabla \log \delta$ are solenoidal. $2^{1/2}$
- 7. (a) If (r, θ, ϕ) are spherical coordinates show that $\nabla \phi = \nabla \times (r \cos \theta \nabla \theta).$ 2
 - (b) Find the volume element dv in
 - (i) cylindrical.
 - (ii) spherical polar coordinates. $2\frac{1}{2}$

SECTION-IV

- 8. (a) Evaluate $\iint_{S} \vec{f} \cdot \hat{n} \, ds$, where $\vec{f} = 12x^2y\hat{i} 3yz\hat{j} + 2z\hat{k}$ and S is the surface of the plane x + y + z = 1 included in the first octant. $2\frac{1}{2}$
 - (b) Find the work done in moving a particle in a force field $\vec{f} = 3x^2\hat{i} + (2xz - y)\hat{j} + z\hat{k}$ along the line joining the point (0, 0, 0) and (2, 1, 3).

1450//KD/1113

9. (a) State and prove Stokes theorem.

(b) Evaluate by Green's theorem

$$\oint_{C} (x^2 - \cos h y) \, dx + (y + \sin x) \, dy$$

where C is the rectangle with vertices

$$(0, 0), (4, 0), (4, 1), (0, 1).$$
 $2\frac{1}{2}$

Roll No.

Total Pages : 3

GSE/M-21

1462

COMPUTER AWARENESS (LEVEL-I) LI- (I) BASIC COMPUTER EDUCATION

Time : Three Hours]

[Maximum Marks: 100

- **Note :** Attempt *five* questions in all. All questions carry equal marks.
- नोट : कुल पाँच प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।
- What is operating system? Explain functions of Operating System.
 आपरेटिंग सिस्टम क्या है? आपरेटिंग सिस्टम के कार्य समझाइए।
- 2. Write short note on following :
 - (a) Interface.
 - (b) Desktop.
 - (c) Icons.
 - (d) Folder.
 - निम्नलिखित पर संक्षिप्त नोट लिखिए:
 - (क) इंटरफेस।
 - (ख) डेस्कटॉप।
 - (ग) ऑइकन।
 - (घ) फोल्डर।

1462//KD/839/Trans.

- What is Word Processing ? Explain component of MS-Word Window.
 वर्ड प्रोसेसिंग (Word Processing) क्या है? MS-Word Window के घटकों को समझाइए।
- What is Mail Merge ? Explain the steps to create mail merge.
 मेल मर्ज क्या है? मेल मर्ज बनाने के चरणों को समझाइए।
- 5. Write short note on the following :
 - (a) Electronic Spread Sheet.
 - (b) Cell, Row and Column.
 - (c) What If analysis ?
 - (d) Web Browsers.

निम्नलिखित पर संक्षिप्त नोट लिखिए:

- (क) इलेक्ट्रॉनिक स्प्रैड शीट।
- (ख) Cell, Row तथा Column.
- (η) What If analysis.
- (घ) वेब ब्राउजर।
- **6.** Explain the various mathematical functions and statistical functions in MS-Excel.

MS-Excel में विभिन्न गणितिय तथा सांख्यिकीय फलनों को समझाइए।

7. What is PowerPoint Presentation? Explain the advantage of PPT and also write the steps to create and modify the presentation.

PowerPoint Presentation क्या है? PPT के लाभ समझाइए। प्रजेंटेशन को बनाने तथा संशोधित करने के चरणों को भी लिखिए।

- Explain the various views of PPT.
 PPT के विभिन्न व्यूज को समझाइए।
- 9. Explain Internet and its application. इंटरनेट तथा इसके अनुप्रयोग समझाइए।
- **10.** What is net surfing and explain various tools used in net surfing?

नेट सर्फिंग क्या है तथा नेट सर्फिंग में प्रयुक्त विभिन्न उपकरणों को समझाइए। Roll No.

Total Pages : 3

GSE/M-21

1472

MATHEMATICS (Number Theory and Trigonometry) Paper–BM-121

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *one* question from each section. Q. No. 1 is compulsory.

Compulsory Question

1.	(a)	Show that the difference between any number and it	ts
		square is even.	2
	(b)	Evaluate $\phi(462)$.	2
	(c)	Prove that $\exp(2n\pi i) = 1$.	1
	(d)	Prove that $\cosh^2 x - \sinh^2 x = 1$.	1
	(e)	Find the principle and general values of log (-5).	2
		SECTION-I	
2.	(a)	Prove that an integer is divisible by 3 iff the sum of it digits is divisible by 3.	ts 4
	(b)	Find the remainder on dividing the	
		1! + 2! + 3! 4! + 5! + 100! by 12.	4

1472//KD/160

3. (a) Solve the congruence $222x \equiv 12 \pmod{18}$.

(b) If m is a prime number and a, b are two numbers less than m, then prove that a^{m-2} + a^{m-3}b + a^{m-4}b² + + b^{m-2} is a multiple of m.

SECTION-II

4. (a) Solve the congruences

 $x \equiv 1 \pmod{4}$ $x \equiv 3 \pmod{5} \text{ and}$ $x \equiv 2 \pmod{7} \text{ simultaneously.} \qquad 4$

(b) Prove that
$$\phi(n) = \frac{n}{2}$$
 iff $n = 2^k$ for some integer $k \ge 1$.

- 5. (a) Find all *n* such that d(n) = 10. Hence find the least such value of *n*. 4
 - (b) Show that the smallest positive quadratic non-residue of an odd prime *p* is itself prime. 4

SECTION-III

6. (a) If $2 \cos \alpha = x + \frac{1}{x}$, $2 \cos \beta = y + \frac{1}{y}$; show that one of

the values of
$$x^m y^n = \frac{1}{x^m y^n}$$
 is $2 \cos(m\alpha + n\beta)$. 4

1472//KD/160

4

- (b) Solve $x^7 = 1$ and prove that the sum of the *n*th powers of the root is 7 or zero, according as *n* is or is not a multiple of 7.
- 7. (a) Show that $[\sin (\alpha \theta) + e^{\pm i\alpha} \sin \theta]^n = \sin^{n-1}\alpha [\sin (\alpha n\theta) + e^{\pm i\alpha} \sin n\theta].$
 - (b) Form an equation whose roots are

$$\cos\frac{2\pi}{7}, \cos\frac{4\pi}{7} \text{ and } \cos\frac{8\pi}{7}.$$
 4

SECTION-IV

8. (a) If $i^{i^{i,\dots,at \text{ inf}}} = A + iB$, principal values only being considered, prove that

(i)
$$\tan \frac{\pi A}{2} = \frac{B}{A}$$

(ii) $A^2 + B^2 = e^{-\pi B}$. 4

(b) Separate $tan^{-1}(x + iy)$ into real and imaginary parts.

4

9. (a) Show that
$$\frac{\pi}{2\sqrt{3}} = 1 - \frac{1}{3^2} + \frac{1}{5 \cdot 3^2} - \frac{1}{7 \cdot 3^3} + \dots \infty$$
. 4

(b) Find the sum of the series :

$$3 \sin \alpha + 5 \sin 2\alpha + 7 \sin 3\alpha + \dots$$
 to *n* terms. 4

Roll No.

Total Pages: 4

1473

GSE/M-21

MATHEMATICS (Ordinary Differential Equation) Paper–BM-122

Time : Three Hours]			[Maximum Marks : 40
Not	æ: A	Attempt <i>five</i> questions in all, selecter each section. Q. No. 1 is computed	cting <i>one</i> question from sory.
		Compulsory Question	n
1.	(a)	Define exact differential equation	on. 1
	(b)	Find the integrating factor of the $a(xdy + 2ydx) = xydy$.	he differential equation 2
	(c)	Define Clairaut's equation.	1
	(d)	Solve the differential equation	$\frac{d^2y}{dx^2} + y = x. 2$
	(e)	Solve the equation $\frac{dx}{y} = \frac{dy}{-x} = \frac{dy}{-x}$	$\frac{dz}{yz}$. 2
		SECTION-I	
2.	(a)	Solve the differential equation	

$$(1 + e^{x/y})dx + e^{x/y}\left[1 - \frac{x}{y}\right]dy = 0.$$
 4

(b) Solve
$$(x^2 + y^2 + 2x)dx + 2ydy = 0.$$
 4

1473//KD/161

- 3. (a) Solve the differential equations $y = px + \sqrt{a^2 p^2 + b^2}$.
 - (b) Solve the differential equation

 $\sin px \cos y = \cos px \sin y + p \text{ and obtain the singular}$ equation. 4

SECTION-II

- 4. (a) Find the orthogonal trajectories of the family of coaxal circles $x^2 + y^2 + 2gx + c = 0$, where g is a parameter and c is a constant. 4
 - (b) Solve the differential equation

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dn} + 4y = x^2 + e^x + \cos 2n.$$
 4

5. (a) Solve the differential equation $\frac{d^2y}{dx^2} + 4y = x \sin n$. 4

(b) Solve the differential equation

$$x^{2}\frac{d^{2}y}{dx^{2}} + 4x\frac{dy}{dx} + 2y = x + \sin x.$$
 4

SECTION-III

6. (a) Solve the differential equation

$$x^{2}\frac{d^{2}y}{dx^{2}} - (x^{2} + 2x)\frac{dy}{dx} + (x + 2)y = x^{3}e^{x}.$$
 4

(b) Solve
$$\frac{d^2y}{dx^2} - \tan x \frac{dy}{dx} + 5y = 0$$
, by removing the first derivation.

7. (a) Solve the differential equation

$$x^{4}\frac{d^{2}y}{dx^{2}} + 2x^{3}\frac{dy}{dx} + n^{2}y = 0.$$
4

(b) Solve
$$x^2 \frac{d^2 y}{dn^2} - 2x(1+x)\frac{dy}{dn} + 2(1+x)y = x^3$$
, by

variation of parameters method. 4

SECTION-IV

8. (a) Solve the following simultaneous equations

$$\frac{dx}{dt} - 7x + y = 0$$
$$\frac{dy}{dt} - 2x - 5y = 0.$$

(b) Solve the equations
$$\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2 + (y+x)^2}$$
. 4

9. (a) Solve the differential equation

$$(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0.$$
 4

(b) Solve the simultaneous equations

$$\frac{xdx}{z^2 - 2yz - y^2} = \frac{dy}{y + z} = \frac{dz}{y - z}.$$
4

Roll No.

Total Pages : 4

1473

GSE/M-21

MATHEMATICS (Ordinary Differential Equation) Paper–BM-122

Time :	Three Hours]	[Maximum Marks : 40
Note :	Attempt <i>five</i> questions in all, each section. Q. No. 1 is con	selecting <i>one</i> question from mpulsory.

Compulsory Question

1.	• (a) Define exact differential equation.		1
	(b)	Find the integrating factor of the differential $a(ndy + 2ydx) = nydy$.	equation 2
	(c)	Define Clairaut's equation.	1
	(d)	Solve the differential equation $\frac{d^2y}{dx^2} + y = n$.	2
	(e)	Solve the equation $\frac{dx}{y} = \frac{dy}{-x} = \frac{dz}{yz}$.	2
		SECTION-I	

$$(1 + e^{x/y})dx + e^{x/y}\left[1 - \frac{x}{y}\right]dy = 0.$$
 4

(b) Solve
$$(x^2 + y^2 + 2x)dx + 2ydy = 0.$$
 4

1473//KD/161

- 3. (a) Solve the differential equations $y = px + \sqrt{a^2 p^2 + b^2}$.
 - (b) Solve the differential equation $\sin px \cos y = \cos px \sin y + p$ and obtain the singular equation. 4

SECTION-II

- 4. (a) Find the orthogonal trajectories of the family of coaxal circles $x^2 + y^2 + 2gx + c = 0$, where g is a parameter and c is a constant. 4
 - (b) Solve the differential equation

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dn} + 4y = n^2 + e^x + \cos 2n.$$
 4

5. (a) Solve the differential equation $\frac{d^2y}{dn^2} + 4y = n \sin n$. 4

(b) Solve the differential equation

$$x^2 \frac{d^2 y}{dn^2} + 4x \frac{dy}{dn} + 2y = n + \sin n.$$

SECTION-III

6. (a) Solve the differential equation

$$x^{2}\frac{d^{2}y}{dn^{2}} - (x^{2} + 2x)\frac{dy}{dn} + (x + 2)y = x^{3}e^{x}.$$
 4

(b) Solve
$$\frac{d^2 y}{dx^2} - \tan x \frac{dy}{dx} + 5y = 0$$
, by removing the first derivation.

$$x^{4} \frac{d^{2} y}{dx^{2}} + 2x^{3} \frac{dy}{dn} + n^{2} y = 0.$$
 4

(b) Solve
$$n^2 \frac{d^2 y}{dn^2} - 2n(1+n)\frac{dy}{dn} + 2(1+n)y = n^3$$
, by

variation of parameters method.

SECTION-IV

8. (a) Solve the following simultaneous equations

$$\frac{dn}{dt} - 7n + y = 0$$

$$\frac{dy}{dt} - 2n - 5y = 0.$$
4

(b) Solve the equations
$$\frac{dn}{z} = \frac{dy}{-z} = \frac{dz}{z^2 + (y+n)^2}$$
. 4

1473//KD/161

[P.T.O.

4

9. (a) Solve the differential equation

$$(yz + 2x)dn + (zx - 2z)dy + (ny - 2y)dz = 0.$$
 4

(b) Solve the simultaneous equations

$$\frac{xdn}{z^2 - 2yz - y^2} = \frac{dy}{y + z} = \frac{dz}{y - z}.$$
4

Roll No.

Total Pages : 4

GSE/M-21

1474

VECTOR CALCULUS Paper–BM-123

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *one* question from each section. Q. No. 1 is compulsory.

Compulsory Question

1. (a) Evaluate
$$\hat{i} \cdot (\hat{j} \times \hat{k}) + (\hat{i} \times \hat{k}) \cdot \hat{j}$$
. 2

(b) If $r = |\vec{r}|$, where $\vec{r} = x\hat{i} + y\hat{j} = z\hat{k}$ prove that $\nabla f(r) \times \vec{r} = \vec{0}$.

(c) Let *u*, *v*, *w* be orthogonal co-ordinates, prove that

$$\hat{e}_1 = \hat{E}_1, \hat{e}_2 = \hat{E}_2, \hat{e}_3 = \hat{E}_3.$$
 2

(d) If
$$\vec{r} = 2t\hat{i} + 3t^2\hat{j} - t^3\hat{k}$$
, evaluate $\int_1^2 \left(\frac{d\vec{r}}{dt} \times \frac{d^2\vec{r}}{dt^2}\right) dt$. 2

SECTION-I

2. (a) If $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors, such that $\vec{b} \times (\vec{c} \times \vec{a}) = \frac{1}{2}\vec{c}$, find angles which \vec{b} makes with \vec{c} and \vec{a} , \hat{i} and \vec{a} being non-parallel. 4 1474//KD/886 [P.T.O. (b) Prove that $(\vec{b} \times \vec{c}) \times (\vec{c} \times \vec{a}) = [\vec{a} \ \vec{b} \ \vec{c}] \ \vec{c}$ and hence deduce that $[\vec{b} \times \vec{c} \ \vec{c} \times \vec{a} \ \vec{a} \times \vec{b}] = [\vec{a} \ \vec{b} \ \vec{c}]^2$. 4

3. (a) Show that
$$[\vec{a} + \vec{b} \ \vec{b} + \vec{c} \ \vec{c} + \vec{a}] = 2[\vec{a} \ \vec{b} \ \vec{c}].$$
 4

(b) The necessary and sufficient condition for the vector function \vec{f} of a scalar variable *t* to have a constant

magnitude is
$$\vec{f} \cdot \frac{d\vec{f}}{dt} = 0$$
.

