GSM/D-20

913

ADVANCED CALCULUS

Paper - BM-231

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

 (i) Write the statement of Lagrange's mean value theorem.
 (ii) State Schwarz theorem.
 (iii) Define screw-curvature. What is its magnitude.
 (iv) Define osculating plane.

UNIT-I

- (i) Every function defined and continuous on a closed interval attains its bounds in that interval. Prove it.
 - (ii) Verify Lagrange's mean value theorem for

$$f(x) = \sin x \text{ in } \left[\frac{\pi}{2}, \frac{5\pi}{2}\right].$$
4

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P.T.O.

3. (i) Show that :

$$\lim_{x \to 0} \frac{(1+x)^{\frac{1}{x}} - e + \frac{ex}{2} - \frac{11}{24}ex^2}{x^3} = -\frac{7e}{16}$$

(ii) Show that the function defined by $f(x) = x^2$ is uniformly continuous in [-2, 2]. 4

UNIT-II

4. (i) Show that the function *f* defined by :

$$f(x, y) = \begin{cases} \frac{x^3 - y^3}{x^2 + y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$
is continuous at (0, 0).

(ii) State and prove Euler's theorem. 4

5. (i) Let
$$f : \mathbb{R}^2 \to \mathbb{R}$$
 be defined as :

$$f(x, y) = \begin{cases} \frac{xy}{x^2 + y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

Show that $\lim f(x, y)$ does not exist. (x, y) \rightarrow (0, 0)

(ii) If
$$z = 2u^2 - v^2 + 3w^2$$
, where

$$u = xe^{y}, v = ye^{-x}, w = \frac{y}{x}$$

Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.

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4

UNIT-III

6. (i) Show that the function

$$f(x, y) = \begin{cases} \frac{x^3 - y^3}{x^2 + y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

is continuous and possesses first order partial derivatives but not differentiable at the origin. 4

- (ii) A rectangular box, open at the top, is to have a volume of 27/2 cubic ft. Find the dimensions of the box requiring least material for construction.
- 7. (i) Find the volume of the largest rectangular parallelopiped that can be inscribed in the ellipsoid 4

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

(ii) Give an example of a function f(x, y) for which $fxy^{(0, 0)} \neq fyx^{(0, 0)}$. 4

UNIT-IV

8. (i) Find the normal form of the curve

$$2 \cot \hat{i} + 2 \sin \hat{j} + 6 \cot \hat{k}, -\infty \cot < \infty.$$
 4

(ii) Prove that :
$$\frac{d\hat{n}}{ds} = i\hat{b} - k\hat{t}$$
. 4

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P.T.O.

- 9. (i) Show that the radius of spherical curvature of a circular helix x = a cosθ, y = a sinθ, z = a θ cot α is equal to the radius of circular curvature.
 - (ii) Find the involutes and evolutes of circular helix

$$x = a \cos u$$
; $y = a \sin u$, $z = a u \tan \alpha$. 4

914

Roll No.

GSM/D-20

PARTIAL DIFFERENTIAL EQUATIONS

Paper - BM-232

Time allowed : 3 Hours Maximum Marks : 40

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

Compulsory Question

- 1. (i) Find the differential equation by eliminating the arbitrary constants λ and A from the equation $z = Ae^{-\lambda^2 t} \cos \lambda x$. $1\frac{1}{2}$
 - (ii) Classify the differential equation $1\frac{1}{2}$ $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$
 - (iii) Write the one dimensional and two dimensional Heat Equation.
 - (iv) Examine the compatibility of system of partial equations : $1\frac{1}{2}$ p = 3x + 6y

$$q = 2x - 4y.$$

(v) Find the complete integral of partial differential equation $p - 3x^2 = q^2 - y$. $1\frac{1}{2}$

UNIT-I

2. (i) Find out partial differential equation by eliminating arbitrary function from : 4

$$z = \left(\frac{xy}{z}\right)$$

- (ii) Solve the partial differential equation : 4 $p + 3q = z + \cot(y - 3x)$
- 3. (i) Find the complete solution of partial differential equation $2xz - px^2 - 2qxy + pq = 0$ by using Charpit's method. 4
 - (ii) Find the complete integral by Jacobi's method for the equation : 4

$$2x^{2}y\left(\frac{\partial u}{\partial x}\right)^{2}\left(\frac{\partial u}{\partial x}\right) - x^{2}\left(\frac{\partial u}{\partial y}\right) - 2y\left(\frac{\partial u}{\partial x}\right)^{2} = 0$$

UNIT-II

4. (i) Solve the partial differential equation : 4 $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^3 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ (ii) Solve : 4

$$(D^3 - 4D^2D' + 4D'^2D)Z = \cos(2x + y)$$

5. (i) Solve: 4

$$(x^2D^2 - xyDD' - 2y^2D'^2 + xD - 2yD')Z = \log\left(\frac{y}{x}\right) - \frac{1}{2}$$

(ii) Solve :
$$(D^2 - 2DD' + D'^2)Z = 12xy.$$
 4
UNIT-III

6. (i) Classify and reduce the equation :

$$\frac{\partial^2 z}{\partial x^2} - x^2 \frac{\partial^2 z}{\partial y^2} = 0 \quad \text{to canonical form.} \qquad 4$$

(ii) Solve
$$r + 5s + 6t = 0$$
. 4

7. (i) Solve
$$ry^2 + 2xys + x^2t + px + qy = 0$$
. 4

(ii) Solve
$$rt - s^2 + 1 = 0$$
 by Monge's method. 4

UNIT-IV

8. (i) Solve the wave equation :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$$
by the method of separation of variables. 4

(ii) Solve the Cauchy problem for the equation $\frac{\partial^2 z}{\partial x^2} - \frac{1}{c^2} \frac{\partial^2 z}{\partial t^2} = 0, c > 0 \text{ subject to the conditions}$ $z(x, 0) = f(x) \text{ and } \left[\frac{\partial z}{\partial t}\right]_{t=0} = g(x).$ 4

9. (i) Find the real characteristics of

$$y \frac{\partial^2 z}{\partial x^2} + (x+y) \frac{\partial^2 z}{\partial x \partial y} + x \frac{\partial^2 z}{\partial y^2} = 0.$$
 4

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P.T.O.

(ii) Solve :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, \ 0 < x < a \text{ and } 0 < y < a$$

subject to the boundary conditions
$$4(x, 0) = 4(x, b) = 0$$

$$4(0, y) = 0$$

$$4(a, y) = \pi y(b - y).$$

4

4

Roll No.

Total Pages : 5

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915

STATICS

Paper - BM-233

Time allowed : 3 Hours Maximum Marks : 40

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

Compulsory Question

- 1. (i) Find the resultant of two unlike parallel forces 40N and 5N acting at A and B respectively where AB = 40 cm. 2
 - (ii) If a force F be resolved into component forces and if one component be at right angles to F and equal to $\sqrt{3}$ F in magnitude. Find the direction and magnitude of the other component. 2
 - (iii) Prove that a given system of forces may be replaced by two forces, one of which acts along a given line OA.
 - (iv) State converse of Lame's theorem. 1
 - (v) Define coefficient of friction.

1

UNIT-I

- 2. (i) Three forces P, Q, R acting at a point O are in equilibrium and the angle between P and Q is double the angle between P and R. show that $R^2 = Q(Q - P)$. 4
 - (ii) Forces P, 3P, 2P, 5P act along the sides AB, BC, CD and DA of the square ABCD. Find the magnitude and direction of their resultant and prove that it meets AD produced at a point E such that AE : DE = 5:4.
- 3. (i) A uniform rod of length 2l and weight w is laying across two pegs on the same level d metre apart. If neither peg can stand a stress greater than T, show that : 4

$$l - \frac{d (W - T)}{W}$$

(ii) ABCD is a rectangle with AB = 4m and BC = 3m. Along AB, BC, CD, DA and AC act forces 2, 7, 6, 10 and 5 kg. respectively. Show that the system reduces to a couple and find its moment.

UNIT-II

4. (i) A beam whose centre of gravity divides it into two portions a and b is placed inside a smooth sphere. Show that if θ be its inclination to the horizon in the position of equilibrium and 2α be the angle subtended by the beam at the centre of the sphere then

$$\tan \theta = \frac{b-a}{b+a} \tan \alpha.$$
4

- (ii) A heavy body is placed on a rough inclined plane of inclination α greater than the angle of friction, being acted upon by a force parallel to the plane and along a line of greatest slope, to find the limits between which the force must lie. 4
- 5. (i) One end of a uniform rod is attached to a hinge and the other end is supported by a string attached to the extremity of the rod; the rod and the string are inclined at the same angle θ to the horizontal. If W be the weight of the rod, show that the reaction at the hinge is ¼W√8+cosec²θ. Also find the tension in the string. 4

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3

UNIT-III

- 6. A heavy uniform rod of length 2α rests with its ends in contact with two smooth inclined planes of inclination α and β to the horizon. If θ be the inclination of the rod to the horizon, prove by principle of virtual work that $\tan \theta = \frac{1}{2} [\cot \alpha - \cot \beta].$
- 7. A force *P* acts along the axis of *x* and another force nP along a generator of the cylinder $x^2 + y^2 = a^2$. Show that the central axis lies on the cylinder $n^2(nx-z)^2 + (1+n^2)^2y^2 = n^4a^2$. 8

UNIT-IV

- 8. Wrenches of the same pitch p act along the edges of a regular tetrahedron ABCD of side a. If the intensities of the wrenches along AB, DC are the same and also those along BC, DA and DB, CA; show that the pitch of the equivalent wrench is $\left(p + \frac{a}{2\sqrt{2}}\right)$ 8
- 9. (i) To find the equation to the null plane of a given point (a, b, c) referred to any axis Ox, Oy, Oz.

(ii) A heavy uniform rod rests with one end against a smooth vertical wall and with a point in its length resting on a smooth peg. Find the position of equilibrium and show that it is unstable.

Total Pages : 3

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920

COMPUTER PROGRAMMING AND THERMODYNAMICS

Paper - PH-301

Time allowed : 3 Hours Maximum Marks : 40

Note :Attempt any five questions, selecting at least one question from each unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Questions

- 1. (i) Convert $(12.125)_{10}$ into binary number. 2
 - (ii) Define Variables. Name different types of variables available in FORTRAN with suitable examples.
 2
 - (iii) How cooling is produced by adiabatic demagnetisation, explain?
 - (iv) Define fusion, vaporisation and sublimation lines on a phase diagram.2

UNIT-I

2. (i) What is a Computer? Explain the computer organisation with the help of block diagram.
 6

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P.T.O.

- (ii) What are builtin functions. Explain with examples. 2
- 3. (i) Explain various input-output statements available in FORTRAN with examples. 4
 - (ii) Explain the following statements with example:
 - (i) FORMAT statements.
 - (ii) DO statement 4

UNIT-II

- 4. Write an algorithm, flowchart and program to arrange marks in ascending or descending order. 8
- 5. Write an algorithm, flowchart and program to evaluate finite integral through Simpson's one-third rule.
 8

UNIT-III

- 6. (i) Describe Carnot's cycle and deduce the efficiency of ideal heat engine? 6
 - (ii) A reversible heat engine converts two-fifth of input heat into work. When the temperature of the sink is reduced by 50°C, its efficiency is doubled. Find the temperature of the source and the Sink.

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 $\mathbf{2}$

- 7. (i) Define Entropy. What is its physical significance? Show that the entropy remains constant during a reversible process, but increases in irreversible process.
 - (ii) Calculate the change in entropy, when a body of mass 5 gram is heated from 100K to 1000K. The specific heat of body is 0.1 cal/gram/degree.

UNIT-IV

- 8. Define Helmholtz and Gibb's functions. Derive them from Maxwell thermodyamical relations. 8
- 9. (i) Show that $C_p C_v = TE\alpha^2 V$, where C_p and C_v are the specific heats at constant pressure and volume respectively, E is the bulk modulus of elasticity, \propto the co-efficient of volume expansion and V, the specific volume. 5
 - (ii) Calculate the change in boiling point of water due to change in pressure of 0.01 m of mercury. L = 22.68×10⁵ J Kg⁻¹, volume of 1 kg of water at 100°C is 1000 c.c and volume of 1 kg of saturated steam at 100°C is 1600×10³c.c. 3

Total Pages : 4

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921

WAVE AND OPTICS-I

Paper - VI (PH-302)

Time allowed : 3 Hours Maximum Marks : 40

Note: Attempt any five questions, selecting at least one question from each unit. Question No. 1 is compulsory. Use of Scientific (nonprogrammable) calculator is allowed.

Compulsory Questions

1.	(i)	How	can	we	locate	central	fringe	in
		biprism?					2	

- (ii) Why do we use an extended source to produce colours in thin films? 2
- (iii) What is condition of diffraction? Explain the difference between interference and diffraction.
- (iv) Distinguish between dispersive power and resolving power of a grating. 2

P.T.O.

UNIT-I

- 2. (i) Describe the method to find the thickness of a thin transparent sheet using biprism. Can you find thickness of a thick sheet also?
 - (ii) Two slits in Young's apparatus arc 0.2mm apart. The interference fringes for light of wavelength 6000A are formed on screen 80 cm away. How far is the second dark band from the central fringe ?
- 3. (i) How will you determine the wavelength of monochromatic light by means of Lloyd mirror? Write the difference between Biprism and Lloyd mirror fringes.
 - (ii) The distance between the slit and the biprism and screen is 60 cm each. The angle of biprism is 179° and its refractive index is 1.5. If the distance between successive fringes is 0.0150 cm. Calculate wavelength of light used.

UNIT-II

 What are non-reflecting films? How they are produced. Derive expression for reflectivity in terms of wavelength and refractive index.

- 5. (i) Explain the formation of Newton's rings by reflected light. How can these are used to find the refractive index of a transparent film.
 - (ii) A thin film of a material, whose refractive index is 1.45. on being introduced in one of the arms of Michelson's interferometer, causes a shift of 7 fringes. If wavelength of light used is 5893Å. Calculate the thickness of the film.

UNIT-III

- 6. What is zone plate ? How it is constructed ? Discuss its working as lens. What is phase reversal zone plate ?
 8
- 7. (i) Describe analytically the phenomenon of Fresnel's diffraction at a circular aperture. 6
 - (ii) Determine the radius of the first half period zone of a zone plate which behaves as a convex lens of focal length 50 cm for a wavelength of 5000Å.

UNIT-IV

8. (i) Discuss Fraunhoffer diffraction at double slit. Find the positions of maxima and minima.
 6

3

- (ii) In a Fraunhoffer diffraction due to a narrow slit is placed lm away from the lens to obtain pattern. If slit width is 0.1 mm and first minima lies 4 mm on either side of the central maxima, find wavelength of light used.
- 9. What is plane diffraction grating? Discuss its theory and derive conditions for secondary maxima and minima.
 8

Total Pages : 4

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922

INORGANIC CHEMISTRY

Paper - VIII - CH-201

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 Questions

- 1. (i) Out of Cu_2Cl_2 and $CuCl_2$ which is more stable and why ?
 - (ii) Give the number of unpaired electrons in Cr^{+3} and Co^{+2} .
 - (iii) Write IUPAC name of $Na[Co(CN)_4]$.
 - (iv) What is the oxidation state of cobalt in $\left[Co(NH_3)_3 (H_2O)_2 Cl \right]^{+2}.$
 - (v) Give the example of amphiprotic solvent.
 - (vi) Which out of NH_3 or H_2O undergoes more autoionization ?
 - (vii) What EAN rule?
 - (viii) Draw the structure of [Co(EDTA)]. 1×8

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P.T.O.

UNIT-I

2	(a)	Iron is a transition element but sodium is
	(0)	not Explain 2
	(b)	A Subshall is filled prior to 2d but on
	(U)	4s-Subshell is filled prior to 5d but on
		ionisation, 4s-electrons are removed first.
		Explain. 2
	(c)	Cu^{+2} ions are coloured and paramagnetic
		while $\operatorname{Zn}^{^{+2}}$ ions are colourless and
		diamagnetic Explain why? 2
3.	(a)	Calculate in Bohr magneton the expected
		spin magnetic moment for the following ions:
		(i) Fe^{+3} (ii) Ni^{+2} 2
	(b)	Why do transition elements in zero and
		lower oxidation state form complexes with
		weak ligands like CO, NO or PR_3 ? 2
	(c)	Write the stereochemistry of following
		complexes : 2
		(i) $[Ag(CN)_2]$ (ii) $Ni(CO)_4$ 2
4.	(a)	Consider the Latimer diagram for Tl^+ . 3
		$T1^{+3} \xrightarrow{+1.26} T1^{+} \xrightarrow{-0.34} T1$
		+0.73
		(i) Construct a frost diagram
		(1) Construct a most magrann.

(ii) Predict the stability or unstability of Tl^{+} .

- (b) Write the names and symbols of members of second and third transition series belonging to Fe, Co and Ni groups.
- 5. (a) Draw polymeric structure of $CuCl_2$. 2
 - (b) Which should be a better Oxidising agent : Co^{+2} or Co^{+3} in water. Explain why ? 3
 - (c) Name a transition metal which is liquid at room temperature. Give reason.

UNIT-II

- 6. Write IUPAC names of the following : 3 NH_2
 - (i) $[(NH_3)_4 Co \underbrace{NH_2}_{NO_2} Co(NH_3)_4](NO_3)_4$
 - (ii) $K_2[Fe(CN)_5NO]$
 - (iii) $[Cr(NH_3)_6] [Co(CN)_6]$
 - (b) What is oxidation state and coordination number of the metal ion and the geometrical arrangement of ligands in the complex K₄[Ni(CN)₄].
- 7. (a) What are chelates ? Discuss the factors which affect the stability of chelates. 2
 - (b) Write: 2
 - (i) Linkage isomer of [Cu(NH₃)₅ONO]Cl₂
 - (ii) Coordination isomer of $[Cu(NH_3)_4]$ [PtCl₄].