SECTION-II

4. (a) Find the directional derivative of

f(x, y, z) = xy + yz + zx

in the direction of the vector $2\hat{i} + 3\hat{j} + 6\hat{k}$ at the point (3, 1, 2).

- (b) Show that $r^n \vec{r}$ is irrotational, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ and $|\vec{r}| = r$.
- 5. (a) Explain geometrical interpretation of grad d. 4

(b) Prove that
$$\nabla^2 f(r) = \frac{2}{r} f'(r) + f''(r)$$
. 4

SECTION-III

- 6. (a) Express the vector field $2y\hat{i} z\hat{j} + 3x\hat{k}$ in spherical polar co-ordinates. 4
 - (b) Prove that spherical coordinate system is self-reciprocal.
- 7. (a) Express $\vec{f} = 3y\hat{i} + x^2\hat{j} z^2\hat{k}$ in cyclindrical coordinates.
 - (b) Prove that u = xy, $v = \frac{x^2 + y^2}{2}$, w = z are not orthogonal.

SECTION-IV

8. (a) Evaluate by Green's theorem

 $\oint_{C} (\cos x \sin y - xy) dx + \sin x \cos y \, dy, \text{ where } C \text{ is the}$ circle $x^2 + y^2 = 1.$ 4

(b) Evaluate by Stocke's theorem $\oint_C (e^x dx + 2ydy - sz)$ where C is the curve $x^2 + y^2 = 4$, z = 2.

9. (a) Evaluate
$$\iint_{S} (x^3 dy dz + y^3 dz dx + z^3 dx dy)$$
 over the

surface S of a cube bounded by the coordinate planes and the planes x = y = z = a. 4

1474//KD/886

(b) Show that the area bounded by a simple closed curve

C is given by $\frac{1}{2} \oint_C x dy - y dx$. Hence find the area of

the ellipse $x = a \cos \theta$, $y = b \sin \theta$. 4
Total Pages : 3

GSE/M-21

1479

PROPERTIES OF MATTER AND KINETIC THEORY OF GASES Paper–I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *one* question from each unit. Q. No. 1 is compulsory. Each question carries equal marks. Use of scientific non-programmable calculator is allowed.

Compulsory Question

- 1. (a) In a fly wheel, most of the mass is concentrated at the rim. Why? (2)
 - (b) Explain why a hollow shaft of same length, mass and material as that of a solid shaft is much stronger. (2)
 - (c) When a gas is suddenly compressed its temperature increases? Explain. (2)
 - (d) Why are viscosity, thermal conductivity and diffusion called transport phenomena. (2)

UNIT-I

 (a) State and prove theorem of parallel axes for a laminar body.
 (5)

1479//KD/166

- (b) A solid sphere of mass 500 g and radius 5cm rolls with a uniform velocity of 5 cm/sec along a straight line on a horizontal table. Calculate its total energy. (3)
- **3.** (a) A solid cylinder rolls down an inclined plane without slipping. Deduce an expression for its acceleration.

(3)

- (b) Derive an expression for the moment of inertia of a hollow sphere about a diameter. (3)
- (c) A sphere has a radius of 0.15 m. Calculate its moment of inertia about any diameter. Density of the material is 7.8×10^3 kg/m³. (2)

UNIT-II

4. (a) Prove that the couple per unit twist for a hollow cylindrical rod is :

$$C = \frac{\pi \eta r^4}{2l}$$

where the symbols have their usual notations. (5)

(b) Prove that a hollow cylinder is much stronger than a solid cylinder of the same mass, length and material.

(3)

- 5. (a) A uniform beam is clamped horizontally at one end loaded at the other. Obtain the relation between the load and depression at the loaded end. (5)
 - (b) Show that a shear strain Φ is equivalent to a compression strain φ/2 and an extension strain Φ/2, in mutually perpendicular directions. (3)

UNIT-III

- 6. (a) What consideration led Van der Waal to modify the gas equation of state? Deduce Van der Waal's equation for a real gas. (4)
 - (b) Deduce expression for the critical constants of a gas in terms of Van der Waal's constants. (4)
- (a) State the basic postulates of the kinetic theory of gases and prove that the pressure exerted by a perfect gas is two-thirds of the kinetic energy of translation per unit volume.
 - (b) Calculate the temperature at which the root mean square speed of a molecule of hydrogen will be equal to 2×10^3 m/s. (2)

UNIT-IV

- 8. (a) Discuss Maxwell's distribution law of molecular speeds in gases and hence derive an expression for Most probable speed. (5)
 - (b) Define mean free path of the molecules of a gas and derive an expression for it. (3)
- **9.** (a) On the basis of Kinetic Theory of gases, deduce an expression for coefficient of viscosity of a gas. (5)
 - (b) Find the diffusion coefficient of hydrogen in standard condition, if the free path of the molecule is 1.6×10^{-7} m. (3)

1479//KD/166

3

Total Pages : 3

GSE/M-21

1480

PHYSICS

(Semiconductor Devices)

Paper-II

Time : Three Hours]

[Maximum Marks: 40

Note : Q. No. 1 is compulsory. Attempt *four* more questions selecting *one* question from each unit. All questions carry equal marks. Use of Non-programmable calculator is allowed.

Compulsory Question

1.	(a)	Discuss effect of temperature on the electric conductivity of a semiconductor.	al: 2
	(b)	What is a load line ? How is it obtained.	2
	(c)	What are positive and negative feed backs ?	2
	(d)	Why Emitter follower has high input impedance ?	2
		UNIT–I	
_			

2.	(a)	Describe Zener Diode. Discuss how it is used as	a
		constant voltage regulator ?	5
	(b)	Describe π -filter.	3

1480//KD/167

- **3.** (a) What is a Rectifier ? Derive expressions for ripple factor of a half wave rectifier. 5
 - (b) What is a P-N Junction Diode ? Explain its action forward and reverse biasing. 3

UNIT-II

- (a) Discuss the input and output characteristics of a transistor in common base configuration and draw a circuit to obtain these characteristics.
 - (b) Calculate the collector current and the collector to the emitter voltage in the following circuit. Take $R_B = 300 \text{ K}$ ohm $R_C = 2 \text{ K}$ ohm, B = 50, $V_{CC} = 6 \text{ V}$.



2

- **5.** (a) Draw a circuit and explain working of NPN transistor.
 - (b) Explain collector to Base Bias circuit. 4

UNIT-III

- Draw the circuit diagram of a two stage RC coupled amplifier and explain the use of different resistances and capacitances. Explain the frequency response.
- 7. (a) Draw a circuit for common emitter amplifier and explain its working.5
 - (b) How the use of negative feed back in an amplifier improves its gain stability ? 3

UNIT-IV

- **8.** (a) Draw a circuit for common emitter collector tuned oscillator and explain its working. 6
 - (b) The tuned collector oscillator circuit used in the local oscillator of a radio receiver make use of an LC tuned circuit with L = 0.1 mH and C = 400 pf calculate the frequency of oscillations. 2
- **9.** Give the construction and working of CRO. Discuss its uses. 8

Total Pages : 3

GSE/M-21

1481

CHEMISTRY (Inorganic Chemistry) Paper–IV CH-104

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *five* questions in all, selecting *two* questions from each section. Question No. 1 is compulsory.

Compulsory Question

- **1.** (a) What is inert pair effect ?
 - (b) Why H_2SO_4 is highly viscous ?
 - (c) Which alkaline earth metal is radioactive ?
 - (d) Why sodium is stored in kerosene oil and not in H_2O ?
 - (e) What is p-n-p transitor ?
 - (f) Why xenon forms compounds with F_2 and O_2 ?
 - (g) Why CCl_2F_2 is used in refrigerators.
 - (h) Write down general electronic configuration of S-Block elements. (1×8=8)

SECTION-A

- 2. (a) Name two conditions for the formation of H-bond. 2
 - (b) Write note on p-type semiconductors. 2
 - (c) Describe briefly Dipole-Induced dipole type of Van der Waal's forces. 2

1481//KD/168

		SECTION-B	
	(c)	What are main postulates of BAND theory of metallic bonding. 2	
	(b)	Why LiF is insoluble in H_2O while fluorides of all other alkali metals are soluble ? 2	
5.	(a)	Discuss structure of XeF_2 and $XeOF_4$. 2	
	(c)	Why alkali metals give blue solution in liquid ammonia?	
	(b)	Discuss factors which led to late discovery of compounds of noble gases. 2	
4.	(a)	Discuss diagonal relationship of Beryllium with Aluminium. 2	
	(c)	What is structure of Beryllium Chloride in solid state and in vapour state ? 2	
	(b)	Why Li_2CO_3 is unstable while Na_2CO_3 is quite stable ?	
3.	(a)	Explain the role of semiconductors in photo voltaic cell	

6. (a) What are carbides ? How do CaC_2 and Al_4C_3 differs ?

2

- (b) Draw structures of P_4O_{10} and N_2O_5 . 2
- (c) Give *four* uses of silicone polymers. 2

1481//KD/168

2

7.	(a)	Give any two methods of preparation of Borazine.	2
	(b)	Why BF ₃ is less acidic than BCl ₃ ?	2
	(c)	Why CO_2 is gas while SiO_2 is solid ?	2
8.	(a)	Name any <i>four</i> oxy acids of sulphur with their structure	es. 2
	(b)	What happens when H_2O_2 reacts with (i) Acidified KMnO ₄ .	
		(ii) Acidified FeSO_4 .	2
	(c)	Discuss structure of IF ₇ on the basis of hybridizatio	n. 2
9.	(a)	Write note on cyclic silicates.	2
	(b)	Give any <i>three</i> methods of preparation of inter halog compounds.	en 2
	(c)	Chlorine forms ClF_3 while fluorine does not form FC Why ?	1 ₃ . 2

Total Pages: 4

GSE/M-21

1482

CHEMISTRY (Physical Chemistry) (Theory) Paper–V (CH-105)

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *five* questions in all, selecting at least *two* questions from each Section. Question No. 1 is compulsory. Use of Log-table and Non-programming calculator is allowed.

Compulsory Question

1.	(a)	What is the difference between Rate constant and	Rate	
		of reaction?	1	
	(b)	Give an example of Zero order reaction.	1	
	(c)	Write units of rate constant for Second order react	tion.	
			1	
	(d)	Write general expression for half-life period of a read	ction	
		of nth order.	1	
	(e)	State Ostwald' dilution law.	1	
	(f)	What do you mean by pH of a solution?	1	
	(g)	Write Debye-Huckel-Onsager equation in comp	olete	
		form. What do different symbols signify?	2	
148	1482//KD/169 [P.T.O.			

SECTION-A

- 2. (a) What do you mean by second order reactions? Show that for these reactions, the half-life period is inversely proportional to the initial concentration. $2\frac{1}{2}$
 - (b) The slope of the Arrhenius plot of log k against 1/T for a certain reaction is found to be -7610 K. Calculate the activation energy of the reaction.
 - (c) What is temperature coefficient of a reaction? Why the rate of reaction is doubled for every 10° C rise of temperature? $1\frac{1}{2}$
- 3. (a) Explain the simple collision theory for unimolecular reactions. 3
 - (b) For the reaction $A \rightarrow B + C$, the following data were obtained :

Time in seconds	:	0	900	1800
Concentration of A in moles/lit	re :	50.6	19.7	7.82
Find the order of the reaction.				2

- (c) How is the rate constant of an ionic reaction related to the dielectric constant of the solvent? 1
- 4. (a) Using 'Transition state theory', derive an expression for the rate constant in terms of the free energy of activation for a reaction. What is the significance of the equation obtained?
 - (b) How does catalyst increase the speed of a reaction? What is its effect on equilibrium constant of the reversible reaction? 2

- (c) What type of plot will be obtained for a zero order reaction for :
 - (i) Concentration versus time.
 - (ii) Rate of reaction versus concentration? 1
- (a) For a third order reaction of the type 3A→Products, derive an expression for the rate constant.
 - (b) Give *two* characteristics of first order reaction. 2
 - (c) Define 'Half-life-period' of a reaction. 1

SECTION-B

- 6. (a) What support do colligative properties of strong electrolytes offer in favour of Arrhenius theory of electrolytic dissociation?
 - (b) Define specific conductance, equivalent conductance and molar conductance. What are their units? 3
 - (c) In a conductometric titration, the solution to be added from burette should be much stronger than the solution taken in conductivity cell. Why? 1
- 7. (a) What is buffer solution? Explain buffer action with a suitable example for basic buffer.3
 - (b) At 18°C, the saturated aqueous solution of BaSO₄ was found to have specific conductivity of 3.648×10^{-6} ohm⁻¹ cm⁻¹, that of water being 1.250×10^{-6} ohm⁻¹ cm⁻¹. Ionic conductance of Ba²⁺ and SO₄²⁻ ions are 55 and 68.3 ohm⁻¹ cm² equiv⁻¹ respectively. Determine the solubility of BaSO₄ in water (Atomic weight of Ba = 137).

1482//KD/169

- 8. (a) How does Kohlrausch' law help in the calculation of equivalent conductance of weak electrolyte at infinite dilution? Explain by giving suitable example. 2
 - (b) What is the basic principle of conductometric titration? Discuss the titration curve obtained in the conductometric titration of AgNO₃ solution with KCl solution.
 - (c) What is the effect of dilution on specific and equivalent conductance? 1
- **9.** (a) Derive Henderson-Hasselbalch equation for the calculation of pH of an acidic buffer mixture. 2
 - (b) At 293 K, the equivalent conductance at infinite dilution of HCl, CH_3COONa and NaCl solution are 383.5, 78.4 and 102.0 ohm⁻¹cm² equiv⁻¹ respectively. If the equivalent conductance of CH_3COOH at some other dilution is 100.0 ohm⁻¹cm² equiv⁻¹ at 293 K, calculate the degree of dissociation of acetic acid at that dilution.
 - (c) What are the limitations of Arrhenius theory of Ionization? 2

1482//KD/169

4

Total Pages : 4

GSE/M-21

1483

CHEMISTRY (Organic Chemistry) (Theory) Paper–VI-CH-106

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *five* questions in all, selecting *two* questions from each Section. Question No. 1 is compulsory.

Compulsory Question

- 1. (a) Compare the melting point of *cis* and *trans*-2-butene. Explain giving reason.
 - (b) Chlorination of chlorobenzene is more difficult than that of toluene. Why?
 - (c) Arrange the "Following in the increasing order of their reactivity in $S_N 1$ reaction.