- (c) Calculate EAN of central atom in : 2 $Fe(CO)_5$ and $[Cr(NH_3)_6]^{+3}$.
- 8. (a) How do the following solutes behave in liq
 SO2 (as an acid or a base)?
 2
 - (i) $SO(SCN)_2$ (ii) $CaSO_3$
 - (b) Discuss self ionisation of liq. SO₂ as non-aqueous solvent. What are the most effective acids and bases of this solvent system. Give reactions.

(c)
$$HgI_2 + KI \xrightarrow{IIquid SO_2} ?$$
 1

- 9. (a) Explain why :
 - (i) Acitamide behaves as a weak base in aqueous solution but shows acidic properties in liquid NH₃.

 2×2

- (ii) Na metal solution in liquid NH_3 is blue in colour, paramagnetic and highly reducing in nature. 2
- (b) Complete the following reactions in liquid NH_3 2
 - (i) $SO_2 Cl_2 + 4NH_3 \longrightarrow$
 - (ii) $BCl_3 \longrightarrow$

Total Pages : 4

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924

PHYSICAL CHEMISTRY

Paper - CH-202

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 Questions

- 1. (a) Which are intensine properties among following: 2
 - (i) Internal energy
 - (ii) Entropy
 - (iii) Volume
 - (iv) Dipole moment.
 - (b) The value of Cp and Cu for a gas are 6.96 and 4.97 find the value of R and Y. 2
 - (c) Define law of chemical equilibrium. 2
 - (d) If $\frac{C_1}{(1-\alpha) C_2}$ have constant value, Where concentration of solute is C_1 and C_2 in solvent 1 and 2 respectively, and α is degree of dissociation of solute. What does it signifies. 2

UNIT-I

- (a) Explain various types of Thermodynamic systems with examples.
 3
 - (b) Which are state functions among following also give reason : 3
 - (i) Internal energy
 - (ii) Work
- 3. (a) Prone enthalpy change is a path function. 3
 - (b) What symbols, signs are used for work done on the system and work done by the system.
- 4. (a) Explain Joule-Thomson effect for real gases. 3
 - (b) Derive the relationship of Joule-Thomson coefficient for real gases in terms of Vander Waal's constants.
 3
- 5. (a) Derive the equations for calculating change in internal energy and work done for adiabatic process of ideal gases.
 - (b) Derive Pv^r = constant
 for reversible adiabatic expansion of ideal
 gas. 3

UNIT-II

- 6. (a) Derive the equation of equilibrium constant in terms of pressure. 3
 - (b) Drive the relationship between standard free energy change with equilibrium constant. 3
- 7. (a) Write the applications of Clavsivs-Clapeyron equation.
 - (b) The normal boiling point of water is 100 °C.
 Its vapour pressure at 80°C is 0.47 atmosphere. Calculate the enthalpy of vaporization.
- 8. The partition coefficient of Iodine between CS_2 and water is 410. A solution of KI containing 8.0gm of salt per litre was shaken with CS_2 until equilibrium, the aqueous layer contain 2.15gm of Iodine per litre and the CS_2 layer 35.42 gm of Iodine per litre. Calculate the equilibrium constant for the reaction :

 $KI + I_2 \iff KI_3$

Given that the concentration of Iodine in the aqueous layer is the sum of free and combined iodine. 6

- 9. (a) Calculate how much compound can be extracted from 100 ml of aqueous solution containing 5.0 gm of compound extracted with 50 ml of ether. The partition coefficient of compound between ether and water is 4. 3
 - (b) How to calculate the degree of association of solute in one of the solvents by logarithmic method.

Total Pages : 4

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926

ORGANIC CHEMISTRY

Paper - X-CH-203

Time allowed : 3 Hours Maximum Marks : 32

Note :Attempt any five questions, selecting at least two questions from each unit. Question No. 1 is compulsory.

Compulsory Questions

- (i) Suggest a reagent to convert a carboxylic acid into the corresponding primary alcohol.
 - (ii) Name the reagent which can be used to distinguish between 1,2-propanediol and 1,3-propanediol.
 - (iii) Phenol has smaller dipole moment than methanol. Explain why? 2
 - (iv) What happens when an organic compound is subjected to UV radiation?2
 - (v) Acetic acid in the vapour state has a molecular mass of 120. Explain.

(vi) How will you convert an acid chloride into anilide?1

UNIT-I

- (i) Why are alcohols weaker acids than water ?
 Explain. 2
 - (ii) Arrange 1-pentanol, 1-butanol, 2-butanol,
 2-methyl-12-propanol and 2-methyl-1 propanol in decreasing order of boiling
 points and explain.
 - (iii) Compare the acidic character of primary, secondary and tertiary alcohols with suitable examples.
- 3. (i) Discuss the role of H-bonding on physical properties of alcohols. 2
 - (ii) How Lucas test is helpful in distinguishing between primary, secondary and tertiary alcohols.
 - (iii) What happens when phenol is treated with phosphorus pentachloride.
- 4. Discuss the mechanism of the following :
 - (i) Kolbe's reaction
 (ii) Claisen rearrangement
 (iii) Reimer-Tiemann reaction.
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- 5. What are epoxides? Discuss the methods of preparation with mechanism :
 - (i) Epoxidation of alkenes 3
 - (ii) From halohydrins. 3

UNIT-II

- 6. (i) What is a chromophore? Identify the chromophoric group in : 2¹/₂
 - (a) Cyclopentene
 - (b) Toluene
 - (c) Butanone.
 - (ii) Compounds A, B and C have the formula C_5H_8 and on hydrogenation yield n-pentane. The ultraviolet spectra show the absorption values of λ_{max} for A=176 nm, B=211 nm and C=215 nm. Assign the structures to A, B and C (1-pentene absorbs at λ_{max} 178 nm). $3\frac{1}{2}$

- (a) Benzene shows an absorption band at $\lambda_{max} 254$ nm ($\epsilon 230$) while aniline absorbs at $\lambda_{max} 280$ nm ($\epsilon 1430$).
- (b) Aniline absorbs at λ_{max} 280 nm (ε 1430)
 in aqueous solution but at λ_{max} 254 nm
 (ε 230) in aqueous acidic solution.

(ii) How can the rate of reaction be measured using UV-VIS spectroscopy? 2

8. Write short notes on the following : 3+3

- (ii) Effect of substituents on the acidic strength of carboxylic acids.
- (ii) Physical Properties of carboxylic acids.
- 9. (i) Discuss the hydrolysis of esters with mechanism taking some suitable example. 3
 - (ii) Discuss relative stability of acyl derivatives.3

Total Pages : 3

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930

BIOLOGY AND DIVERSITY OF SEED PLANTS-I

Paper - I

Time allowed : 3 Hours

Maximum Marks : 40

Note: Attempt five questions in all, selecting two questions from each unit. Questions No. 1 is compulsory. Draw relevant diagram wherever necessary. All questions carry equal marks.

Compulsory Questions

- 1. Define the following :
 - (a) Pycnoxylic wood
 - (b) Zoodiogamy
 - (c) Why cycads are called living fossils
 - (d) Mycorrhizal root
 - (e) Write botanical name of Chir & Kail plants.
 - (f) Sympodial growth
 - (g) Synangium
 - (h) Name characters which made an ovule primitive.

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P.T.O.

 $1 \times 8 = 8$

UNIT-I

2.	Describe the	following fossil plants :	4+4
----	--------------	---------------------------	-----

- (a) Lyginopteris
- (b) Cycadeoidea (= Bennattites)
- 3. Describe general characters of gymnosperms. 8
- 4. What are fossils ? Describe fossilization process. 8
- Mention the various eras of geological time scale and their rough duration with the predominant type of vegetation.

UNIT-II

- Draw well labelled diagrams of the following (No description required): 4+4
 - (a) T.S. coralloid root of cycas.
 - (b) T.S. pinus stem.
- Describe development of female gametophyte and fertilization in pinus.
 8
- 8. Write notes on : 4+4
 - (a) Microsporophyll of Cycas.
 - (b) Male cone of pinus.

- 9. Describe the following :
 - (a) Primitive characters of Amentiferal and Ranales.

4+4

(b) Male gametophyte of Ephedra.

Total Pages : 3

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931

PLANT ANATOMY

Paper - II

Time allowed : 3 Hours

Maximum Marks : 40

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

Compulsory Questions

	1.	Answer	briefly	:
--	----	--------	---------	---

- (a) Ephemeral plants
- Exarch xylem (b)
- (c) Phellem
- (d) Collenchyma cells.
- (e) Unicostate reticulate venation
- Haplocheilic stomata (f)
- (g) Velamen
- (h) Medullary rays.

931/K/63

P.T.O.

 $1 \times 8 = 8$
UNIT-I

2.What are complex permanent tissues in plants ? Briefly write about their functions. 8 Write notes on : 3. 3+2+3(a) Xerophytes (b) Sclerenchyma Trichomes (c) With suitable diagram, explain anomalous 4. secondary growth in Boerhaavia stem. 8 Write difference between : 5. 3+2+3Sapwood and Heartwood. (a) (b) Xylem and Phloem Tracheids and vessels. (c) **UNIT-II** Write notes on : 6. 4 + 4(a) Compound leaves. (b) Leaf abscission.

- 7. Write about the following : 4+4

 (a) Stomatal apparatus and its types
 (b) Phyllotaxy and its types.

 8. Compare the histological organisation of a monocot and a dicot root. 8
 9. Write notes on : 4+4
 - (a) Internal structure of root of Rhizophora.
 - (b) Internal structure of a monocot leaf.

Total Pages : 3

GSM/D-20

932

LIFE AND DIVERSITY OF CHORDATES

Paper - I

Time allowed : 3 Hours

Maximum Marks : 40

Note :Attempt five questions in all. Question No. 1 is compulsory. Attempt at least two questions from each Unit I and II. Draw well labelled diagrams wherever necessary.

Compulsory Question

- 1. Explain the following : $1\frac{1}{2}\times10=15$
 - (a) Wheel organ
 - (b) Endostyle
 - (c) Retrogressive metamorphosis
 - (d) Venous heart
 - (e) Holobranch
 - (f) Why cyctostomes are called agnatha
 - (g) Dorsal tubercle

932/K/64

- (h) Name two lung fishes
- (i) Catadromous fishes
- (j) Characteristic features of cartilagenous fishes.

UNIT-I

2.	(i)	Give	an	account	of	digestive	system	of
		Brand	chios	etoma.			4	₽ ¹ ⁄4
	(ii)	Write	a no	ote on ey	e sp	ot of <i>Branc</i>	chiostomo	ı.2
3.	(i)	Draw	a w	ell labell	ed d	liagram of	pharynx	of
		Herdr	nani	ia.			4	1 <u>/</u> 4
	(ii)	Discu	ss go	onads in <i>l</i>	Hera	lmania.		2
4.	Exp	olain	in	detail	dig	gestive s	ystem	in
	Am	phioxu	<i>s</i> .				6	3 ¹ / ₄
5.	(i)	Give	an	account	of	excretory	system	in
		Brand	chios	toma.			4	1 ¹ /4
	(ii)	Write	a	note on	rep	productive	system	in
		Brand	chios	toma.				2
				UNIT	'-II			

6. (i) Write general characters of cyctostomata and classify it upto order label. 4¹/₄

932/K/64

 $\mathbf{2}$

- (ii) Discuss excretory system in *petromyzon*. 2
- 7. (i) Explain digestive system in *petromyzon*. 4¹/₄
 (ii) Write a note on eye of *petromyzon*.
 8. (i) Give an account of circulatory system in *labeo*. 4¹/₄
 (ii) Write a note on air bladder of labeo. 2
- 9. Give a detailed account of fish Migration. $6\frac{1}{4}$

Total Pages : 3

GSM/D-20

933

MAMMALIAN PHYSIOLOGY

Paper - II

Time allowed : 3 Hours

Maximum Marks : 40

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

Compulsory Question

- 1. (i) What is a glycosidic bond ? $1\frac{1}{2}\times10=15$
 - (ii) Differentiate between myoglobin and haemoglobin.
 - (iii) What is rancidity?
 - (iv) What are zymogenes?
 - (v) Define turgor pressure.
 - (vi) What is lactose intolerance?
 - (vii) What are chylomicrons?
 - (viii) What is tetanus?
 - (ix) What is osteonecrosis?
 - (x) What is the disease caused by deficiency of Vitamin C ? What are the symptoms ?

UNIT-I

2.	(i)	Write a note on isomerism in mono-
		saccharides. 3 ¹ / ₄
	(ii)	Describe the structure of glycogen. 3
3.	(i)	Differentiate between saturated and
		unsaturated fatty acids. 3
	(ii)	Discuss the dynamics of biocarbonate buffer
		system in the body. $3\frac{1}{4}$
4.	(i)	Describe secondary structure of proteins
		with the help of a suitable diagram. $3\frac{1}{4}$
	(ii)	Justify the statement that proteins are
		amphoteric molecules. 3
5.	(i)	Differentiate between competitive and
		allosteric inhibition. $3\frac{1}{4}$
	(ii)	Write a note on isoenzymes. 3
		UNIT-II
6.	(i)	Describe hormonal control of digestive
		enzyme secretion.
	(ii)	What is the function of HCl present in
		gastric juices? 6 ¹ / ₄
7.	(i)	Differentiate between autotrophic and
		heterotrophic nutrition. 2
	(ii)	Explain single muscle twitch. $4\frac{1}{4}$
933/]	K/65	2

8.	(i)	Describe the sliding filament theory	y of
		muscle contration.	$4^{1/_{4}}$
	(ii)	Give differences between isotonic	and
		isometric contraction.	2
9.	(i)	Give an account of the structur	e of
		mammalian bone.	$3^{1}/_{4}$
	(ii)	Describe genetic bone disorders.	3

936

Roll No.

GSM/D-20

OP-AMP AND LINEAR INTEGRATED CIRCUITS

Paper-I

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt five questions in all, selecting at leastone question from each Unit. Question No. 1 iscompulsory. All questions carry equal marks.

Compulsory Question

- 1. (a) Write the characteristics of an Ideal operational Amplifier. 2
 - (b) Define input Bias current. Also define offset voltage. 2
 - (c) What is Buried layer in an I.C.? Why is it used? 2
 - (d) A Power supply has voltage regulation of 2%. If no load voltage is 30V, what is the full load voltage?2

UNIT-I

2. (a) Find the expression for the gain of an Operational Amplifier in Non-Inverting configuration. 4

936/K/797

P. T. O.

- (b) Explain with the help of circuit diagram, howOperational Amplifier can be used as differenceAmplifier.
- 3. (a) Discuss the working of Operational Amplifier as a Summing Amplifier. 3
 - (b) Derive relation between input and output in a double ended differential Amplifier.

UNIT-II

- 4. (a) Explain with the help of circuit diagram, the working of Operational Amplifier as an integrating circuit.
 - (b) Discuss the working of Op-amp as a multiplier of different signals.
- 5. (a) Explain the working of a High pass first order active filter using op-amp. 4
 - (b) Explain the operation of Op-amp as differentiating circuit.

UNIT-III

- 6. (a) Discuss the various steps to fabricate NPN transistor in Integrated Circuit. 3
 - (b) Discuss the Photolithographic etching process in detail.3

- (c) What do you mean by SSI, MSI, LSI and VLSI in IC fabrication technology?2
- 7. (a) Discuss the Epitaxial growth in brief. 3
 - (b) Explain the importance of SiO_2 layer. 2
 - (c) Explain the various methods for making diodes in Integrated Circuit technology. 3

UNIT-IV

- 8. (a) Draw the functional block diagram of three Terminal voltage regulators & explain in brief. 4
 - (b) Define Line regulation and Load regulation.Elaborate the difference between series and shunt type Voltage regulation.
- 9. (a) Explain the working of Current regulation using Op-amp. 4
 - (b) Explain with the help of circuit diagram, the working of Shunt regulator. What are its advantages over a series voltage regulator? 4

Total Pages : 3

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Roll No.

GSM/D-20

OPAMP AND LINEAR INTEGRATED CIRCUITS-I

Paper - I

Time allowed : 3 Hours

Maximum Marks : 40

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

Compulsory Question

- 1. (i) What is buried layer. Why is it used $? 2 \times 4 = 8$
 - (ii) How virtual ground is different from ordinary ground ?
 - (iii) State the applications of Schmitt trigger.
 - (iv) Differentiate between an active and passive filter. Which is advantageous & why ?

UNIT-I

(i) What is the difference between dielectric isolation and beam lead isolation ? Draw appropriate diagrams.

- (ii) What is a positive photoresist and how it is different from negative photoresist ?
- 3. (i) What are the advantages of an IC and what are its limitations. 3
 - (ii) Describe photo-etching process. How many masks are required to complete an IC ? List the function performed by each mask.

UNIT-II

 Describe clearly the various steps involved in fabricating the following monolithic circuit : 8



- 5. (i) How JFET and MOSFET are fabricated using monolithic process? 4
 - (ii) Define sheet resistance R_s. What in the order of R_s for base region and also for emitter region ? Sketch the cross section of an IC resistor.

UNIT-III

- In an OPAMP, the input and output 6. (i) $300k\Omega$ and resistances are 100Ω respectively, when negative feedback is applied to increase the input resistance to 20 M Ω , the gain of the amplifier reduces to 500. Find : 6
 - (i) Open loop voltage gain
 - (ii) Closed loop output resistance
 - (iii) Feedback factor.
 - Show that the output of an ideal differential (ii) amplifier is independent of drift. $\mathbf{2}$
- Explain why the CMRR is infinite if a true 7. (i) content current source is used in a symmetrical emitter-coupled differential amplifier? 3
 - For the circuit show below, find the (ii) output voltage V_0 , if open loop gain is 10^3 , $R_{i} = 50K.$ 5



UNIT-IV

- 8. (i) Discuss Butterworth first order high pass filter. Find the expression for the magnitude of gain and the low cutoff frequency of this filter. Draw its frequency response curve too.
 - (ii) Draw and explain the circuit of integrator.What are its disadvantages ? How can these be removed in a practical integrator circuit ?
- 9. (i) Discuss the working of OPAMP as Schimitt Trigger with its transfer characteristics. 4
 - (ii) Discuss how an OPAMP can be used for multiplication and division of signals. 4

Total Pages : 3

GSM/D-20

938

DIGITAL ELECTRONICS-II

Paper - II

Time allowed : 3 Hours

Maximum Marks : 40

Note :Attempt five questions in all, selecting at least one question from each unit. Questions No. 1 is compulsory.