(i)
$$H_{3}C - C - CI = C_{6}H_{5}$$

(i) $H_{3}C - C - CI = CI = C_{6}H_{5}$

(ii)
$$H = C_6 H_5$$

(iii) $H = C_6 H_5$

1483//KD/170

(iv) C₆H₅CH₂Cl

- (d) Give IUPAC names of the following compounds :
 - (i) $H_2C=C=CH_2$.
 - (ii) $HC=C-CH_2CH=CH_2$ (2×4=8)

SECTION-A

2. (a) Complete the following reaction and give its mechanism.

$$CH_3CH_2CH_2CH_2OH \xrightarrow{Conc. H_2SO_4}$$

- (b) How will you convert :
 - (i) But-2-ene to ethanoic acid.
 - (ii) Propan-1-ol to propan-2-ol.
 - (iii) Propene to 1-Bromopropane. 3,3
- **3.** (a) What is peroxide effect ? Why is it shown only by HBr and not by HF, HCl and HI ?
 - (b) Complete the following reactions:

- **4.** (a) What are annulenes ? Give one example each of aromatic, anti-aromatic and non-aromatic annulenes.
 - (b) Explain the mechanism of nitration of benzene. 3,3
- **5.** (a) (i) Why an aqueous solution of Tropylium bromide gives precipitate with silver nitrate solution. ?
 - (ii) Benzene is unsaturated compound but it fails to give Baeyer's test. Explain.
 - (b) (i) Pick out the substituents which are (i) Ring activating (ii) Ring deactivating -Br,-NH₂, -CH₃, -NO₂, -CN
 - (ii) Predict the product of Friedel Craft's reaction of benzene with isobutyl chloride and write chemical equation. 3,3

SECTION-B

- 6. (a) Give products and mechanism of addition of $BrCCl_3$ to buta-1,3-diene in presence of peroxide.
 - (b) Why terminal alkynes are acidic in nature ? 3,3
- 7. (a) Complete the following reactions :
 - (i) $CH \equiv C CH = CH_2 + HCl \rightarrow$

(ii)
$$H_3C - C \equiv C - CH_3 \xrightarrow{Na/NH_3(liq.)}{196 - 200 \text{ K}}$$

(iii)
$$H_2C=CH-CH=CH_2 \xrightarrow{HBr}$$
 low temp.

- (b) Convert the following :
 - (i) Iodoform into ethyne.
 - (ii) Ethyne into acetaldehyde. 3,3

1483//KD/170

- **8.** (a) Allyl halides are more reactive than alkyl halides towards nucleophilic substitution reactions. Explain.
 - (b) Complete the following reactions :

(i)
$$CH_3COOAg \xrightarrow{Br_2, CCl_4} \Delta$$

(ii)
$$C_2H_5Br \xrightarrow{Na/Pb}$$
 Dry ether

(iii)
$$\xrightarrow{\text{Ni-Al/NaOH}} 3,3$$

- **9.** (a) Explain :
 - (i) Wurtz-Fittig reaction.
 - (ii) Dow's process.
 - (b) Complete the following reactions :

(i)
$$CH_{3}CH_{2}CH_{2}CI \xrightarrow{KOH (alc.)}{\Delta}$$

(ii) $C_{6}H_{5}N_{2}CI \xrightarrow{\oplus \ominus}{HBF_{4}}$
 $H_{13}C_{6}$

(iii)
$$H_{3C}$$
 H_{3C} H_{3

Total Pages : 6 **1484**

GSE/M-21 ENGLISH

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt all questions.

1. Read the following passage and answer the questions given at the end :

To be healthy is not to be civilized-savages are often healthy, although not so often as is usually supposed but unless you have good health, you cannot enjoy anything or achieve anything. There have, it is true, been great men who have been invalids, but their work was done in spite of their ill health, and, good as it was, it would have been better had they been well. Not only do men and women enjoy better health; they live longer than they ever did before, and they have a much better chance of growing up.

Questions :

- (i) Name the essay and its author.
- (ii) Is to be healthy a sign of civilization ?
- (iii) What is the importance of good health ?
- (iv) Find a word from the passage which means "uncivilized".
- (v) Use the word "chance" in a sentence of your own.

1484//KD/171

In some regions in the world, in equality between women and men directly involves matters of life and death, and takes the brutal form of unusually high mortality rates of women and a consequent preponderance of men in the total population, as opposed to the preponderance of women found in societies with little or no gender bias in health care and nutrition. Mortality inequality has been observed extensively in North Africa and in Asia, including China and South Asia.

Questions :

- (i) Name the essay and its author.
- (ii) What do you mean by "mortality inequality" ?
- (iii) Name the regions where mortality inequality is prevalent.
- (iv) Find a word from the passage which means "widely".
- (v) Use the word "Nutrition" in a sentence of your own.

5

2. Explain with reference to the context :

Our school syllabi, teaching methods and examinations are, with a few exceptions, based on encouraging conformism and rote learning. Questions by students are discouraged for several reasons. The teacher does not have the confidence to answer the question. Or, the question, although a good one, may be irrelevant to the subject matter in the syllabus.

There are many who object to the American intervention, fearing the destructiveness of war and the possibility that the conflict will escalate. There are many who repudiate a passive or quietist response, fearing the cost of not standing up to terrorism and fascism. 3

- 3. Answer the following questions in about 30 words each :
 - (a) What are the major defects of our civilization, according to C.E.M. Joad ?

OR

How can we ensure that our school children experience the joy of discovery in the present set-up ?

(b) What is Dr. Christlaan Barnard's achievement that made him a celebrity ?

OR

When, according to B.R. Ambedkar, will untouchability vanish ?

(c) What is the principle of graded inequality on which the Hindu social order is based ?

OR

Draw a comparison between the wars of the past on one hand and the Afghanistan War (2001) on the other.

(d) What are Amartya Sen's views on "Natality inequality"?

1484//KD/171

OR

What problems do women have to face in getting employment and promotions ? 6

4. What steps does J.V Narlikar suggest to encourage curiosity, creativity and originality in our education system ?

OR

Summarise the main argument of B.R. Ambedkar's essay "Untouchability and the Caste System".

5. Translate the following passage into Hindi :

Among the manifold misfortunes that may be fall humanity, loss of health is one of the severest. All the joys which life can give can not outweight the sufferings of the sick. Give the sickman everything and leave him with his sufferings and he will feel that half the world is lost to him. A comfortable bed, a delicious meal, a heavy purse all these can be enjoyed only when one enjoys good health. Illness makes even a very rich man envy the health of a beggar.

OR

(For Non-Hindi speaking Foreign students only)

The great advantage of early rising is the good start it gives us in our day's work. The early riser has done a large amount of hardwork before other men have got out of bed. In the early morning the mind is fresh, and there are few sounds or other distractions, so that work done at that time is generally well done. In many cases the early riser finds time

to take some exercise in the fresh morning air, and this exercise supplies him with a fund of energy that will last until the evening. By beginning so early, he knows that he has plenty of time to do thoroughly all the work he can be expected to do, and is not tempted to hurry over any part of it. All his work being finished in good time, he has a long interval of rest in the evening before the timely hour when he goes to bed. He gets to sleep several hours before midnight, at the time when sleep is most refreshing and after a sound night's rest rises early next morning in good health and spirit for the labours of a new day.

Questions :

- (i) What is the great advantage of early rising ?
- (ii) How does one feel in the early morning ?
- (iii) What supplies an early riser a fund of energy ?
- (iv) Give the meanings of the following words and use them in sentences of your own.
 - (a) Distractions.
 - (b) Thoroughly. 5
- 6. Make a precis of the following passage and give it a suitable heading.

Adversity has often been hailed as a blessing in disguise. It is adversity which brings into play all the best qualities in man which would otherwise have remained dormant. It is not a stumbling block in the way of man but a steeping stone in his career. The bestmen of the world have been nursed in the cradle of poverty. They were beset with calamities and hardships but they exterted their soul force

and came out successful. It is by struggling hard against adverse circumstances that man learns to be courageous and patient. Heraism consists in fighting hard against the vicissitudes of life and in smiling at the frowns of fate. One should be a hero in the strife : one should behave like a giant, not like a dwarf. Again, it is adversity that gives relish to enjoyment and prosperity of life, for if there were no adversity to interrupt them every now and then, they would lose all their charm. It is only due to trouble and pain that joy and happiness seem so charming. 7

7. Write a letter to the editor of a newspaper pointing out the dangers of environmental pollution.

OR

Write a letter to the Deputy Commissioner requesting him to put a ban on the use of loudspeakers in your town after 10 p.m. 8

Total Pages : 3

GSE/M-21

1487

BOTANY (Diversity of Archegoniates) Paper–I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *two* questions from each unit. Question No. 1 is compulsory. Illustrate your answers with suitable diagrams.

Compulsory Question

- 1. Answer briefly :
 - (a) Name on aquatic bryophyte.
 - (b) Name the two types of rhizoids found in Marchantia.
 - (c) Why is *Funario* known as cord moss ?
 - (d) What is the difference between elaters and pseudoelaters?
 - (e) Where was the fossil plant Rhynia discovered ?
 - (f) What are resurrection plants ? Give an example.
 - (g) Define heterospory. Give an example of a heterosporous plant.
 - (h) Give the botanical name of the plant commonly known as horse tails. (8×1=8)

1487//KD/174

UNIT-I

- **2.** (a) Draw a neat and well labelled diagram of L.S. of archegoniophore of *Marchantia*.
 - (b) Briefly explain vegetative reproduction in *Marchantia* through gamma cups.
 - (c) What are elaters and their function. (3+4+1=8)
- **3.** Write briefly on :
 - (a) Sporophyte of Marchantia.
 - (b) Internal structure of thallus of *Anthoceros*. (4+4=8)
- **4.** (a) With the help of suitable diagrams give the details of structure of sporophyte of *Anthoceros*.
 - (b) Write a short note on peristome teeth of Funoria.

(6+2=8)

5. With neat and well labelled diagrams explain the significant steps in the life cycle of *Funaria*. 8

UNIT-II

- 6. (a) What are rhizophores in *Selaginella* ? Justify why the rhizophores are known as organs sui-generis ?
 - (b) Draw T.S. of stem of *Selaginella* and label it.
 - (c) Write a note on male gametophyte of *Selaginella*.

(2+3+3=8)

- **7.** (a) With suitable diagrams explain the structure of strobilus of *Silaginella*.
 - (b) Write a brief note on the morphology of stem of *Equisetum*.
 - (c) Write a note on sporangiophore of *Equisetum*.

(3+2+3=8)

- **8.** (a) Draw a well labelled diagram of transverse section of stem of *Equisetum* passing through internode. List the hydrophytic and xerophytic characters exhibited by it.
 - (b) Write a brief note on the mechanism of dehiscence of sporangium in *Pteris*. (6+2=8)
- 9. With schematic diagrams explain the life history of *Pteris*. 8

1488

GSE/M-21 BOTANY (Genetics) Paper–II

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *two* questions from each unit. Question No. 1 is compulsory (short answer type). All questions carry equal marks.

Compulsory Question

- **1.** Answer the following :
 - (a) Define genetic material.
 - (b) Define a nucleosome.
 - (c) Who discovered Mendelism ?
 - (d) What is co-dominance ?
 - (e) What are reverse mutations ?
 - (f) Define a cistron.
 - (g) What is translation ?
 - (h) What is cytoplasmic inheritance ? $(8 \times 1=8)$

1488//KD/175

UNIT-I

2.	(a)	Explain any <i>one</i> experiment which prove that the genetic material.	DNA is 5
	(b)	Give physical properties of DNA.	3
3.	Exp	plain the following :	
	(a)	Degeneracy and non-ambiguity of genetic cod	e. 4
	(b)	Repetitive DNA.	4
4.	(a)	Explain coupling and repulsion hypothesis.	4
	(b)	Describe complete and incomplete linkage.	4
5.	Wri	te notes on :	
	(a)	Complementary gene interaction.	4
	(b)	Duplicate genes.	4
		UNIT-II	
6.	Diff	ferentiate between :	
	(a)	Gene and Chromosomal mutations.	
	(b)	Spontaneous and Induced mutations.	
	(c)	Morphological and Biochemical mutations.	
	(d)	Somatic and Germinal mutations.	(4×2=8)
7.	(a)	Explain complementation test.	5
	(b)	Explain the structure of tRNA.	3
148	8//KI	D/175 2	

8. Write notes on :

9.

(a)	Ribosomes.	3
(b)	hn-RNA processing.	3
(c)	Chain termination.	2
Expl	ain the following :	
(a)	Induction and Repression.	2
(b)	lac-operon in E.Coli.	6

Total Pages : 3

GSE/M-21

1489

ZOOLOGY

(Life and Diversity from Annelida to Arthropoda and Genetics-I)

Paper-I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* quesions in all, selecting *two* questions each from Section A and B. Question No. 1 is compulsory. Draw diagrams wherever required.

Compulsory Question

- 1. Give short answer to the following questions :
 - (a) Clitellum and its significance.
 - (b) Why chlorogogen cells are considered to be analogous to liver of vertebrates ?
 - (c) Coxal glands.
 - (d) Sericulture and Apiculture.
 - (e) What type of mouth parts are found in grasshopper?
 - (f) Gene pool.
 - (g) Pleiotropy.
 - (h) Which type of honey bee is produced parthenogenetically?

1489//KD/176

- (i) A man has hypertrichosis of the ears, a condition due to agene on the Y-chromosome. Show the types of male and female children he has.
- (j) Map unit. $(1 \times 10 = 10)$

SECTION-A

2. Give an illustrated account of Alimentary Canal of Pheretima. $7\frac{1}{2}$

Write	e notes on :	
(a)	Trochophore Larva.	21/2
(b)	Characters of Class Insecta.	21⁄2
(c)	Coelom.	21/2
Expl	ain the following :	
(a)	Malpighian Tubules.	21⁄2
(b)	Setae and Setal Sac.	21⁄2
(c)	Oviposition.	21/2
(a)	Give an illustrated account of Male reproductive sy of grasshopper.	stem 4
(b)	Describe the circulatory system of grasshopper.	31⁄2
	Writ((a) (b) (c) Expl (a) (b) (c) (a) (b)	 Write notes on : (a) Trochophore Larva. (b) Characters of Class Insecta. (c) Coelom. (c) Coelom. Explain the following : (a) Malpighian Tubules. (b) Setae and Setal Sac. (c) Oviposition. (a) Give an illustrated account of Male reproductive sy of grasshopper. (b) Describe the circulatory system of grasshopper.

SECTION-B

6. What is gene interaction ? Explain the complimentary gene interaction with the help of suitable cross. $7\frac{1}{2}$

Define crossing over. Explain the molecular mechanism of crossing over.
 7¹/₂

8.	(a)	Describe the inheritance of sex-linked disorder, a green colour blindness.	red- 4
	(b)	Explain the inheritance of Kappa particles Paramecium.	in 3½
9.	Writ	te notes on :	
	(a)	Chiasma Frequency (Two point test-cross).	21/2
	(a) (b)	Chiasma Frequency (Two point test-cross). Back Cross and Test Cross.	2 ¹ / ₂ 2 ¹ / ₂

Total Pages : 3

GSE/M-21

1490

ZOOLOGY

(Life and Diversity from Mollusca to Hemichordata and Genetics-II')

Paper-II

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* question in all. Question No. 1 is Compulsory. Select *two* questions from each Section A and B.

Compulsory Question

- **1.** Define the following :
 - (a) Evolution.
 - (b) Madreporite.
 - (c) Epitaenia.
 - (d) Anticodon.
 - (e) Stone Canal.
 - (f) Klinefelter's Syndrome.
 - (g) Collarette.
 - (h) Multiple Allelism.
 - (i) Osphradium.
 - (j) Central Dogma

1490//KD/177

 $(10 \times 1 = 10)$

SECTION-A

- 2. Describe briefly the various larvae of Echinoderms. $7\frac{1}{2}$
- **3.** (a) Describe the circulatory system of Balanoglossus.
 - (b) Write a short note on Gill lamella of Pila. $(5+2\frac{1}{2})$
- **4.** (a) Write down about the general characters and classification of phylum Echinodermata upto order level.
 - (b) Make a neat and labeled diagram of nervous system of Pila. (5+2¹/₂)
- **5.** (a) Write down about the biodiversity and economic importance of Echinoderms.
 - (b) Write a note on Aristotle's Lantern. $(5+2\frac{1}{2})$

SECTION-B

- 6. What is Karyotype? Give an account of human karyotype.
- 7. Describe the following :
 - (a) Sickle cell anaemia.
 - (b) Phenylketonuria.
 - (c) Alkaptonuria. $(2\frac{1}{2}\times3=7\frac{1}{2})$

8. Describe the complete process of protein synthesis. 7¹/₂
1490//KD/177 2

- 9. Write notes on :
 - (a) Transgenic animals.
 - (b) Amniocentesis.
 - (c) Erythroblastoma foetalis.