Compulsory Question

- 1. (i) Differentiate between Asynchronous and synchronors flip-flop.
 - (ii) List the characteristics that must have a device that are used as a binary memory cell.
 - (iii) Draw the output wavefrom of JK flip-flop when the serial inputs applied are J = 1001 and K = 1010 (Assume Q = 0 initially).
 - (iv) What do you mean by level trigger of flip-flop?2×4=8

UNIT-I

2. (i) Implement the following boolean function using 8:1 multiplexer :

$$f(A, B, C) = \sum (0, 2, 5, 6, 7)$$
 4

938/K/68

- (ii) What is code converter ? Design binary to excess-3 code converter. 4
- 3. (i) Implement the following function using 4 to16 lines decoder. 4

(a)
$$f_1(A, B, C, D) = \sum (0, 3, 7, 8, 11, 13)$$

(b) f_2 (A, B, C, D) = $\sum (4, 6, 9, 10, 14, 15)$

(ii) Design even parity generator cum-essor circuit for 8421 codes.

UNIT-II

- 4. (i) Modify clocked RS flip-flop so that it is in store mode when RS = 11. 4
 - (ii) Describe the working of T flip-flop. How a T flip-flop can be used as divide by two device.
- 5. (i) Design and explain the working of a positive edge triggered J-K flip-flop. Also explain the race around problem.
 - (ii) Discuss D-Flip flop Draw the characteristics table of D-flip-flop and explain it.

UNIT-III

6. (i) Design a circuit using a counter to generate the following pulse train (101010) and repeats.

- (ii) What factors determine whether a counter operates a count up or down counter ? 4
- 7. (i) What do you understand by skipping state counter ? Design a Mod-6 counter using T-FF to count the sequence (1, 2, 3, 5, 6, 7).
 - (ii) A synchronous counter is capable of faster operation than a ripple counter. Justify. 3

UNIT-IV

- 8. (i) What do you understand by cyclic shift register ? Explain the operation of ring counter using timing diagram.
 - (ii) Discuss the use of shift register in sequence generator.
- 9. (i) Describe the working of a PIPO shift register. Explain how a number can be shifted in and out from such a register. 5
 - (ii) Explain the use of shift register for constructing a serial adder of 4-bits.

938/K/68

3

Total Pages : 3

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939

DIGITAL ELECTRONICS-I

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.

Compulsory Question

- (i) Make a full adder using a half adder as a building block.
 - (ii) What is a parity in digital codes ? What is its use ?
 - (iii) What is the difference between a synchronous and asynchronous circuit?
 - (iv) What is a binary counter ? $2 \times 4=8$

UNIT-I

- 2. (i) What is a full subtractor ? Explain it with the help of its truth table. 4
 - (ii) Design a full subtractor using NAND gates only.

939/K/69

- 3. (i) What is a parallel binary adder ? Design a parallel binary adder for two 4 bits number.
 6
 - (ii) What is a half adder ? What is its limitation.

UNIT-II

- 4. (i) What is a De-multiplexer circuit ? Explain a
 1:8 De-multiplexer with the help of its truth table.
 6
 - (ii) Implement the following function using 1:8 De-max.

(a)
$$f_1 = \sum (0, 5, 8, 9, 12)$$

- (b) $f_2 \sum (3, 5, 10, 13).$ 2
- 5. (i) What is a parity generator circuit ? Design an Even parity generator circuit for a 4-bit message code using Ex-OR / Ex-OR Gates. 6
 - (b) Implement F (A, B, C) ∑ (1, 3, 5, 7,) using 8:1
 multiplexer. 2

UNIT-III

6. What is a flip-flop ? Explain JK flip-Flop with the help of its circuit diagram and truth table. What is its limitation and how it is resoled ?

- 7. (i) Convert a D-flip flop into SR flipflop using analysis method. 6
 - (b) Why preset and clear inputs in a flip-flop are called asynchronous inputs ?2

UNIT-IV

- Design a Decade synchronous up-counter using JK flip flops. Make its state diagram and timing waveforms.
 8
- 9. (a) What is the principle of digital clock ? Make a block diagram of digital clock using the above principle.
 - (b) An asynchronous counter is also known as a Ripple counter, why ?2

Total Pages : 3

GSM/D-20

940

DATA STRUCTURES

Paper - I

Time allowed : 3 Hours

Maximum Marks : 40

Note :Attempt five questions in all. Question No. 1 is compulsory. In addition to compulsory question attempt four more questions selecting one question from each unit.

Compulsory Question

1. (i) What is abstract data type ?

8

- (ii) What are parallel arrays ?
- (iii) Differentiate LIFO and FIFO.
- (iv) How linear data structures are different from non linear data structures ?

UNIT-I

- (i) Define data structure ? Explain various data structure operations with example.
 - (ii) Find time complexity of linear search. 8
- 3. (i) What is string ? Explain different methods of storing strings in computer memory.

940/K/70

(ii) Explain various applications of data structures.

UNIT-II

- 4. (i) Write an algorithm to insert an element in one dimensional array.
 - (ii) What do you mean by sparse Array ? How can you store the sparse array in the memory ?
- 5. (i) Write an algorithm to delete a node from single linked list.
 - (ii) Write note on :
 - (a) Garbage collection
 - (b) Free storage list. 8

UNIT-III

- 6. (i) Discuss PUSH and POP operations on stack using arrays. 5
 - (ii) How does stack play important role in recursion?
- 7. (i) What is circular Queue ? Explain advantages of using it by taking suitable example. 3
 - (ii) Write algorithms to insert and delete element in circular queue.5

UNIT-IV

- 8. (i) Discuss linked representation of binary tree in computer memory.
 - (ii) Explain linked representation of Graph. 8

Total Pages : 2

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941

SOFTWARE ENGINEERING

Paper - II

Time allowed : 3 Hours Maximum Marks : 40

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

Compulsory Question

1.	(i)	Outline the benefits of Throwaway Protot	ype
		Model.	2
	(ii)	Explain degree of relationship a	und
		cardinality of relationship.	2
	(iii)	What is Rayleigh's curve? Also state	its
		significance.	2
	(iv)	Explain Test Oracle.	2
		UNIT-I	
2.	Exp	lain Waterfall model? Elaborate its work	ing

with help of the diagram. What are its drawbacks?

3. Discuss various phases of Software Development Life Cycle. 8

UNIT-II

- 4. (i) Differentiate between Cohesion and Coupling. 4
 - (ii) Explain Process Metrics. Discuss its various attributes.
- What is SRS document? What are qualities of a good SRS? Explain.
 8

UNIT-III

- 6. (i) Briefly discuss CPM and PERT techniques along with suitable examples. 4
 - (ii) Differentiate between Verification and Validation.
- Explain the concept of Data Dictionary, Structured English, Decision Table and Risk Management with suitable examples.

UNIT-IV

- Explain various types of testing techniques viz.
 Unit testing, Integration Testing and System Testing.
 8
- 9. (i) What do you mean by Software Configuration Management? Explain. 4
 - (ii) Discuss the Software Re-engineering Process.

Total Pages : 2

GSM/D-20

946

IMMUNOLOGY

Paper - VI

Time allowed : 3 Hours

Maximum Marks : 40

Note :Attempt **five** questions in all, selecting two questions from each unit and compulsory question no. **1**. All questions carry equal marks.

Compulsory Question

1. Write in brief on the following :

 $1 \times 8 = 8$

- (i) Idiotypes
- (ii) Haptens
- (iii) Lymphocytes
- (iv) Precipitation
- (v) Null cells
- (vi) Convalescent sera
- (vii) Mitogens
- (viii) Cytokines.

UNIT-I

 Define acquired immunity. Explain its various types with examples. 2+6

946/K/75

- 3. (i) Describe the complete structure of spleen. 5(ii) What are T-cells ? Describe its receptors. 3
- Classify antibodies and explain the features of major classes of antibodies.
 8

UNIT-II

- Differentiate between T & B cells. 5. (i) 4 (ii) Write about maturation and activation of B-cells. 4 Write the functions of cell mediated 6. (i) immunity. 4 (ii) Explain the various components and properties of complement system. 4 Define MHC restriction. What is 7. (i) its
 - importance in immunological control? 4
 - (ii) Describe autoimmunity with examples. 4

Total Pages : 3

GSM/D-20

947

MOLECULAR BIOLOGY

Paper - VII

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.

Compulsory Question

- 1. Explain the following briefly : 1×8=8
 - (i) Which are the nonsense triplets and why are they so termed?
 - (ii) What is frameshift mutation?
 - (iii) Define coding strand and antisense strand.
 - (iv) What is Shine-Dalgarno sequence?
 - (v) Differentiate between transformation and transduction.
 - (vi) Do the two strands of DNA helix carry the same genetic information? Explain.
 - (vii) What are histone proteins?