(2¹/₂×3=7¹/₂)

Total Pages : 3

GSE/M-21

1493

ELECTRONIC DEVICES AND CIRCUITS-II Paper-I

Time : Three Hours]		[hree Hours]	Maximum Marks : 40
Not	e: 7	There are <i>nine</i> questions in this paper equal marks. Attempt <i>five</i> question 1 is compulsory. Attempt remain selecting <i>one</i> question from each	ber. All questions carry as in all. Question No. ing <i>four</i> questions by unit.
		Compulsory Question	n
1.	(a)	Why fixed bias circuit is not pre-	eferred? 2
	(b)	Why gain of an amplifier is pref	erred to be in decibel?
	(c)	Write the disadvantages of trans	former coupling. 2
	(d)	Why drain current becomes cons FET?	stant after pinch-off in 2
		UNIT-I	
2.	(a)	Define and derive expressions fo	r three stability factors
		for fixed bias circuit.	6

(b) Discuss the reasons due to which the Q-point gets shifted.

1493//KD/865
- **3.** (a) Why the operating point is required to be selected in the middle of load line in an amplifier circuit? 2
 - (b) Define and derive expression for three stability factors for collector-to-base bias circuit.

UNIT-II

- 4. (a) Discuss voltage divider biasing arrangement. 4
 (b) Draw the emitter-bias circuit and explain its working. 4
 5. (a) Explain biasing technique in Bias circuit with emitter resistor. 4
 - (b) Explain the gain in multi-stage amplifier. 4

UNIT-III

6. (a) Draw and explain two stage R-C coupled amplifier and calculate its overall gain.
(b) Why direct coupled amplifiers are not preferred?
7. (a) With the help of circuit diagram, explain the working

of direct coupled amplifier.

(b) Write the advantages of transformer coupling. 2

6

UNIT-IV

8. (a) Draw and explain the drain and transfer characteristics of p-channel depletion MOSFET. 4

1493//KD/865

	(b)	Discuss CS and CD low frequency model.	4
9.	(a)	Draw and explain the drain characteristics of n-chan	nel
		JFET.	4
	(b)	Discuss FET small signal low frequency model.	4

Total Pages : 4

GSE/M-21

1494

ELECTRONIC–I (Electronic Devices and Circuits-II) Paper–I (Theory)

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *one* question from each unit. Q. No. 1 is compulsory.

Compulsory Question

- 1. (a) Why bias stabilization is required? (2)
 - (b) The voltage gains of a three stage amplifier are 30, 50 and 80. Calculate the overall voltage gain in decibels.
 (2)
 - (c) If mid band gain of an amplifier is 200, calculate the cut-frequency gain in dB.
 (2)
 - (d) Input resistance of a JFET is very high. Justify. (2)

UNIT-I

- 2. (a) What do you understand from biasing? Why a transistor should be biased? (5)
 - (b) Calculate Collector current and collector to emitter voltage for the circuit shown in Fig. 1. Given that $R_b = 300 \text{ k}\Omega$; $R_C = 2 \text{ k}\Omega$.; $V_{CC} = +9 \text{ V}$ and $\beta = 50$. Assume that $V_{BE} = 0.3 \text{ V}$.

1494//KD/179



Fig. 1

3. (a) What are the main requirements of a biasing circuit?

(3)

(3)

(b) Discuss collector to base bias circuit and obtain its operating point. (5)

UNIT-II

- Explain transistor biasing circuit with Emitter resistor. Obtain its operating point. Discuss how this circuit provides stabilization to the operating point? What are its drawbacks?
 (8)
- 5. (a) Calculate the dc bias voltages and currents in Fig. 2. Assume that $V_{BE} = 0.3$ V. Given that $R_1 = 40$ kΩ; $R_2 = 5$ kΩ; $R_C = 5$ kΩ; $R_E = 1$ kΩ; $V_{CC} = +12$ V and $\beta = 60$.

1494//KD/179



Fig. 2 (5)

(b) Explain the function of emitter resistor R_E in the potential divider biasing circuit. (3)

UNIT-III

- 6. (a) Draw a two stage transistorized RC coupled amplifier circuit and discuss its operation in detail. (6)
 - (b) An RC coupled amplifier has voltage gain of 100 in the frequency range of 400 Hz to 25 kHz. The low and high 3 dB frequencies are 80 Hz and 40 kHz respectively. Calculate the gain in dB at cut-frequencies.
 (2)
- 7. (a) Discuss a direct coupling scheme in amplifiers. Give its applications. (5)
 - (b) Define bandwidth, lower cut-off and higher cut-off frequencies of an amplifier with a diagram. (3)

1494//KD/179

UNIT-IV

- 8. What is a JFET? Explain drain and transfer characteristics of JFET. What do you understand by Pinch-off ? (8)
- 9. (a) Discuss construction of a p-channel enhancement MOSFET and explain its working. (5)
 - (b) Define different parameters of FET. (3)

Total Pages : 4

GSE/M-21

1495

ELECTRONICS (Digital Electronics-I) (Theory) Paper–II

Time : Three Hours]

[Maximum Marks: 40

Note : Attempt *five* questions in all. Question No. 1 is compulsory. Select *one* question from each unit.

Compulsory Question

1.	(a)	What is BCD code? What are its advantages a disadvantages ?	and 2
	(b)	How can AND-OR circuit can be converted to NAI logic ?	ND 1
	(c)	Define don't care conditions.	1
	(d)	What is meant by current source logic ?	1
	(e)	Define figure of merit.	1
	(f)	What is current hogging in logic circuit?	2

UNIT-I

- 2. (a) Perform the following operations using 8 bits :
 - (i) $(42)_{10} (19)_{10}$ in 2's complement.
 - (ii) $(29)_{10} (13)_{10}$ in 1's complement. 4

1495//KD/180

(b) Convert the following :

(i)
$$(108.35)_{10} = (?)_2 = (?)_8$$
.
(ii) $(453.16)_8 = (?)_{16} = (?)_{10}$.

- **3.** (a) A seven bit even parity Hamming code is received as 1100110. Find and correct the error, if any. 2
 - (b) Write a short note on ASCII code. 2
 - (c) Represent the number $(6837.98)_{10}$ in
 - (i) NBCD code.
 - (ii) EX-3 code.
 - (iii) Gray code.
 - (iv) 2421 code.

UNIT-II

- 4. (a) Give the definition, symbol and truth table of XNOR and NAND gates. 2
 - (b) Explain De Morgan's theorem and give its proof. 2
 - (c) Prove the following identities using Boolean theorems:

(i)
$$AB + BC + CA = \overline{A} \ \overline{B} + \overline{B}\overline{C} + \overline{A}\overline{C}$$

(ii)
$$AB + AC + ABC (AB + C) = 1.$$
 4

5. (a) Find the SOP and POS expression for the following function :

$$f(A, B, C) = \overline{A} + BC.$$
 2

1495//KD/180

(b) Simplify the following using K- map:

F (A, B, C, D) = Σ (2, 5, 6, 9, 10, 12, 13, 14) + $\Sigma\phi$ (3, 7, 11, 15).

(c) Simplify and implement the following function using NOR gates only.

 $\mathbf{F} = \pi \ (4, \ 6, \ 10, \ 12, \ 13, \ 15). \tag{3}$

UNIT-III

- 6. (a) What are logic families? Discuss the classification of logic family.2
 - (b) Draw the logic diagram of DTL NAND gate for three inputs. Explain its operation. Mention the advantages and disadvantages of this logic family.
- 7. (a) Define the following characteristics of Digital ICs : Fan-in, Fan-out, Propagation Delay time, Noise margin.

4

(b) What are advantages of CMOS logic? Discuss CMOS NAND gate. 4

UNIT-IV

- 8. (a) What is a Full-adder? Draw and explain the circuit diagram of a Full adder circuit using two half adders using NAND gates only.
 - (b) Draw and explain a 4-bit parallel binary adder. 4

1495//KD/180

- **9.** The entrance to a group of three flats has a tube light. The light is to be switched ON and OFF independently by the tenants of the three flats using switches located in their flats. Design a switching circuit to implement this using :
 - (a) XOR gates.
 - (b) NAND gates only.

Total Pages : 3

GSE/M-21

1496

ELECTRONICS Paper–II (Theory)

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting atleast *one* question from each unit. Question No. 1 is compulsory.

Compulsory Question

- 1. (a) Define Kirchhoff's Current and Voltage Laws.
 - (b) Write the equations for h-parameters.
 - (c) Define Mesh analysis of a circuit.
 - (d) Write the steps to solve the network using Superposition Theorem. (2×4=8)

UNIT-I

2. (a) Determine the value of the current through the 1 Ω in the following network using Mesh analysis. 5



(b) Explain the concept of source transformation.

3

1496//KD/181

- 3. (a) State and explain Thevenin Theorem. Write the steps to solve the network using Thevenin's Theorem. 4
 - (b) Find the voltage across 4 Ω resistor using Superposition Theorem. 4



UNIT-II

- 4. (a) Write a short note on Duality.
 - (b) Find the maximum power delivered to the load by using maximum power transfer theorem for the following circuit. 2



5. (a) State and explain Norton's Theorem.

(b) Draw the Norton equivalent of the following circuit. 5



3

UNIT-III

- 6. (a) Define Z-parameters and draw its equivalent circuits.
 - (b) Find h-parameters of the following network : 4

4



- 7. (a) Define ABCD Parameters. Derive Hybrid parameters in terms of ABCD parameters. 6
 - (b) Define Y parameters and write equations for it. 2

UNIT-IV

8. (a) Obtain the lattice equivalent of a symmetrical T Network shown below : 4



- (b) For a π -network having series impedance as Z_1 and shunt impedance 2 Z_2 , what is the image impedance ?
- **9.** Determine the driving point impedance at the input and output of a terminated network. 8

1496//KD/181

Total Pages : 2

GSE/M-21

1497

COMPUTER SCIENCE (Programming in 'C') Paper–I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *one* question fromeach unit in addition to Compulsory Question No. 1. All questions carry equal marks.

Compulsory Question

1.	(a)	Explain structure of a 'C' program.	2
	(b)	Elaborate on type casting in C language.	2
	(c)	What are the differences between break and	continue.
			2
	(d)	Write short note on structure in C language.	2

UNIT-I

2.	Explain the following in 'C' language with suitable examples :			
	(a)	Keywords.	4	
	(b)	Data types.	4	

3. Explain various unformatted and formatted Input / Output Functions in 'C' language with suitable examples. 8

UNIT-II

- 4. Discuss various types of operators available in 'C' language. Also write down the precedence of operators. 8
- 5. Explain if-else' and 'nested if' statements in 'C' language with suitable examples. 8

UNIT-III

- Explain the while and do-while loop control structures in 'C' language. Give examples.
- Explain various parameter passing techniques used in 'C' language using examples.
 8

UNIT-IV

- Explain different types of storage classes available in 'C' language along with their purpose, scope, storage and lifetime.
- Define Array. Explain various types of Arrays. How the arrays are declared, initialized and processed in 'C' language. Give examples.

1497//KD/182

Total Pages : 3

GSE/M-21

1498

COMPUTER SCIENCE (Logical Organization of Computer) Paper–II

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *one* question from each unit. Q. No. 1 is compulsory.

Compulsory Question

- 1. (a) Prove that 2421 is self complimenting.
 - (b) State and prove Demorgans' Law.
 - (c) Make TT of three variable NOR and AND gate.
 - (d) Define Duality principle.

UNIT-I

- **2.** Convert as follows :
 - (a) (i) (7.625)₁₀ to Binary, Octal and Hexadecimal.
 - (ii) What is number in Binary and Octal for C2BF7 ?
 - (iii) What is $(X)_2 = (2345)_6$?
 - (iv) (101010111110) to Octal and Hexadecimal.
 - (b) Write coding scheme for 8421 and for Error Detection and Correction system.

1498//KD/183

[P.T.O.

- **3.** (a) Write Note on Floating point Notation.
 - (b) Perform 2's compliment arithmetic.

-22 -12 and -36-17 8

UNIT-II

- 4. (a) Define Boolean algebra and write its postulates.
 - (b) Solve Using Boolean Algebra

(i)
$$(x + y)(xz + z)$$
 $(\overline{y} + xz) = \overline{x}yz$.

(ii) ab + bc + ca.

8

5. (a) Draw and Label 4 Variable K-Map and solve for four corners.

OR

Make Venn Diagram for OR, NAND and XOR gates.

- (b) (i) Solve using K-Map $Z = \Sigma 1, 3, 5, 7, 9, 13, 15$
 - (ii) Solve using K-Map $Z = \pi 0, 2, 4, 6.$ 8

UNIT-III

- 6. (a) Draw T.T and Gates for OR and NAND, NOR and XOR Gates. 8
 - (b) Make circuit using logic gates for Full Adder.
- 7. (a) Make circuit and explain 4 : 1 Multiplexer and 10 to 4 line encoder. 8
 - (b) Make 10 to 4 line Encoder.

1498//KD/183

UNIT-IV

8.	Exp	lain Clocked SRFF, its problem and solution.	8
9.	(a)	Make Mod-5 Counter suing JKFF.	
	(b)	Make Shift register to store 1011.	8

Total Pages : 3

GSE/M-21

1499

COMPUTER APPLICATION (Information Technology) Paper–I

Time : Three Hours]

[Maximum Marks : 40

Note : Answer *five* questions in all, selecting *one* question from each unit in addition to the Compulsory question No. 1.

Compulsory Question

- **1.** What is :
 - (a) IT.
 - (b) Microprocessor.
 - (c) DSS.
 - (d) OLAP.
 - (e) EDI.
 - (f) GPS.
 - (g) WWW.
 - (h) Multiplexing.

 $(8 \times 1 = 8)$

UNIT-I

- 2. Briefly explain the following :
 - (a) Motherboard.
 - (b) Bus.

1499//KD/184

(c) Port.

(d) Memory Expansion Slot. $(4\times2=8)$

OR

What is Information Technology? Define its role. Briefly explain any *three* applications of IT. 8

UNIT-II

- **3.** Briefly explain the following :
 - (a) Data Warehouse.
 - (b) Data Mining.
 - (c) Firewall.

(d) Virus.

$(4 \times 2 = 8)$

OR

Explain the various threats to computer security and solutions available to counter those threats. 8

UNIT-III

What is E-Commerce? What are its application areas? Explain how mobile communication has helped in advancement of E-commerce.

1499//KD/184

Briefly explain the following :

- (a) Digital Sound.
- (b) Multimedia Presentation Devices.
- (c) Global Positioning System.
- (d) Smart Card. $(4\times 2=8)$

UNIT-IV

 What is Computer Network? What are its various types? Briefly explain various transmission media used in a Computer Network.

OR

Briefly explain the following :

- (a) Browser.
- (b) Service Provider.
- (c) Domain Name.
- (d) Search Engine.

 $(4 \times 2 = 8)$

1499//KD/184

Total Pages : 2

GSE/M-21

1500

PROGRAMMING IN C Paper–II

Time : Three Hours]

[Maximum Marks : 40

Note : A candidate will be required to answer *five* questions in all, selecting *one* question from each unit in addition to Compulsory Question No. 1. All questions carry equal marks.