(viii) What is the role of RNA in DNA replication?

UNIT-I

- (i) Discuss the classical blender experiment which demonstrated DNA as genetic material.
 4
 - (ii) Give an account of Watson and Crick's model of DNA.
- 3. (i) Describe the transposable elements of Maize and P elements of Drosophila. 4
 - (ii) Describe various steps of DNA replication in eukaryotes.
- 4. (i) What is DNA repair? Discuss the direct reversal and SOS mechanism of DNA repair.
 6
 - (ii) Write short note on Theta configuration. 2 UNIT-II
- 5. (i) Describe 'Genetic code'. Give a brief account of the experiments which helped in deciphering the genetic code.
 - (ii) Describe the structure of E.coli RNA polymerase and discuss the roles of different components of this enzyme in RNA synthesis on DNA template.

- 6. (i) Discuss the mechanism of protein synthesis in eukaryotes.5
 - (ii) Give an account of conjugation mechanism for recombination in prokaryotes. 3
- 7. (i) Describe briefly how Lac Operon is a classical example of both negative and positive control systems.
 6
 - (ii) What do you mean by 'attenuation' in reference to transcription?2

Roll No.

Total Pages: 04

GSQ/D-20 1030 MATHEMATICS Reals Analysis BM-351

Time : Three Hours]

[Maximum Marks : 27

- Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory.
- 1. (a) Compute L(*f*, P) and U(*f*, P) for the function $f(x) = \frac{1}{x^2}$ on [1, 4] and partition P = {1, 2, 3, 4}.

11⁄2

- (b) Examine the convergence of $\int_{1}^{\infty} \frac{dx}{x}$. 1
- (c) Define open sphere and closed sphere and give examples.
 1¹/₂
- (d) Show that in a discrete metric space (X, d), every subset of X is open.
- (e) Show that in a metric space (X, d), the complement of every singleton set is open. $1\frac{1}{2}$

1

Section I

2. (a) Prove that a bounded function having a finite number of points of discontinuity on [a, b] is integrable on [a, b]. $2\frac{1}{2}$

(b) Show that
$$\lim_{n \to \infty} \left[\frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \dots + \frac{1}{2n} \right] = \frac{\pi}{4}$$
.
2¹/₂

3. (a) If f is bounded and integrable on [a, b], then |f| is also integrable on [a, b]. More over

$$\left| \int_{a}^{b} f dx \right| \leq \int_{a}^{b} |f| dx. \qquad 2\frac{1}{2}$$

(b) Evaluate the integral :

$$\int_{-1}^{1} ([x] - x) dx$$

where [x] stands for greatest integer not greater than x. $2\frac{1}{2}$

Section II

4. (a) Show that
$$\int_{0}^{\infty} \left(\frac{1}{1+x} - e^{-x}\right) \frac{dx}{x}$$
 is convergent. 2¹/₂

- (b) Examine the convergence of the integral $\int_{0}^{\infty} \frac{\cos x}{\sqrt{x^2 + x}} dx \cdot 2\frac{1}{2}$
 - a) Find the values of m and n for which the integral
 - $\int_{0}^{1} x^{n} e^{-mx} dx \quad \text{converges.} \qquad 2\frac{1}{2}$
- (b) Prove that :

5.

(a)

$$\int_{0}^{\pi/2} \frac{dx}{\left(a^2 \sin^2 x + b^2 \cos^2 x\right)^2} = \frac{\pi \left(a^2 + b^2\right)}{4a^3 b^3}.$$
 2¹/₂

Section III

6. (a) Prove that any metric space, (X, d), bounded or not, can be converted into a bounded metric space

(X,
$$d^*$$
), where $d^*(x, y) = \frac{d(x, y)}{1+d(x, y)}$. $2\frac{1}{2}$

- (b) Prove that every open sphere in a metric space (X, d) is an open set. $2\frac{1}{2}$
- 7. (a) Let (Y, d^*) be a subspace of a metric space (X, d). A subset B of Y is d^* -open iff there exists a d-open subset G of X such that $B = G \cap Y$. $2\frac{1}{2}$

(b) Prove that the usual metric space (R, d) is complete. $2\frac{1}{2}$

Section IV

8.	(a)	Prove that every contraction mapping $f: (X, d) \rightarrow$
		(X, d) is uniformly continuous on X. $2\frac{1}{2}$
	(b)	Prove that a compact subset of a metric space is
		closed and bounded. 21/2
9.	(a)	Prove that every closed subset of a compact metric
		space is compact. 21/2
	(b)	If E is connected subset of a metric space (X, d)
		such that ECA \cup B, where A and B are separated
		sets in X, then either $E \subset A$ or $E \subset B$. 2 ¹ / ₂

(5)L-1030

4

Roll No.

Total Pages : 03

GSQ/D-20 1031

MATHEMATICS Groups and Rings BM-352

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. (i) If $a^2 = e$ (identity element) for all $a \in G$, where G is a group. Then prove that G is abelian.
 - (ii) Prove that every cyclic group is an abelian group.
 - (iii) Define principal ideal.
 - (iv) Show that set of all odd integers is not a ring.
 - (v) Define primitive polynomial.
 - (vi) Define field with examples.

Section I

2. (a) Prove that if (G, \cdot) is an abelian group, then for all $a, b \in G$ and for all integers n:

$$(a\cdot b)^n = a^n \cdot b^n.$$
- (b) If an abelian group of order 6 contains an element of order 3, show that it must by cyclic group.
- 3. (a) State and prove Lagrange's theorem for finite groups.
 - (b) Let G be a group, with o(a) = n, then prove that

$$o(a^k) = \frac{n}{(n,k)}$$
, where $a \in G$.

Section II

- 4. (a) Prove that necessary and sufficient condition for a homomorphism f to be one-one is that ker f = {e}, where {e} is the identity element of domain.
 - (b) If H and K are subgrouds of a group G and H is normal in G, then $\frac{HK}{H} \cong \frac{K}{H \cap K}$.
- 5. (a) Let G be a finite group, $a \in G$, then prove that $o(cl(a)) = \frac{o(G)}{o((N/a))}.$
 - (b) Show that centre of a non-abelian group of order 343 always have 7 elements in its centre.

Section III

- 6. (a) Prove that a division ring has no zero division.
 - (b) Show that an ideal of a ring of integers is maximal iff it is generated by some prime integer.

(5)L-1031

- 7. (a) Let S and T be two ideals of a ring R then $\frac{S+T}{S} \cong \frac{T}{S \cap T}.$
 - (b) Show that if $f : \mathbb{R} \to \mathbb{R}'$ is a ring homomorphism then Kernel of f is an ideal of \mathbb{R} .

Section IV

- 8. (a) Prove that every field is an Euclidean ring.
 - (b) If R is an Integral domain, then R[x] is also an integral domain.
- 9. (a) Prove that every Euclidean ring is a unique Factorisation domain.
 - (b) Show that the polynomial $x^4 + 1$ is irreducible over Q.

(5)L-1031

Total Pages : 04

GSQ/D-20 1032 NUMERICAL ANALYSIS BM-353

Time : Three Hours] [Maximum Marks : 20

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

(Compulsory Question)

- 1. (a) State Newton-Gregory formula for forward interpolation.
 - (b) What is Extrapolation ? Explain with example.
 - (c) Write Simpson's 3/8 quadrature formula.
 - (d) Prove that $\nabla = \Delta E^{-1}$. **1,1,1,1**

Section I

2. (a) Given that :

x	: 1	2	3	4	5
y	: 2	5	10	17	26

Find the value of $\nabla^2 y_5$, using various properties.

1

(b) Given :

x	:	1	2	3	4	5	6	7	8
У	:	1	8	27	64	125	216	343	512
Find the value of f (7.5). 2,							2,2		

- 3. (a) By means of Lagrange's formula, prove that $u_1 = u_3 - 0.3(u_5 - u_{-3}) + 0.2(u_{-3} - u_{-5}).$
 - (b) Find the polynomial of the lowest possible degree which assumes the value 3, 12, 15, -21, when x has the value 3, 2, 1, -1 respectively.
 2,2

Section II

4. (a) Use Gauss' forward formula to find the value of y, when x = 3.75 from the following table :

x : 2.5 3.0 3.5 3.5 4.0 4.5 5.0 y : 24.145 22.043 22.043 20.225 18.644 17.262 16.047 (b) Apply Bessel's formula to obtain y_{25} , given $y_{20} = 2854$, $y_{24} = 3162$; $y_{28} = 3544$, $y_{32} = 3902$. 2,2

- (a) Find the probability distribution of the number of heads in three tosses of a coin.
 - (b) A die is thrown 6 times. Getting an odd number is a success. What is the probability of getting (i) 5 successes (ii) at least 5 successes. 2,2

Section III

7. Using power method, find the largest eigen value and the corresponding eigen vector of the matrix

$$\mathbf{A} = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 6 \end{bmatrix} .$$

Section III

8. (a) Evaluate
$$\int_{0}^{1} \frac{1}{1+x^2} dx$$
 by Trapezoidal rule.

- (b) The velocity V (km/min) of a bike wihch starts from rest is given at fixed intervals of time (min.) as follows :
 - x:02468101214161820y:010182529322011520Estimate approximately by the distance covered in
20 minutes.2,2

9. (a) Apply Euler's method to solve
$$\frac{dy}{dx} = x + y$$
,
 $y(0) = 0$, choosing the step length = 0.2, find $y(1.4)$.

(b) Given
$$\frac{dy}{dx} = 1 + y^2$$
; where $y = 0$, when $x = 0$ find $y(0.2)$ by R-K method.

Total Pages : 04

GSQ/D-20 1053 MATHEMATICS BM-351 Real Analysis

Time : Three Hours]

[Maximum Marks : 40

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

Compulsory Question

1. (a) If $f(x) = x, x \in [0, 1]$ and $P = \{0, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1\}$ be the partition of [0, 1], then compute L(f, P) and U(f, P). 2

(b) Prove the inequality
$$1 \le \int_0^1 e^{x^2} dx \le e$$
. $1\frac{1}{2}$

(c) Show that
$$\int_{1}^{\infty} \frac{\sin x}{x^{m}}$$
 converges absolutely if $m \ge 1$.

11/2

- (d) Show that the space (0, 1] with usual metric space is not complete.
- (e) Prove that usual metric space (R, d) is not compact. $1^{1/2}$

(2)L-1053

Section I

2. (a) Show that the function
$$f$$
 defined by $f(x) = x, x \in [0, 1]$ is integrable and $\int_0^1 f(x) dx = \frac{1}{2}$.

(b) By definition, prove that
$$\int_0^a \cos x \, dx = \sin a$$
, where *a* is a fixed number. 4

3. (a) If a function
$$f$$
 is continuous on $[a, b]$ and
 $F(x) = \int_{a}^{x} f(t) dt$, then F is differentiable on $[a, b]$
and $F' = f$.
4

(b) Evaluate
$$\int_0^1 \sqrt{1+x^4} dx$$
 by using mean value theorem.
4

Section II

4. (a) Examine the convergence of the improper integral :

$$\int_{-a}^{a} \frac{x \, dx}{\sqrt{a^2 - x^2}} \tag{4}$$

(b) Show that the integral
$$\int_0^\infty x^{n-1}e^{-x}dx$$
 is convergent
if $n > 0$.

(2)L-1053

5. (a) Evaluate
$$\int_0^a \frac{\log(1+\alpha x)}{1+x^2} dx, \alpha > 0$$
. 4

(b) Show that
$$\int_0^{\pi/2} \sin x \log(\sin x) dx$$
 is convergent with

the value
$$\log\left(\frac{2}{e}\right)$$
. 4

Section III

6.	(a)	The inte	rior set	of a subset	t of a	metric	space i	s the
		largest o	open set	contained	in A.	Prove		4

- (b) If A and B are subsets of a metric space (X, d), then prove that : 4
 - (i) $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$
 - (ii) $A^{\circ} \cup B^{\circ} \subset (A \cup B)^{\circ}$
- 7. (a) Every Cauchy sequence is bounded in a metric space. Prove.4
 - (b) Let X be a metric space, then prove that :
 - (i) any intersection of closed sets in X is closed.
 - (ii) finite union of closed sets in X is closed. 4

Section IV

8. (a) A metric space is sequentially compact iff every infinite subset has a limit point.4

(2)L-1053

	(b)	Prove that continuous image of a compact metric	ric
		space is compact.	4
9.	(a)	A continuous image of a connected space	is
		connected. Prove.	4
	(b)	Every compact (sequentially-compact) metric space	ce
		is complete. Prove.	4

Total Pages : 03

GSQ/D-20 1054 MATHEMATICS BM-352 Groups and Rings

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)	Prove that every subgroup of an abelian group is			
		always normal. 11/2			
	(b)	Prove that identity mapping is the only inner			
		automorphism for an abelian group. 11/2			
	(c)	(c) Let $f : \mathbb{R} \to \mathbb{R}'$ be a homomorphism. Then f is one			
		to one if kerf = $\{0\}$. 1 ¹ / ₂			
	(d)	Define Euclidean ring. 1 ¹ / ₂			
	(e)	Define transposition. What do you mean by even			
		and odd permutations ? 2			
		Section I			

2. (a) Prove that order of every element of a finite group is finite and is less than or equal to the order of the group.4

(2)L-1054

- (b) Prove that every subgroup of a cyclic group is cyclic. 4
- 3. (a) Prove that the order of every element of a finite group is a divisor of the order of the group. 4
 - (b) If a group (G, ·) has four elements, show that it must be abelian. 4

Section II

- 4. (a) Prove that the set Inn(G) of all inner automorphisms of a group G is isomorphic to the quotient group G/Z(G), where Z(G) is the centre of G.
 - (b) Let f: G → G be a homomorphism. Let f commutes with every inner automorphism of G. Show that H = {x ∈ G; f²(x) = f (x)} is a normal subgroup of G.
 4
- 5. (a) Let G' be commutator subgroup of a group G. Then G is abelian iff $G' = \{e\}$, where e is the identity element of G. 4

(b) Find the centre of the permutation group S_3 . 4

Section III

6. (a) Show that every field is an integral domain. Also show by an example that every integral domain need not be a field.
4

(2)L-1054

- (b) Let R be a commutative ring. An ideal S of R is a prime ideal iff for two ideals A, B of R, AB ⊆ S ⇒ either A ⊆ S or B ⊆ S.
 4
- 7. (a) Show that an ideal S of a commutative ring R with unity is maximal iff R/S is a field.4
 - (b) Let f be a ring isomorphism of R onto R'. show that if R' is an integral domain, then so is R.

Section IV

- 8. (a) Show that an element in a principal ideal domain is prime element iff it is irreducible.4
 - (b) Show that $\sqrt{-5}$ is a prime element of the ring $z\sqrt{-5} = \{a+b\sqrt{-5} : a, b \in \mathbb{Z}\}.$ 4
- 9. (a) Prove that every principal ideal domain is a unique factorization domain.
 4
 (b) Show that the polynomial :
 4
 - $1+x+x^2+x^3+x^4$ is irreducible over Q.

(2)L-1054

Total Pages : 04

GSQ/D-20 1055 MATHEMATICS BM-353 Numerical Analysis

Time : Three Hours]

[Maximum Marks : 30

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

(Compulsory Question)

1.	(a)	Show that $\bigwedge_{y, z}^{2} x^{2}$ is independent of x, y, z.	11/2
	(b)	State Gauss's Forward Interpolation Formula.	11/2
	(c)	Define Poisson's distribution.	11/2
	(d)	State Simpson's 1/3rd quadrative formula.	11/2

Unit I

2. (a) State and prove Newton-Gregory Formula. 3

(b) Find the value of an annuity at $5\frac{3}{8}\%$, given the following table : 3

Rate	e per cent	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6
Ann	uity value	17.29203	16.28889	15.37245	14.53375	13.76483

(2)L-1055

3. (a) Given the following data, find f(x) in polynomial process of (x-5): 3

x	0	2	3	4	7	9
f(x)	4	26	58	112	466	922

(b) The values of function f(x) for values of x are given as f(1) = 4, f(2) = 5, f(7) = 5, f(8) = 4. Find values of f(6) and also value for x for which f(x) is maximum or minimum. 3

Unit II

- 4. (a) Derive Gauss Backward Interpolation formula. 3
 (b) Apply Bessel's formula for finding the values of y for x = 3.75 given that : 3
 f (2.5) = 24.145, f (3.0) = 22.043, f (3.5) = 20.225, f (4.0) = 18.644, f (4.5) = 17.262, f (5.0) = 16.047.
- 5. (a) Find the probability distribution of the number of doublets in 4 throws of a pair of dice.3
 - (b) A manufacturer of bulb knows that 5% of his production is defective. If he sells bulbs in boxes of 100 and guarantees that not more than 4 bulbs will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality? (Take $e^{-5} = 0.0067$) 3

(2)L-1055

Unit III

6. (a) The distance(s) covered by a car in a given time (t) is given in the following data : 3

Time (minutes)	12	14	18	20	24
Distance (km)	14	18	23	25	34

Find the acceleration of the car at t = 17.

(b) Find the largest eigen values and the corresponding eigen-vector of the matrices : **3**

$$\begin{array}{cccc}
-1 & 1 & 2 \\
0 & 1 & -1 \\
4 & -2 & -9
\end{array}$$

7. Transform the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ to tri-diagonal form

by Given's method. Find the eigen vector corresponding to the largest eigen value from the eigen vectors of the tri-diagonal matrix. **6**

Unit IV

8.	(a)	Evaluate $\int_0^4 e^x dx$, by Simpson's one-third rule u	ising
		the data :	3
		$e = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60$	

3

(2)L-1055

(b) Apply Runge-Kutta method to solve
$$\frac{dy}{dx} = x + y$$
;
 $y(0) = 1$ for $x = 0.1$. 3

9. (a) Solve the following by Euler's modified method

$$\frac{dy}{dx} = \log_{10} (x + y), \text{ at } x = 1.2 \text{ and } 1.4 \text{ with } h = 0.2,$$
given $y(0) = 2.$
3

given
$$y(0) = 2$$
. 3
(b) Use Picard's method to find the third approximation
of the following differential equation : 3
 $\frac{dy}{dx} = y - 1, y(0) = 2$

$$\frac{dy}{dx} = y - 1, \ y(0) = 2$$

Roll No.