Compulsory Question

1.	(a)	Write short note on Sorting. What are different types of Sorting Techniques?	f 2
	(b)	Explain the syntax and use of scanf() function in C Language.	2
	(c)	Write short note on break and continue statement in C Language.	2
	(d)	Define Functions. How can we declare functions in C Language? 2	2

UNIT-I

- 2. Define Problem Solving. Explain various Problem Solving Techniques with suitable examples. 8
- 3. Explain Linear Searching and Binary Searching with suitable examples. 8

1500//KD/1

UNIT-II

- 4. Explain various data types available in C Language. Also discuss the format specifiers corresponding to each data type.
- 5. Explain various types of operators in C Language along with their hierarchy and suitable examples. 8

UNIT-III

- 6. Explain If, If... Else and Switch Statements in C Language with examples. 8
- Explain the various Loop Control Statements in C Language along with their syntax and examples.
 8

UNIT-IV

- 8. Explain the various Storage Classes in C Language with examples. 8
- Define Array. Explain various types of Arrays in C Language. How can we do initialization in 1-D and 2-D Arrays in C Language.
 8

1500//KD/1

Total Pages : 3

GSE/M-21

1501

ELECTRONIC EQUIPMENT MAINTENANCE (Principles of Electronics–II) Paper–I (Theory)

Time : Three Hours]

[Maximum Marks : 30

Note : Attempt *five* questions in all, selecting *one* question from each unit. Question No. 1 is compulsory.

Compulsory Question

- 1. (a) Which Kirchoff's law is based on conservation of charge ? Justify.
 - (b) Super position theorem is based on the concept of Linearity or Non-Linearity principle.
 - (c) What do you mean by level trigger flip-flop ?
 - (d) Explain the use of ultrasonic soldering. $(1\frac{1}{2}\times4=6)$

UNIT-I

- **2.** (a) Discuss the superposition theorem. 2
 - (b) Find the current I_L in the following circuit through 15 Ω resistor : 4



1501//KD/2

3. (a) State and explain Thevenin's theorem.

(b) What value of E is required to deliver 10 W of power to 8 Ω resistor ?



UNIT-II

4. (a) Determine the open circuit impedance parameters of the following circuit : 4



- (b) What are transducers ? Classify the tranducers according to their applications. 2
- 5. (a) Explain the theory and working of photo voltaic cell.
 - (b) Find the G-parameters of the following network :



1501//KD/2

2

4

2

UNIT-III

- 6. (a) How a T flip-flop be used as divided by two devices ? 2
 - (b) Design a module-7 counter using T-flip-flops and explain. 4
- 7. (a) Discuss D flip-flop in detail. Also explain the uses of Asynchronous inputs used in this flip-flop.3
 - (b) Design and draw the circuit of a shift register to generate the 1101011......... sequence.

UNIT-IV

- 8. (a) What attributes should a service engineer possess to become successful in his profession ?
 - (b) List desoldering tools and describe the desoldering procedure. What precautions need to be observed in desoldering ?
 3
- **9.** (a) Write down the correct soldering techniques for good soldering. 3
 - (b) Describe the requisites for an ideal servicing workshop.What precautions should be taken while designing the servicing workshop.

1501//KD/2

Total Pages : 2

GSE/M-21

1503

BIOTECHNOLOGY (General Microbiology) Paper–III

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *two* questions from each unit and Q. No. 1 is compulsory question.

Compulsory Question

- 1. Define/Explain/Comments on the following :
 - (a) Chemoheterotrophs.
 - (b) HEPA filters.
 - (c) Oxidative phosphorylation.
 - (d) Resolution and Magnification.
 - (e) Antony van Leeuwenhock.
 - (f) Labelled diagram of growth curve in bacteria.
 - (g) Photosynthetic apparatus in bacteria.
 - (h) SEITZ Filters.

 $(1 \times 8 = 8)$

UNIT-I

- 2. Write note on :
 - (a) Working principle of fluorescence microscope.
 - (b) Membrane filter for sterilization.

1503//KD/4

- (c) Differential staining.
- (d) Contribution of Robert Koch. (2×4=8)
- **3.** Write a note on principle and applications of different chemical and radiation methods used for sterilization. 8
- **4.** Write a clearcut difference in the working principle and utility potential of SEM, TEM, phase contrast and dark field Microscope.

UNIT-II

- 5. Write note on :
 - (a) Classification of bacteria on the basis of extreme environment.
 - (b) Cell wall of gram +ve bacteria.
 - (c) Structure of lambda phase.
 - (d) Synchronous growth. (2×4=8)
- 6. Write down in detail the causing agent, symptoms, transmission and control measures of AIDS and pneumonia in humans.
- 7. Write note on :
 - (a) Flow chart of HMP pathway. 5
 - (b) Structure of Hepatitis B virus. 3

1503//KD/4

1710

GSQ/M-21 COMPUTER APPLICATION IN OFFICE MANAGEMENT

Paper-Theory

Time Allowed : 3 Hours]

[Maximum Marks : 80

Note : Attempt five questions in all. All questions carry equal marks. कुल पाँच प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।

- (a) What are the two main components of CPU of a Computer system? List the main functions of each component.
 कंप्यूटर प्रणाली के CPU के दो मुख्य घटक क्या हैं? प्रत्येक घटक के मुख्य कार्यों को सूचीबद्ध कीजिए।
 - (b) What is Computer ? Differentiate Digital, Analog and Hybrid Computers.

कंप्यूटर क्या है? डिजिटल, एनालॉग और हाइब्रिड कंप्यूटर में अंतर कीजिए।

What are the various types of Storage Devices? Explain with appropriate examples.
 16

विभिन्न प्रकार के स्टोरेज डिवाइस क्या हैं? प्रत्येक को उपयुक्त उदाहरणों के साथ समझाइए।

- 3. Write short notes on the following :
 4×4=16

 निम्नलिखित पर संक्षिप्त टिप्पणियाँ लिखिए :
 - (a) Word Processing.(b) Spreadsheets.वर्ड प्रोसेसिंगस्प्रीडशीट।
 - (c) Operating system.(d) Database.ऑपरेटिंग सिस्टम।डेटाबेस।
- (a) Explain Access mechanism of Optical Disk.
 ऑप्टिकल डिस्क की पहुँच तंत्र की व्याख्या कीजिए।

1710/K/37

P. T. O.

	(b) Write short note on CD and DVD.				8
		सीडी और डीवीडी पर संक्षिप	त नोट	ट लिखिए।	
5.	Write short notes on the following :				
	निम्न	लिखित पर संक्षिप्त टिप्पणियाँ लि	नखिए	:	
	(a)	Table.	(b)	Queries.	
		टेबल।		क्वेरीस।	
	(c)	Reports.	(d)	Form.	
		रिपोर्ट।		फॉर्म।	
6.	Write short notes on the following :				
	निम्न	लिखित पर संक्षिप्त टिप्पणियाँ लि	1खिए	:	
	(a)	LAN.	(b)	WAN.	
		लैन।		वान।	
	(c)	WWW.	(d)	Video Conferencing.	
		डब्ल्यूडब्ल्यूडब्ल्यू.		वीडियो कॉनफेरेंसिंग।	

- 7. What do you mean by Software? What are the various types of Software? Explain with examples.
 16
 सॉफ्टवेयर से आपका क्या अभिप्राय है? सॉफ्टवेयर के विभिन्न प्रकार क्या हैं। सोदाहरण व्याख्या कीजिए।
- 8. What are the various types of Secondary Storage Devices? Explain with examples.

विभिन्न प्रकार के माध्यमिक भंडारण उपकरण क्या हैं? उदाहरण सहित स्पष्ट कीजिए।

9. What do you mean by RAM? What are various types of RAM? Explain with examples.

RAM से आपका क्या तात्पर्य है? विभिन्न प्रकार के रैम क्या हैं? उदाहरण सहित बताइए।

10. What are different componenets of Form? Explain each component with example. Also explain the procedure to generate Form.
16
फॉर्म के विभिन्न घटक क्या हैं? उदाहरण के साथ प्रत्येक घटक की व्याख्या कीजिए। फॉर्म जेनरेट करने की प्रक्रिया भी बताइए।

1710/K/37

Roll No		
---------	--	--

1717

GSQ/M-21 COMPARATIVE CONSTITUTION OF THE UK AND USA

Option-(i)

Time Allowed : 3 Hours]

[Maximum Marks : 80

- Note : Attempt any five questions. All questions carry equal marks. किन्हीं पाँच प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान हैं।
- 1. Describe the salient features of the Constitution of America.16अमेरिका के संविधान की मुख्य विशेषताओं का वर्णन कीजिए।
- Define Conventions. Describe the important conventions of the British Constitution.
 परम्पराओं की परिभाषा दीजिए। इंग्लैंड के संविधान की मुख्य परम्पराओं का वर्णन कीजिए।
- 3. Examine the powers and position of the American President.16अमेरिका के राष्ट्रपति की शक्तियों व स्थिति का परीक्षण कीजिए।
- 4. "The British Parliament is so Supreme that it can do anything except changing man into woman and women into man." Comment.
 16 ''ब्रिटिश संसद इतनी सर्वोच्च है कि वह स्त्री और पुरुष और पुरुष को स्त्री में परिवर्तित करने के अतिरिक्त अन्य सब कुछ कर सकती है।'' टिप्पणी कीजिए।
- 5. Write the main functions of Political Parties.16राजनीतिक दलों के मुख्य कार्य बताइए।
- 6. What is meant by Pressure groups ? Explain the characteristics of American Pressure groups.
 16 दबाव समूह का क्या अर्थ है? अमेरिकन दबाव समूहों की विशेषताओं का वर्णन कीजिए।
- Compare the characteristics of British and American Bureaucracy.
 ब्रिटिश एवं अमेरिकी नौकरशाही की विशेषताओं की तुलना कीजिए।
- Discuss the recent Political Trends found in America.
 अमेरिका में पाई जाने वाली नवीन राजनीतिक प्रवृत्तियों का वर्णन कीजिए।

1717/K/44

9. Objective type questions :

वस्तनिष्ठ प्रश्नः (i) Conventions are found mostly in which Country ? (a) America (b) Pakistan (c) England (d) Japan. प्रथाएँ सबसे अधिक किस देश में अस्तित्व रखती हैं? (b) पाकिस्तान (a) अमेरिका (c) इंग्लैंड (d) जापान। (ii) What is the nature of American Constitution ? (a) Flexible (b) Rigid (c) Flexible and Rigid (d) None of the above. अमेरिकी संविधान कैसा है? (a) लचीला (b) कठोर (c) लचीला एवं कठोर (d) उपरोक्त कोई नहीं। (iii) Official resisdence of American Prime Minister is : (a) White House (b) Bukinghum Place (c) 10, Dowining Street (d) Ellesey House. अमेरिका के प्रधानमंत्री का निवास है : (b) बंकिघंम महल (a) व्हाइट हाउस (d) इलिसी पैलेस। (c) 10, डाउनिंग स्ट्रीट (iv) Who said, "England Constitution is the father of all Constitutions." (b) Munro (a) Thomas Pan (d) Lenin. (c) Wilson यह किसने कहा, ''इंग्लैंड का संविधान सभी संविधानों का जनक है।'' (a) थॉमस पैन (b) मुनरो (d) लेनिन। (c) विल्सन (v) Cabinet is responsible to : (a) House of Commons (b) Speaker (c) President (d) King. मंत्रिमण्डल किसके प्रति उत्तरदायी है? (a) कॉमन्स सदन (b) स्पीकर (c) राष्ट्रपति (d) सम्राट।

1717/K/44

(vi) Total Numbers of Senate are:

- (a) 100 (b) 95 (c) 120 (d) 200. सीनेट के सदस्यों की कुल संख्या कितनी है? (a) 100 (b) 95 (c) 120 (d) 200. (vii) System of Govt. in England is : (a) Federal (b) Unitary (c) Parliamentary (d) Monarchy. इंग्लैंड में शासन का स्वरूप कैसा है? (a) संघात्मक (b) एकात्मक (c) संसदीय (d) राजतंत्र। (viii) Which Party system is found in USA? (a) Bi-Party (b) Multi-Party (c) Single Party (d) None of the above. अमेरिकी में कौन-सी दलीय प्रणाली पाई जाती है? (b) बहु-दलीय (a) द्वि-दलीय
 - (c) एकदलीय (d)
- (d) उपरोक्त में से कोई नहीं।

1721

2

GSQ/M-21 REAL AND COMPLEX ANALYSIS

Paper–BM-361

Time Allowed : 3 Hours]

[Maximum Marks : 27

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory.

Compulsory Question

- 1. Write short answer of the following :
 - (a) Prove Symmetry of Beta function.
 - (b) Find the Fourier coefficient for the function f(x) = x in $[=\pi, \pi]$.
 - (c) Find a point on the complex plane corresponding to the point $\left(\frac{1}{3}, -\frac{2}{3}, \frac{2}{3}\right)$ on the Riemann sphere $x^2 + y^2 + z^2 = 1$. 2
 - (d) Find the angle of rotation at z = 2 + i for the transformation $w = z^2$.

(e) Find the fixed points of Bilinear transformation $w = \frac{z}{z-2}$. 1

UNIT-I

- 2. (a) Find the Jacobian of u, v, w with respect to x, y, z given that $u = x + y + z; v^2 = yz + zx + xy; w^3 = xyz.$ $2^{1/2}$
 - (b) Prove that :

$$\int_{0}^{\pi/2} \sqrt{\tan \theta} \, \mathrm{d}\theta = \frac{\pi}{\sqrt{2}}.$$
 2¹/₂

1721/K/48

3. (a) Evaluate $\iiint xyz \, dx \, dy \, dz$ over the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.$$
 2¹/₂

(b) Evaluate
$$\int_{0}^{\infty} \int_{0}^{x} x e^{-x^2/y} dy dx$$
 by changing the order of integration. $2\frac{1}{2}$

UNIT-II

4. (a) Find the Fourier series for the function

$$f(x) = |\sin x|; -\pi < x < \pi.$$
 $2^{1/2}$

(b) Find the half-range cosine series for $f(x) = x(\pi - x)$ in the interval (0, π). $2^{1/2}$

5. (a) Obtain Fourier series for the function $f(x) = x - x^2$, -1 < x < 1. $2\frac{1}{2}$

(b) Let

$$f(x) = \begin{cases} -1 & , & -\pi < x < 0 \\ 1 & , & 0 < x < \pi \end{cases}$$

Using Parseval's identity, compute the sum $\sum_{k=1}^{\infty} (2k-1)^{-2}$. $2\frac{1}{2}$

UNIT-III

- 6. (a) Prove that $f(z) = \overline{z}$ is nowhere differentiable, but continuous everywhere in complex plane. $2^{1/2}$
 - (b) Show that $u = \frac{1}{2} \log(x^2 + y^2)$ is harmonic and find its harmonic conjugate. $2\frac{1}{2}$
- 7. (a) Prove that an analytic function with constant modulus is constant. $2\frac{1}{2}$
 - (b) For what value of λ , the function $f(z) = r^2 \cos \lambda \theta + ir^2 \sin 2\theta$ is analytic. Also find f'(0). $2^{\frac{1}{2}}$

1721/K/48

UNIT-IV

8. (a) Let the rectangular region D in the z-plane be bounded by x = 0, y = 0, x = 2, y = 3. Determine the region D¹ of the w-plane into which D is mapped under the transformation w = √2 e^{iπ/4}z. 2¹/₂
(b) Find the image of | z+3i |=6 under the transformation

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

- 9. (a) Find the Bilinear transformation which maps the points z = 0, -1, i onto $w = i, 0, \infty$. Also find the image of the unit circle |z|=1. $2^{1/2}$
 - (b) Find all the Mobius transformation which map the half-plane $I(z) \ge 0$ into circle $|w| \le 1$. $2^{1/2}$
Maximum Marks : 26

1722

1

1

1

GSQ/M21 LINEAR ALGEBRA Paper–BM-362

Time allowed : 3 Hours

Note : Attempt **five** questions in all, selecting **one** question from each unit. Question No. **1** is compulsory.

Compulsory Question

- 1. (i) In a vector space V(F), prove that : (-1)u = -u for all $u \in V$. 1
 - (ii) Prove that the set $\{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ is a basis of vector space $R^{3}(R)$.
 - (iii) Prove that the transformation $T : R^2 \to R$ defined by T(x, y) = xy is not linear.
 - (iv) Define Dual Space.
 - (v) Define Inner Product Space.
 - (vi) Define Self Adjoint Operator.

UNIT-I

- 2. (i) Prove that the necessary and sufficient condition for a vector space V(F) to be a direct sum of its subspaces W1 and W2 are that :
 - (a) $V = W_1 + W_2$ (b) $W_1 \cap W_2 = \{0\}.$ $2^{1/2}$
 - (ii) Prove that the four vectors $v_1 = (1, 0, -1)$, $v_2 = (-1, 0, 0)$, $v_3 = (1, 0, 1)$ and $v_4 = (2, 1, 3)$ are linearly depended over *R*. $2^{\frac{1}{2}}$
- 3. (i) Prove that every subspace *W* of a finite dimensional vector space V(F), has a complementary subspace *W* and lim W = lim V lim W. $2\frac{1}{2}$

(ii) If V is a vector space of all square matrices over

R and W =
$$\left\{ \begin{bmatrix} a & b \\ o & c \end{bmatrix} : a, b, c, \in R \right\}$$
. Find a basis of $\frac{V}{W}$. $2\frac{1}{2}$

UNIT-II

4. (i) Prove that every n-dimensional vector space U(F) is isomorphic to F^n .

- (ii) If $T: U(F) \rightarrow V(F)$ is a linear transformation, then prove that : Rank T + Nullity T = lim U.
- 5. (i) Let $S = \{v_1, v_2, v_3\}$ be a basis of $v_3(R)$, defined by $v_1 = (-1, 1, 1)$, $v_2 = (1, -1, 1), v_3 = (1, 1, -1)$. Find the dual basis of S. $2^{1/2}$
 - (ii) If V is a finite dimensional vector space and W be a subspace of V, then prove that A[A(w)] = W. $2\frac{1}{2}$

 $2^{1/2}$

UNIT-III

6. (i) Let
$$T_1: \mathbb{R}^3 \to \mathbb{R}^2$$
 such that $T_1(x, y, z) = (x + y + z, x + y)$
 $T_2: \mathbb{R}^3 \to \mathbb{R}^2$ such that $T_2(x, y, z) = (2x + z, x + y)$

 $T_3: \mathbb{R}^3 \to \mathbb{R}^2$ such that $T_3(x, y, z) = (2y, x)$

Find a formula defining the transformation $2T_1 - 3T_2 + 4T_3$. Also find the image of (-1, 0, 3) under this map and show that T_1 , T_2 , T_3 are linearly independent. $2^{1/2}$

- (ii) Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be a linear operator defined by T(x, y, z) = (x 3y 2z, y 4z, z). Show that *T* is invertible and find T⁻¹. $2^{1/2}$
- 7. (i) Write the matrix of linear transformation $T: p_3(x) \to p_2(x)$ defined by $T(a_0 + a_1x + a_2x^2 + a_3x^3) = a_3 + (a_1 + a_3)x + (a_0 + a_1)x^2$ relative to the basis $B = \{1, x - 1, (x - 1)^2, (x - 1)^3 \text{ and } B^1 = \{1, x, x^2\}.$ $2^{1/2}$
 - (ii) Let $T : \mathbb{R}^3 \to \mathbb{R}^3$ be a linear transformation such that :

$$\mathbf{A} = \begin{bmatrix} 3 & 1 & 7 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$

is a matrix of T with respect to ordered basis $\{(1, 2, 3), (1, 2, 0), (1, 0, 0)\}$. Determine the Eigen values and Eigen vectors for *T*. $2\frac{1}{2}$

UNIT-IV

8. (i) Let V be an inner product space, then prove that :
$$\| u + v \| \le \| u \| + \| v \|.$$
 $2^{1/2}$

(ii) Let S be a subset of an inner product space V then show that : $S^{1} = S^{111}$. $2^{1/2}$

9. (i) Let *W* be a subspace of an inner product space V(F). If $\{u_1, u_2, ..., u_n\}$ is an orthonormal basis of *W* and $\{v_1, v_2, ..., v_m\}$ is an orthonormal

basis of W_{\perp} , then show that $\{u_1, u_2, \dots, u_n, v_1, v_2, \dots, v_m\}$ is an orthonormal basis of V. $2^{1/2}$

(ii) Let *T* be a normal operator on an inner product space *V*. If $u \in V$, then show that :

$$T(u) = 0$$
 iff $T^{*}(u) = 0.$ $2^{1/2}$

1743

GSQ/M21 REAL AND COMPLEX ANALYSIS

Paper-BM-361

Time allowed : 3 Hours

/•>

Note: Attempt five questions in all, Question No. 1 is compulsory. Selecting **one** question from each unit. All questions carry equal marks.

Compulsory Question

1.	(1)	Find the coefficient of magnification and angle of rotation	at
		$z = 2 + i$ for the conformal transformation $w = z^2$.	2
	(ii)	Show that the function $u(x, y) = \frac{1}{2}\log(x^2 + y^2)$ is harmonic.	2
	(iii)	Evaluate : $\int_0^\infty \sqrt{x} e^{-x^3} dx$	2
	(iv)	Define Fourier Series for odd functions.	2
		UNIT-I	
2.	(i)	Show that the function $u = x^2 + y^2 + z^2$, $v = x + y + z$, $w = xy + yz +$	ZX
		are not functionally independent of each other. Also find	the
		relation between them.	4
	(ii)	Show that :	4

) Show that :

$$\int_{0}^{\infty} \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx = 2B(m, n)$$

3. (i) Change the order of integration of the following integral and hence evaluate : 4

$$\int_{0}^{a} \int_{y^{2}/a}^{y} \frac{y}{(a-x)\sqrt{ax-y^{2}}} \, dx \, dy$$

(ii) Evaluate $\iiint z(x^2 + y^2 + z^2) dxdydz$ through the volume of the cylinder $x^2 + y^2 = 4$ intercepted by the planes z = 0 and z = 2. 4

4. (i) If the Fourier Series for f(x) converges uniformly in (c, c + 2l), then prove that : 4

$$\int_{c}^{c+2l} [f(x)]^2 dx = l \left[\frac{1}{2} a_0^2 + \sum_{n=1}^{\infty} (a_n^2 + b_n^2) \right]$$

1743/K/63

Maximum Marks : 40

P.T.O.

- (ii) Obtain the Fourier Series expansion for the function $f(x) = x + x^2$ in $[-\pi, \pi]$.
- 5. (i) Find the Fourier expansion of the function f(x) with period 2π defined as : 4

$$f(x) = \begin{cases} -1 & \text{, for } -\pi < x < 0 \\ 1 & \text{, for } 0 \le x \le \pi \end{cases}$$

(ii) Express f(x) = x as half range cosine series in 0 < x < 2. 4 UNIT-III

- 6. (i) Find the stereographic projection of the point z = x + iy of extended complex plane on the sphere of radius 1 and centre (0, 0, 0) in R³. 4
 - (ii) Show that the function $f(z) = |z|^2$ is continuous everywhere but nowhere differentiable except at origin. 4
- 7. (i) Show that the function $f(z) = \sqrt{|xy|}$, z = x + y is not analytic at the origin, although the Cauchy-Hiemann equations are satisfied at that point. 4
 - (ii) Prove that $u = y^3 3x^2y$ is a harmonic function and find the corresponding analytic function. 4

UNIT-IV

- 8. (i) What is the region of the w-plane into which the rectangular region in the z-plane bounded by the lines x = 0, y = 0, x = 1 and y = 2, is mapped under the transformation w = z + (2 - i).
 - (ii) Find the fixed points and normal form of the Mobins transformation: 4

$$W = \frac{z}{z-4}$$

- 9. (i) Find the billnear transformation which maps the joints z = 1, i, -1onto w = i, 0, -i. Also, find the image of |z| < 1.
 - (ii) Prove that the image of |z + 2i| = 5 under the transformation

$$f(z) = \frac{1}{z}$$
 is $u^2 + v^2 = \frac{1}{21} (1 - 4v)$.

Maximum Marks : 40

1744

GSQ/M21 LINEAR ALGEBRA Paper–BM-362

Time allowed : 3 Hours

Note : Attempt **five** questions in all, selecting **one** question from each unit. Question No. **1** is compulsory.

Compulsory Question

1.	(i)	Find the dimension of Vector space $Q(\sqrt{2})$ over Q.	2
	(ii)	Define Linear dependence and Independence of vectors of a set.	2
	(iii)	Express $(1, 2)$ as a Linear combination of $(2, 0)$ and $(1, 3)$.	1
	(iv)	Find the norm of vector $u = (2, -3, 6)$ and normalize the vector.	2
	(v)	Define Inner Product Space.	1
		UNIT-I	
2.	(i)	Show that the set $Q(\sqrt{2}) = \{a + b\sqrt{2} : a, b \in Q\}$ is a vector space	over
		Q with respect to the compositions :	
		$(a + b\sqrt{2}) + (c + d\sqrt{2}) = a + c + (b + d)\sqrt{2}$	
		$\alpha(a+b\sqrt{2})=a\alpha+b\alpha\sqrt{2}$	
		where a, b, c, d and α are rational numbers.	4
	(ii)	Union of two subspacer is a subspace if and only if one is contain	ed in
		the other.	4

- 3. (i) The intersection of two subspaces w_1 and w_2 of Vector Space V(F) is also a subspace of V(F).
 - (ii) Determine a basis of the subspace spanned by the vector (-3, 1, 2), (0, 1, 3), (2, 1, 0), (1, 1, 1,).

UNIT-II

- 4. (i) Let $u_1 = (1, 1)$, $u_2 = (0, 1)$ be a basis of IR^2 . Let $T : IR^2 \to IR$ to be linear transformation for which $T(u_1) = 3$ and $T(u_2) = -2$. Find the linear transformation *T*. 4
 - (ii) Let T: U(F) → V(F) be a linear transformation. If u₁, u₂,, u_n are linearly independent vectors of U and T is one-one then T(u₁), T(u₂),, T(u_n) are also linearly independent.

- 5. (i) If $T: U(F) \to V(F)$ is a linear transformation, then : dim[R(T) + dim[N(T)] = dim U.
 - (ii) If $T: U \to V$ be a homomorphism, then ker(T) is a subspace of U. 3 UNIT-III

5

4

- 6. (i) Let $T: IR^3 \rightarrow IR^3$ be a linear operator defined by : T(x, y, z) = (2x, 4x - y, 2x + 3y - z). Show that *T* is invertible and find T^{-1} .
 - (ii) If linear transformation T: ⊄(IR) → ⊄(IR) defined as T(a+ib) = a-ib for all a, b ∈ IR. Find matrix of T with respect to the ordered basis B = {1 + i, 1 + 2i}.
- 7. (i) Prove that similar matrices have same characteristic polynomial.
 - (ii) Find the Eigen values, Eigen vectors for the matrix :

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
UNIT-IV

- (ii) Every finite dimensional vector space is an inner product space. 4
- 9. (i) Obtain an orthonormal basis with respect to standard inner product for the subspace of IR³ generated by (1, 0, 1), (1, 0, -1) and (0, 3, 4). 4
 - (ii) Let T be a Linear Operator on a Unitary space V, then T is normal iff : $|| T^{*}(u) || = || T(u) || \forall u \in V.$ 4

GSQ/M-21

SOLID STATE AND NANO PHYSICS

Paper-XI

Time Allowed : 3 Hours]

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. Use of Scientific (Non-Programmable) calculator is allowed.

Compulsory Question

1.	(a)	Which type of lattice does diamond has? How many atoms are i	n a
		primitive cell and conventional cube of diamond ?	2
	(b)	A two dimensional lattice has the basis vector $\vec{a} = 2\hat{x}, \vec{b} = \hat{x} + 2\hat{y}$. F	ind
		the reciprocal lattice vectors.	2
	(c)	Discuss the concept of flux quantization.	2
	(d)	What is single wall carbon nanotube?	2
		UNIT–I	

- 2. (a) What do you mean by Miller indices? How do the Miller indices of a plane are determined? What are the important features of Miller indices? 6
 - 2 (b) Discuss in brief the Crystal structure of Zinc sulphide.
- 3. (a) Explain the concepts of Atomic radius and Atomic packing fraction. Calculate the values of atomic radius and atomic packing fraction for : 6
 - (i) simple cube
 - (ii) body centered cube
 - (iii) face centered cube structure.
 - (b) A substance with fcc lattice has molecular weight 60.2 and density 6250 kg/m³. Calculate lattice constant α . 2

1748

Total Pages : 2

[Maximum Marks : 40

UNIT-II

4.	(a)	Derive Laue's equations of diffraction for X-rays. Show that theselead to Bragg's law for X-ray diffraction.5
	(b)	Discuss the rotating crystal method for X-ray diffraction. 3
5.	(a)	Discuss the concept of Reciprocal lattice. Show that the fcc lattice is reciprocal of the bcc lattice and vice versa. 5
	(b)	Derive expression for Brillouin zone for fcc lattice. 3
		UNIT-III
6.	(a)	Explain the concept of Perfect diamagnetism. Prove that the coherence length is reduced due to the presence of impurities in a Superconductor. 5
	(b)	The critical temperature for Mercury with isotopic mass 199.5 is 4.185 Kelvin. Calculate its critical temperature when its isotopic mass changes to 203.4.
7.	(a)	Discuss BCS theory of Superconductor. How does it account for the superconducting state? 5
	(b)	Describe the applications and limitations of Superconductors. 3
		UNIT-IV
8.	(a)	Explain the Molecular assembler concept. 4
	(b)	Explain the construction and working of Transmission electron Microscope. 4
9.	(a)	Explain the Carbon fullerene. Describe the synthesis and purification of fullerenes.
	(b)	Explain the vision and the objectives of Nanotechnology. 4

GSQ/M-21 1749 ATOMIC AND MOLECULAR-SPECTROSCOPY

Paper-XII

Time Allowed : 3 Hours]

[Maximum Marks : 40

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory.

Compulsory Question

- 1. Give brief answers of the following :
 - (i) A hydrogen atom is in 4p state. To what state or states can it go by radiating a photon in an allowed transition?
 - (ii) Why are the I.R. spectra of homonuclear molecular note observed?

1

- (iii) An atom possesses two valence electrons having antiparalled spins. What is the maximum value of Lande's g-factor for the LS coupled states?
- (iv) Define the Hyperfine splitting of the spectral lines of an atom. 1
- (v) Is it possible to observe a rotational Raman spectrum by using a radiation in visible region?2
- (vi) For principle quantum number $\eta = 4$, draw all possible orbits (using Sommerfeld Theory). 2

UNIT-I

- 2. (i) What is Space Quantization ? Show that the quantum coditions due to it, lead to a realtionship between the azimuthal quantum number and the magnetic quantum number.
 - (ii) If Rydberg constant of an atom of finite Nuclear mass is αR_{∞} , where R_{∞} is the Rydberg constant corresponding to an infinite Nuclear mass

is
$$\frac{(1-\alpha)}{\alpha}$$
.

1749/K/69

P. T. O.

- 3. (i) Write down short-commings of Bohr's model. 2 (ii) Derive condition for allowed elliptical Orbits : 6 $\frac{k}{n} = \frac{b}{a}$, where symbols have their usual meanings. UNIT-II
- 4. (i) Discuss the characteristic features of penetrating and non-penetrating Orbits. How do they bring in the concept of Quantum Defect ? 6
 - (ii) Find intensity ratio for doublet lines of Principal series of Sodium.

2

2

- 5. (i) A spinning electron behaves like a magnetic top and undergoes Larmor's precession around the magnetic field direction. Due to this, each energy state in an atom having a Single valence electron splits into a Doublet. Derive an expression for the magnitude of this doublet separation. Illustrate by giving one example.
 - (ii) Find ground state term of Al.

UNIT-III

- 6. (i) Write total number of Spectral terms of two equivalent (f²) electrons. 2
 - (ii) If ground state of Cl atom is $2P_{3/2}$, then show that its magnetic moment is $\frac{2}{3}\sqrt{15}$ Bohr magneton. 2
 - (iii) If Cesium has a Nuclear spin of $\frac{7}{2}$, draw the hyperfine spectrum of

the D lines of the Cesium atom.
$$\begin{bmatrix} 6^2 P_3 \rightarrow 6^2 S_1 \\ \frac{1}{2} \end{bmatrix} = 6^2 S_1 + 6^2 S_1 = 6^2 S_1$$

- 7. (i) Calculate Γ factors for LS coupling in two valence electron atoms and show interaction energy schematically for pd configuration.
 6
 - (ii) Write total number of terms for two non-equivalent (f,f) electrons.

2

UNIT-IV

- 8. (i) Why Anomalous Zeeman effect is called Anomalous? Derive an expression for Lande's g-factor.
 6
 - (ii) The exciting line in an experiment is 4040Å and the Stoke line is observed at 4220Å. Find the wavelength of Antistoke line in Å. 2
- 9. (i) Discuss the vibrational spectra of a diatomic molecule treating it as a harmonic oscillator as well as an anharmonic oscillator and compare them.
 - (ii) A sample is placed in a magnetic field of flux 0.3T. Find the separation between the Zeeman compoments of wavelength 400 nanometer

$$\left[\text{given}\,\frac{\text{e}}{\text{m}} = 1.7 \times 10^{11} \,\text{C}\,\log^{-1}\right].$$
2

Roll No.

Total Pages : 4

GSQ/M-21

1750

INORGANIC CHEMISTRY

Paper-XVIII, CH-304

Time Allowed : 3 Hours] [Maximum Marks : 32

Note : Attempt five questions in all, selecting two questions each from Unit-I and Unit-II. Question No. 1 is compulsory.

Compulsory Question

1.	(i)	Give two examples of one Carbon Bonded
		ligand. 1
	(ii)	Which is stronger acid between $\mathrm{BF}_{\scriptscriptstyle 3}$ and
		(CH ₃) ₃ B ? 1
	(iii)	Which enzyme is used in conversion of $\mathrm{CO}_{\!_2}$ to
		Bicarbonate ? 1
	(iv)	What is the formula of Ferrocene ? 1
	(v)	How is Iron stored in the body ? 1
	(vi)	What is the hepaticity of Butadiene in the
		complex $[Fe(CO)_3(C_4H_6]$? 1

1750/K/70

P. T. O.

(vii)	Name	any	two	π -acid	ligands.		1
-------	------	-----	-----	-------------	----------	--	---

(viii) What is Glass transition temperature ? 1

UNIT-I

- (a) What do you understand by β-elimination in metal alkyls ? How can it be avoided ? Explain giving example.
 - (b) Explain the structure of Methyl lithium. 2
 - (c) What is EAN rule ? Give one example each of organometallic compound in which EAN rule is :(i) obeyed
 - (ii) not obeyed. 2
- (a) Discuss the nature and bonding in metal Carbonyl complexes.
 3
 - (b) Explain Lewis concept of Acids and Bases. 2
 - (c) Write the IUPAC name of $[PtCl_3(C_2H_4]^-$. 1
- 4. (a) What are the limitations of HSAB principle ? 2
 - (b) Give any two methods of preparation of Organotin compounds.2

- (c) In each of the following pairs, which is stronger acid and why ?
 - (i) HF and HCl.

(ii)
$$C_6H_5COOH$$
 and CH_3COOH . 2

5. (a) What is
$$\beta$$
-strain ? Explain giving example. 3

- (b) What is the theoretical justification of HBAB principle? 2
- (c) $[AgI_2]^-$ is stable and $[AgF_2]^-$ is unstable. Why ? 1

UNIT-II

- 6. (a) What is Nitrogen fixation ? Discuss briefly biological and abiological nitrogen fixation. 2
 - (b) Draw the polymeric backbones of Silicones and Phosphagenes.2
 - (c) Fe^{II} salts undergo hydrolysis in air, but not so in Mb or Hb. Explain.2
- 7. (a) Name two Oxygen carriers and give their importance in Biological system.
 - (b) What is the biological role of Mg^{2+} ? 2
 - (c) Define Bohr effect. 1

1750/K/70 3 P. T. O.

8.	(a)	Draw a cyclic process showing role of Hb and
		Mb as O_2 and CO_2 transporter. 3
	(b)	What are Silicon resin ? Give their applications.
		3
9.	(a)	What are homomorphic and heteromorphic
		π system ? 2
	(b)	List important properties of Silicones. 2
	(c)	Name four main classes of the Silicone
		elastomers. 2

Roll No.

Total Pages : 4

GSQ/M-21

1752

PHYSICAL CHEMISTRY (Theory)

Paper-XIX (CH-305)

Time Allowed : 3 Hours] [Maximum Marks : 32

Note : Attempt five questions in all, selecting at least two questions from each Unit. Question No. 1 is compulsory.

Compulsory Question

1/76	солг	170	D T	0				
	(g)	What are Isotonic solutions ?		1				
		volatile solute.		1				
	(f)	Define Raoult's law for solutions contain	ing n	on-				
	(e)	Define the term 'Phase'.		1				
	(d)	State 'Gibb's phase rule'.		1				
		called ?		2				
	(c)	What is Partition function ? Why	is it	S0				
	(b)	What is Phosphorescence ?		1				
1.	(a)	a) Define First law of Photochemistry.						

UNIT-I

- 2. (a) Give one example of a Photochemical reaction in which the quantum yield is very high. Briefly explain the reason for the same.
 3
 - (b) For the Photochemical reaction $A \rightarrow B$, 1.0×10^{-5} moles of B are formed on absorption of 6.0×10^7 ergs at 3600Å. Calculate the quantum efficiency of the reaction. 3
- 3. (a) What are Photochemical reactions ? How these reactions differ from Thermochemical reactions ? 3
 - (b) Calculate the value of an Einstein of energy for radiation of wavelength 4000 Å.
 - (c) What is 'Resonance fluorescence' ? Give one example.
- 4. (a) What is Photosensitizer ? How does it act ? Explain by giving two suitable examples.3
 - (b) What is Statistical mechanics ? What are the main points of difference between Classical Statistical mechanics and Quantum Statistical mechanics ?

- 5. (a) Discuss the following :
 - (i) Thermodynamic probability.
 - (ii) Born-Oppenheimer approximation. 4
 - (b) Write expression for Maxwell-Boltzmann distribution law taking degeneracy of states into consideration. What do different symbols signify?

UNIT-II

- 6. (a) Give two examples each of two component systems in which :
 - (i) the components do not react with each other.
 - (ii) the component react to form a compound with congruent melting point
 - (iii) the component react to form a compound with incongruent melting point.
 - (b) What is meant by Triple point of Water ? Why is it different from the normal melting point of Ice ?2
 - (c) What is Condensed system ? 1
- 7. (a) Calculate the number of components and degrees of freedom for the following systems :

(i) $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$

- (ii) $C(s) + O_2(g) \rightleftharpoons CO(g) + CO_2(g)$
- (iii) Rhombic sulphur \rightleftharpoons Monoclinic sulphur

(iv)
$$NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$$
. 4

- (b) Draw a labelled phase diagram for lead-silver system.
- 8. (a) What are ideal and non-ideal solutions? Give one example of each of them. 2
 - (b) Define the term Colligative properties. How can you justify that Osmotic pressure is a colligative property ?
 - (c) 1.20 g of a substance dissolved in 100 g of water lowered its freezing point by 0.37 °C. Calculate the molecular weight of the substance. Molal depression constant of water is 1.86 °C per molality.
- 9. (a) Define Molal elevation constant. Derive the relationship between elevation in boiling point and molality of the dissolved solute.
 - (b) Differentiate between Molarity and Molality of a solution. Which out of these is the preferred method of expressing Concentration and why?

Roll No.

Total Pages : 5

GSQ/M-21

$\mathbf{1754}$

ORGANIC CHEMISTRY (Theory)

Paper-III (XX-CH-306)

Time Allowed : 3 Hours] [Maximum Marks : 32

Note : Attempt five questions in all, selecting two questions from each Unit. Question No. 1 is compulsory.

Compulsory Question

- 1. (i) Write Paal-Knorr synthesis for Furan.
 - (ii) Write the resonance structures of Thiophene.
 - (iii) Draw the structure of Oxalate ions obtained from Acetylacetone.
 - (iv) Out of the Acetone and Diethylmalonate which has more acidic strength and why?
 - (v) Write about Zwitter ion structure of α -amino acid.
 - (vi) Name two amino protecting groups in Peptide synthesis.

1754/K/74

P. T. O.

- (vii) Name the monomers of :
 - (a) Nylon-6.
 - (b) Bakelite.
- (viii) Name the most commonly used Ziegler-Natta catalyst. 1×8=8

UNIT-I

- (a) Write about molecular orbital structure of Pyridine.
 2
 - (b) Write the reaction and mechanism of skraup synthesis of Quinoline.
 - (c) What happens when : 2
 - (i) Isoquinoline reacts with Sn/HCl ?
 - (ii) Pyrrole undergoes Gattermann-Koch reaction ?
- 3. (a) Compare the basicity of Pyrrole, Pyridine and Piperidine.2
 - (b) Write mechanism and orientation of Electrophilic substitution in Pyrrole.

- (c) Write equations for : Chlorination of Indole. (i) (ii) Oxidation of Isoquinoline. (a) Write the reaction and mechanism for the 4. preparation of Ethyl acetoacetate. 2 (b) From Malonic ester prepare : 3 Iso-valeric acid. (i) (ii) 1,4-dicarboxylic acid. (c) Which Alkyl halide is used for the 0 Ĩ preparation of $C_6H_5CH_2CH_2 - \overset{''}{C} - CH_3$ from ethylacetoacetate. 1
- (a) Comment upon acidic hydrolysis in the synthetic 5. importance of ethylacetoacetate. $\mathbf{2}$
 - (b) Prepare :
 - 0 || $R - \ddot{C} - CH_2COOH$ from malonic ester. (i)
 - (ii) Succinic acid from ethylacetoacetate.

3

1754/K/74

 $\mathbf{2}$

(c)	Write	about	Keto-Enol	tautomerism	of	ethyl-
	acetoa	cetate.				2

UNIT-II

6.	(a)	Write the general mechanism of Cationic vin	yl
		polymerisation.	2
	(b)	Write the preparation and uses of :	2
		(i) Nylon 66	
		(ii) Polytetrafluoroethylene.	
	(c)	Write about natural rubber.	2
7.	(a)	Give preparation and uses of :	2
		(i) Bakelite	
		(ii) Styron.	
	(b)	Arrange the following in increasing order	of
		reactivity in anionic polymerisation :	2

$$\label{eq:CH2} \begin{array}{c} \mathrm{CH} & \\ | \\ \mathrm{CH}_2 = \mathrm{CHCH}_3 \text{ , } \mathrm{CH}_2 = \mathrm{C} \\ | \\ \mathrm{COOC}_2 \mathrm{H}_5 \end{array} \text{, } \mathrm{CH}_2 = \mathrm{CF}_2.$$

1754/K/74

4

- (c) Define the terms with example : 2
 - (i) Addition polymerization
 - (ii) Copolymer.
- 8. (a) Write equations for the preparation of Amino acids in : 2
 - (i) Strecker synthesis.
 - (ii) Gabriel phthalimide synthesis.
 - (b) Write about solid Phase peptide synthesis. 2
 - (c) Explain the process of Electrophoresis. 2
- 9. (a) Classify the Proteins according to hydrolysis products. 2
 - (b) Write about acid-base behaviour of the Amino acids. 2
 - (c) Discuss secondary structure of Proteins. 2

5

GSQ/M21 1758 BIOCHEMISTRY AND PLANT BIOTECHNOLOGY Paper–I

Time allowed : 3 Hours

Note : Attempt **five** questions in all, Question No. **1** is compulsory. Attempt **two** question from each unit. All questions carry equal marks.

Compulsory Question

- 1. Attempt all questions :
 - (i) Define Isoenzyme.
 - (ii) What are Lectins?
 - (iii) How will you distinguish between L-form and D-form of amino acid?
 - (iv) Give the full form of IPA, IAA, IBA, 2,4,-D.
 - (v) How many Acetyl Co~A molecules are required for the synthesis of one molecule of Palmitate?
 - (vi) Define totipotency of a cell and name the scientist who coined this term.
 - (vii) What are Cosnids?
 - (viii) What is Cryopreservation?

UNIT-I

2. Write short notes on : Inhibition of enzymes by poisons. $2^{1/2}$ (i) Mode of enzyme actions. $2^{1/2}$ (ii) Mechanism of action of enzyme 3 (iii) 3. (i) Define Auxins. With the help of suitable diagrams chalk out the discovery of Auxins. 4 Enumerate the various physiological effects of Auxins. 4 (ii) 4. Write notes on : Abscisic Acid. 3 (i) Physiological effects of Ethylene. (ii) 2 Bioassay for Auxin, Gibberellins and Cytokinins. 3 (iii)

Maximum Marks : 40

 $1 \times 8 = 8$

5.	5. (i) Explain the β -oxidation of Fatty Acid degradation in pla			
	(ii)	Glyoxylate Cycle - explain briefly.	3	
		UNIT-II		
6.	Explai	n symbiotic nitrogen fixation in Leguminous plants.	8	
7.	Differ	entiate between :		
	(i)	Nitrification and Ammonification.	21/2	
	(ii)	Reductive Anination and Transanination	3	
	(iii)	Batch and continuous culture.	21/2	
8.	(i)	Explain protoplasmic fusion and somatic hybridization.	4	
	(ii)	Define transgenic plants. Explain the Direct Gene	Transfer	
		technique in plants.	4	
9.	Descri	be the different sources from which DNA is obtained for	cloning	
	and th	eir selective amplification.	4 + 4 = 8	

Maximum Marks : 40

1759

GSQ/M21 **ECONOMIC BOTANY**

Paper-II

Note: Attempt five questions in all, selecting two questions from each unit. Question No. 1 is compulsory. All questions carry equal marks.

	Compulsor	y Questio	n	
1.	Define the followings :			$1 \times 8 = 8$
	(i) Surface fiber	(ii)	Rhizome	
	(iii) Narcotics	(iv)	Beverage	
	(v) Bagasse	(vi)	Sapwood	
	(vii) Lumber	(viii)	Bio-fuels.	
	UN	IT-I		
2.	Describe the origin, distribution, cu	ltivation a	nd uses of wheat.	8
3.	Write short notes on :			4 + 4 = 8
	(i) Flax	(ii)	Potato.	
4.	Give a concise account of cultivation	on and uses	s of the following :	4 + 4 = 8
	(i) Mustard	(ii)	Coconut.	
5.	What are Pulses? Describe the cul	tivation ar	nd uses of gram (C	Chickpea) or
	Arhar.			8
	UNI	T-II		
6.	What are Spices and Condime	nts? Desc	cribe the botanic	al features,
	cultivation and uses of Cloves.			8
7.	Give the botanical name, family, pl	ant part us	ed, cultivation and	uses of any
	two of the following :			4 + 4 = 8
	(i) Coriander	(ii)	Opium	
	(iii) Coffee.			
8.	Describe the botanical features, pro	cessing an	d use of tea.	8
9.	Write notes on :			4 + 4 = 8
	(i) Hevea	(ii)	Ferula.	

Time allowed : 3 Hours

GSQ/M-21 1760 AQUACULTURE AND PEST MANAGEMENT–I Paper–I

Time Allowed : 3 Hours]

[Maximum Marks : 40

Note : Attempt five questions in all, selecting two questions from each Unit. Question No. 1 is compulsory.

Compulsory Question

- 1. Explain the following in about 20 words : $1 \times 10=10$
 - (i) EEZ.
 - (ii) Subsistence fisheries.
 - (iii) Oligophagous.
 - (iv) Dip net.
 - (v) Two species of Edible molluscs.
 - (vi) Fishing unit.
 - (vii) Stocking pond.
 - (viii) Honey dew.
 - (ix) Ratoon crop.
 - (x) Zoological name of Hadda beetle.

UNIT-I

- 2. Describe the Riverine fisheries in India. $7\frac{1}{2}$
- 3. What are Fishing crafts? Describe various fishing crafts in detail. $7\frac{1}{2}$
- 4. Write notes on the following : $3+4\frac{1}{2}=7\frac{1}{2}$
 - (a) World Fish production.
 - (b) Pearl culture.

1760/K/80

- 5. Write notes on the following :
 - (a) Tank Fish culture.
 - (b) Reservoir Fisheries.

UNIT-II

- 6. Explain the systematic position, habits, nature of damage, life-cycle and control of Wheat stem borer. $7\frac{1}{2}$
- 7. Discuss the nature of damage caused and habits of following Pests :

 $3^{1/2}+4=7^{1/2}$

- (a) Rice stem borer.
- (b) Red pumpkin beetle.
- 8. Give the systematic position of following Pests :
 - (a) The vegetable mite.
 - (b) Gundhi bug.
 - (c) Cotton grey weevil.
 - (d) Sugarcane top borer.
- 9. Write notes on the damage causing stage and control of the following Pests :
 - (a) Sugarcane leaf-hopper.
 - (b) Pumpkin fruit fly.
 - (c) Sugarcane root borer. $2\frac{1}{2}+2\frac{1}{2}+2\frac{1}{2}=7\frac{1}{2}$

 $2+2+2+1\frac{1}{2}=7\frac{1}{2}$

GSQ/M-21 1761 AQUACULTURE AND PEST MANAGEMENT–II

Paper-II

Time Allowed : 3 Hours]

Note : Attempt five questions in all, selecting two questions from each Unit. Question No. 1 is compulsory.

Compulsory Question

- 1. (i) Define the Composite culture.
 - (ii) What do you mean by maximum Standing crop?
 - (iii) What is Cryopreservation?
 - (iv) Differentiate between Totipotent and Pluripotent cells.
 - (v) What are Fry and Fingerlings?
 - (vi) Write the systematic position of Callosobruchus maculatus and Rhyzopertha dominica.
 - (vii) What are Pesticides?
 - (viii) What do you mean by Integrated Pest Management (IPM)?
 - (ix) What are Fumigants?
 - (x) Name common predators of Rodents. $1\frac{1}{2} \times 10=15$

UNIT-I

2.	Discuss	the	methods	of	collection	of	Fish	seed.	6¼	ŀ

Write a note on Artificial food to Supplement natural Food of Fish under cultivation in Ponds.
 6¹/₄

- 4. Write a note on management of Rearing pond. $6^{1/4}$
- 5. (a) List the technical problems in Cryopreservation of Fish spermatozoa. $3\frac{1}{4}$

[Maximum Marks : 40

(b) Differentiate between short-term and logn-term Cryopectants. 3

UNIT-II

6.	Give an account on Trogoderma granarium.	6¼
7.	Write a note on Biological control of Harmful insects.	6¼
8.	Discuss about the Insect repellents and attractants.	6¼
9.	Write an essay on Pestiferous birds and their management.	6¼

GSQ/M-21

1764

2

MICROPROCESSOR ARCHITECTURE & PROGRAMMING-II

Paper–I (Theory)

Time Allowed : 3 Hours]

[Maximum Marks : 40

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

- 1. (a) Explain the Priority interrupts of 8085.
 - (b) Write a Control Word when the ports of 8255 are defined as follows :Port A and Port B as Output port in mode 1.

Port C_{UP} as an Output port and Port C_{LOW} as an input port. 2

- (c) What are the different types of write Operations used in 8253 ? 2
- (d) Write the four different applications where Stepper motor is used. 2

UNIT-I

2.	(a)	What is Interrupt? Name the vectored and non-vectored interrupts of					
		8085.	2				
	(b)	Discuss the Bit pattern of SIM instruction.	2				
	(c)	What is the difference between Software and Hardware interrup	ots?				
		Discuss the Software interrupts of 8085.	4				
3.	(a)	Explain the Conditional interrupts of Microprocessor 8085.	3				

(b) Draw and explain the Interrupt control circuit for 8085. 5

UNIT-II

- 4. (a) Explain with block diagram the programmable peripheral interface IC 8255. 6
 - (b) What is the mode and Input-Output configuration for ports A, B and C of an 8255 PPI after its control word register is loaded with 54H?

- 5. (a) Write a control word when the ports of 8255 are defined as follows : Port A and Port B as Output port in mode 0.
 Port C_{LIP} as an Output port and Port C_{LOW} as an Input port.
 2
 - (b) What are different operating modes 8255 ? Explain each in brief. 6

UNIT-III

- 6. Explain with block diagram the 8253 timer chip and its Operation in brief.
 - 8
- 7. (a) Explain the Control word format of 8253 in detail. 4
 - (b) Explain, how 8253 can be used as Square wave generator. 4

UNIT-IV

- 8. Explain the Micro-processor based Traffic light control system. Also write the program to control the Triffic lights by taking an example. 8
- 9. (a) What is DMA? Using block diagram briefly explain, how the Data is transferred by a DMA controller. 2
 - (b) Draw the block diagram of 8257 DMA controller and briefly explain the function of each block.

GSQ/M-21

1765

INTRODUCTION TO C & ITS PROGRAMMING

Paper-II

Time Allowed : 3 Hours]

1

[Maximum Marks : 40

Note : Attempt **five** questions in all. Question No. **1** is compulsory. Attempt other four questions selecting **one** question from each Unit.

Compulsory Question

•	(a)	What is String constant?	2
	(b)	What is the purpose of control string in a scanf function?	2
	(c)	What are the two principal components of a Function?	2
	(d)	How are Multidimensional arrays defined?	2

UNIT-I

- 2. (a) Describe two different ways that floating points can be written. What special rules apply in each case? 4
 - (b) A program in C contains the following declarations and initial assignments : 4

int i = 8, j = 5, k;

float x = 0.005, y = -0.01, z;

determine the value of each of the following Assignment expressions. Use the values originally assigned to the variables of each expression :

(i)
$$k = (j = 5) ? i : j$$

(ii)
$$k = (j > 5)$$
? i : j.

- 3. (a) Describe the two equality operators included in C. How do they differ from the relational operations? 4
 - (b) Discuss the Relational and Logical operations in C. 4

UNIT-II

4. (a) What is the purpose of the scanf and printf function? How are these used within a C program?

```
(b)
          A C program contains the following variables declarations float :
          a = 2.5, b = 0.0005, c = 300;
          show the output of the following printf statements :
                printf ("%3f%3f%3f",a,b,c);
          (i)
                printf ("%8.3f%8.3f%8.3f",a,b,c).
          (ii)
                                                                            4
          What is the purpose of switch and break statements? Explain with
5.
    (a)
          example.
                                                                            4
          What is output of the following program?
                                                                            4
    (b)
          Main()
               int x = 6;
          {
               switch (x)
                 \{ default : x + = 2 ; \}
                  case 4 : x = 4;
                  case 5 : x^{++};
                  break;
          }
                Printf ("%d", x);
          }
                                 UNIT-III
6.
          What are function prototypes? What is their purpose?
    (a)
                                                                            4
          What is output of the following program?
                                                                            4
    (b)
          void swap (int, int);
          main ()
          {
                int x = 20;
                int y = 10;
                swap (x, y);
                printf ("%d%d", y, x+2);
          }
                void swap (int x, int y)
          {
                int temp;
                temp = x;
                x = y;
                y = temp;
          }
                                      2
1765/K/85
```
- 7. (a) Can a function be called from more than one place with in a program?Explain with suitable example.4
 - (b) What are the differences between passing an array to a function and passing a single valued Data item to a function ? 4

UNIT-IV

- 8. (a) When one dimensional character array of unspecified length is assigned an initial value, what extra character is automatically added to the end of the string? 2
 - (b) What advantage is there in defining an array size in terms of symbolic constant rather than a fixed integer quantity? 2
 - (c) Describe array that is defined in the following statements. Indicate what values are assigned to the individual array element. 4
 - (i) int $z[12] = \{0, 0, 8, 0, 0, 6\}$;
 - (ii) float $c[8] = \{2., 5., 3., -4.\}$;
- 9. (a) How a Pointer variable declared? What is the purpose of the Data type included in the declaration?
 - (b) How can the Indirection operator be used to access a Multi-dimensional array element? 4

Total Pages : 2

Roll No.

GSQ/M-21

1766

RELATIONAL DATA BASE MANAGEMENT SYSTEM

Paper-I

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

- 1. Write in short on the following : $2 \times 4 = 8$
 - (a) Differentiate between Equi-join & Nonequi-join.
 - (b) What is Normalization and its Anomalies ?
 - (c) Differentiate between DDL and DML.
 - (d) What is Nested Loop in PL/SQL ?

UNIT-I

- 2. What is Relational Alzebra ? Explain selection and projection operation with example. 8
- 3. Differentiate between Hierarchial data model and Network model. 8

1766/K/86

P. T. O.

UNIT-II

- 4. What is Normalization ? Explain BCNF (Byte Codd Normal Form). 8
- 5. (a) Differentiate between Tuple Relational Calculus & Domain Relational Calculus. 4
 - (b) What is Functional Dependency ? Explain its characteristics.

UNIT-III

- 6. What do you mean by Constraint ? Explain CHECK& FOREIGN KEY Constraint with example.8
- Explain various types of JOINS available in SQL.
 8

UNIT-IV

- 8. What is PL/SQL ? What are its features ? What are the advantages of PL/SQL ? 8
- 9. Explain the following : 8
 - (a) PL/SQL variables.
 - (b) PL/SQL Data types.

GSQ/M-21

1767

COMPUTER NETWORKS

Paper-II

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

- 1. (i) Discuss Network Interface Cards & PC Cards.
 - (ii) Write short note on Multiplexing.
 - (iii) Explain the Wireless LAN.
 - (iv) What is Domain Name System ? $2 \times 4=8$

UNIT-I

2. Compare TCP/IP Model and OSI Model in detail.

8

 What do you understand by Network topologies? Discuss various types of Network topologies.
 1767/K/87
 P. T. O.

UNIT-II

- 4. (a) What is Transmission Media? Discuss guided and unguided transmission media. 5
 - (b) Discuss the terms Data Rate and Baud Rate.

3

 Explain the concept of Switching with the help of suitable diagrams. Discuss various advantages and disadvantages of Switching.

UNIT-III

- 6. What is the purpose of Data Link Layer? Explain various Sliding Window Protocols. 8
- Explain the various Error detection and Correction techniques with suitable examples.
 8

UNIT-IV

- Elaborate on various types of Encryption methods.
 Discuss the Network Security Issues.
 8
- Explain the Shortest Path Routing and Distance
 Vector Routing.
 8

Total Pages : 2

GSQ/M-21

 $\boldsymbol{1768}$

MULTIMEDIA TOOLS

Paper-I

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

- 1. Write short notes on the following : $2 \times 4 = 8$
 - (a) Memory devices.
 - (b) Formatted text.
 - (c) Mono V/S Stereo sound.
 - (d) Interlacing.

UNIT-I

- 2. Explain the various applications of Multimedia. 8
- Explain the process and stage of Multimedia production.
 8

1768/K/88

P. T. O.

UNIT-II

- Explain the various image File formats with their features and limitations.
 8
- 5. Explain the following : 8
 - (a) RTF & HTML texts.
 - (b) Object linking and Embedding.

UNIT-III

- 6. Write steps to create Animations using Flash. 8
- 7. Explain 2-D and 3-D animation techniques. 8

UNIT-IV

- 8. What are the Digital Video Compression Techniques and File Formats ? Explain 8
- 9. Write short notes on the following : 8
 - (a) Image map.
 - (b) Streaming Video.

GSQ/M-21 1769 ADVANCED PROGRAMMING USING C++ Paper-II

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

- 1. (i) What is the purpose of Abstract class? 2
 - (ii) What are differences between access Specifier Private & Public? 2
 - (iii) What do you understand by term Inheritance?Explain. 2
 - (iv) Describe different methods of Opening a file. 2

UNIT-I

 When do we make a Virtual function "Pure"? What are the implications of making a function a pure virtual function? Explain with example.

What is Function Overriding? Explain it with the help of an example.
 8

UNIT-II

- 4. We have two classes A and B. If a is an object of A and b is an object of B and we write b = a, what type of conversion routine will we use and where?
- Write a program in C++ to demonstrate how Protected access specifier is different from Public access specifier.

UNIT-III

- 6. What do you mean by Multipath Inheritance? Write a program to implement it. 8
- 7. What is Generic Programming? How is it implemental in C++ ? Explain the concept of function templates by using suitable example.

UNIT-IV

8. What is an Exception? Write a program containing a possible exception. Use a try block to throw it and a catch block to handle it properly.
8

9.	(a)	What	are	the	File	pointers?	Describe	get	and
		put po	ointe	ers.				3	

(b)	What is	Binary	file?	List	merits	and	demerits
	of Binar	y file.					2

(c) Write note on Operations on Files. 3

1771

GSQ/M-21

MICROBIAL BIOTECHNOLOGY

Paper-XIII

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt five questions in all, selecting at least
 two questions from each Unit. Question No. 1
 is compulsory. All questions carry equal marks.

Compulsory Question

- 1. Write in short on the following : 2,2,2,1,1
 - (a) Give advantages of Continuous fermentation over Batch fermentation.
 - (b) Give example of any four industrially important bacteria with their uses.
 - (c) Define solid state fermentation and give its significance for Fermentation Industry.
 - (d) Define Syntrophic bacteria.
 - (e) Name two fungi known to be employed as Bioinsecticides.

UNIT-I

- Write short notes on the following : 3,3,2
 (a) Chemostat.
 (b) Measurement of dissolved oxygen in a fermentor.
 (c) Synchronous growth.
 What are the different methods for preservation of industrially important microorganism and which method you think is best for Culture collection service and why ?
- 4. Write short notes on the following : 3,3,2
 - (a) Airlift reactor.
 - (b) Bubble column reactor.
 - (c) Methods for cells disintegration.

UNIT-II

 Describe the Microbial fermentation for production of Beer.

- 6. Write short notes on the following : 4,4
 - (a) Citric acid fermentation.
 - (b) Microbial production of Xanthan gum.
- 7. Write short notes on any **two** of the following :
 - (a) PHA.
 - (b) Biomining.
 - (c) Glutamic acid fermentation. 4,4