Total Pages : 02

GSQ/D-20 1060 QUANTUM AND LASER PHYSICS PH-501

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. Non-programmable calculator is allowed.

Compulsory Question

1.	(a)	Write down expression for Compton wavelength.
		2
	(b)	What are the conditions satisfied by a wave
		function ? 2
	(c)	What is temporal coherence in laser ? 2
	(d)	Explain the role of population inversiosn in laser.
		2

Unit I

2.	(a)	Describe Davisson and Germer's experiment to
		confirm wave nature of matter. 4
	(b)	What is uncertainty principle ? Use it to describe
		that electron can not be part of nucleus. 4
(2)I	L-1060	1

Explain the working of Heisenberg γ -ray microscope. 3. (a)

Write down 1-D Schrödinger wave equation, develop (b) 3-D time Schrödinger wave equation for a nonrelativistic particle. Explain characteristics of wave function. 4

Unit II

- Solve the Schrödinger wave equation for a particle passing 4. through a step potential, where $E \ge V_0$. Prove that T+R=1.
- 5. Describe the quantum theory of harmonic oscillator and solve the Schrödinger equation. Plot the energy levels.8

Unit III

6.	(a)	What are Einstein coefficient ? Derive an expression	1
		in relating them between them.	5
	(b)	Describe the concept of spatial coherence.	3
7.	Deriv	e threshold condition for laser oscillation.	3
		Unit IV	
8.	Discu	uss in detail the principle, construction and working	3
	of so	lid state Ruby laser.	3
9.	Discu	uss the important application of laser in Industries.	3
(2)L	-1060	2	

Roll No.

Total Pages : 03

GSQ/D-20 1061 PHYSICS Paper X Nuclear Physics

Time : Three Hours]

[Maximum Marks : 40

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

(Compulsory Question)

1.	(a)	What do you mean by quadrupole moment of the	ne
		nucleus ?	2
	(b)	Define mass attenuation coefficient.	2
	(c)	What are the limitations of cyclotron ?	2
	(d)	Name the conservation laws of nuclear reaction.	2
		Unit I	

2. (a) Describe the structure of nucleus. Explain, why electrons cannot be constituents of nucleus ? 5

1

(2)L-1061

- (b) A nucleus with A = 235 splits into two fragments whose mass numbers are in the ratio of 3:2. Find the radii of the two fragments. Also find the separation between the fragments at the moment of splitting.
 3
- 3. (a) Explain the construction and working of Bain Bridge and Jordan double focussing mass spectrograph. What are its main advantages ?
 - (b) Calculate the average binding energy per nucleon for ${}^{64}_{28}$ Ni having mass 63.9280 amu. Given m_p = 1.007825 amu and m_n = 1.008665 amu. 2

Unit II

- 4. (a) Discuss the theory of α -disintegration with the help of quantum mechanical tunneling. 6
 - (b) Compare the radiation loss with the ionisation loss for 2 MeV β -particles in lead. Calculate the β energy for which these losses are equal in lead. Atomic number of lead is 82. **2**
- 5. Discuss in brief the three processes of interaction of γ -photon with matter by which radiation loses energy while passing through matter. **8**

(2)L-1061

Unit III

6. (a) Describe a tandem accelerator. Give its merits. 6

(b) A uniform magnetic field of 2 Wb/N² is used in a cyclotron to accelerate the protons. The radius of the cylotron is 0.64 m. Calculate, how rapidly the electric field between the dees should be reversed ?
 2

(Mass of proton = 1.67×10^{-27} kg; Charge of proton = 1.6×10^{-19} C)

- 7. (a) What is a scientillation counter ? Give its construction and working.6
 - (b) A GM counter wire collects 10^8 electrons per discharge. When the counting rate is 500 counts/min, what will be the average current in the circuit ? 2

Unit IV

8.	Define Q-value of a reaction. Derive an expression for	Q-
	value in case of two body system.	8

- 9. (a) Explain the terms nuclear fission and fusion. Give example of each. 4
 - (b) Discuss the principle, construction and working of nuclear fission reactor.

(2)L-1061

Total Pages : 04

GSQ/D-20 1062

CHEMISTRY Paper XV-CH-301 Inorganic Chemistry

Time : Three Hours]

[Maximum Marks : 32

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

Compulsory Question

1. Fill in the blanks :

- (i) $[FeF_6]^{-3}$ is colourless whereas $[CoF_6]^{-3}$ is....
- (ii) CFSE of $[TiF_6]^{-3}$ is....
- (iii) In $[Ni(NH_3)_6]^{+2}$, Ni is.....hybridised.
- (iv) Configuration of low spin Fe(II) is.....
- (v) Higher the value of β_n ,is the complex.
- (vi) Greater the multiplicity.....is the energy.
- (vii) The term log I_0/I is known as.....
- (viii) Pt-halogen bond is.....labile than Pt-N bond.

1×8=8

Section A

2.	(a)	$[Cr(NH_3)_6]^{+3}$ is	s paramagnetic	while	$[Ni(CN)_4]^{-2}$	is
		diamagnetic. E	xplain, why ?			2

(2)L-1062

(b)	On the basis	of 'Crysta	l field	theory',	explain	why
	$[Ti(H_2O)_6]^{+3}$	is coloure	d ?			2

- (c) Calculate CFSF for the following ions in coloured complexes : 2
 - (i) d⁴ strong field
 - (ii) d^6 weak field.
- 3. (a) Predict the number of unpaired electrons in $[Fe(H_2O)_6]^{+2}$ and $[Fe(CN)_6]^{-4}$ and calculate the CFSE for the same. 3
 - (b) Which of the following complexes has longer Δ value and why ? **3** $[Co(CN)_6]^{-3}$ or $[Co(NH_3)6]^{+3}$.
- 4. (a) Arrange the following ligands in the decreasing order of trans effect : 1¹/₂ Br⁻, NH₃, Cl⁻, H₂O, OH⁻.
 - (b) Which is more stable complex and why ? $[Cu(en)_2]^{+2}$ or $[Cu(trien)]^{+2}$. 2
 - (c) What is the relation between overall stability constant and stepwise stability constant ? 2¹/₂
- 5. (a) How will you synthesize three isomers of [Pt(NH₃)(Py)(Br)I] starting from [PtCl₄]⁻²?
 - (b) What is the basic difference between the terms thermodynamic stability and kinetic stability ? 2
 - (c) What are labile complexes ? 1

(2)L-1062

Section B

6.	(a)	What is spin magnetic moment ? How does it
		differ from orbital magnetic moment ? 2
	(b)	Calculate in Bohr Magnetron the magnetic moment
		expected from spin only for the ions : 2
		Cr^{+3} and Fe^{+3}
	(c)	Derive the relationship between magnetic
		susceptibility and magnetic moment. 2
7.	(a)	What do you understand by the term 'diamagnetic
		correction'? 2
	(b)	Why does Mn(II) show maximum paramagnetic
		character amongst the bivalent ions of first transition
		series ? 2
	(c)	Predict which of the following configurations are
		expected to have orbital contribution in high spin
		octahedral field ? 2
		(i) d^1 (ii) d^3
		(iii) d^6 (iv) d^8
8.	(a)	Identify the ground state terms for each set of terms :
		(i) ${}^{1}S, {}^{3}P, {}^{1}D, {}^{3}F, {}^{1}G$
		(ii) ${}^{1}S, {}^{3}P, {}^{1}D$ 2
	(b)	Why do tetrahedral complexes of an element give
		much more intense <i>d-d</i> spectra than its octrahedral
		complexes ? 2

(2)L-1062

(c)	Draw Orgel diagram for d^1 and d^9 octahedral
	complexes. 2
9. (a)	Write a brief note on L-S coupling. 2
(b)	$[Ti(H_2O)_6]^{+3}$ ion is purple in colour as shown by
	absorption spectrum. Explain the transition, position,
	intensity and nature of bond. 2
(c)	Calculate number of microstates for p^3 configuration.
	2

(2)L-1062

Total Pages : 04

GSQ/D-20 1064

CHEMISTRY Physical Chemistry Paper : XVI (CH-302)

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *Five* questions in all, selecting *two* questions from each Section. Q. No. 1 is compulsory. Log table and/or non-programmable calculator are allowed.

1. (a) What do you mean by Black body ? $1 \times 8=8$

- (b) What is the significance of wave function Ψ ?
- (c) Define optical activity of a substance.
- (d) What is magnetic permeability ?
- (e) Out of the following, which will exhibit pure rotational spectra and why ?

H₂, HCl, CO₂, H₂O

- (f) How does force constant 'k' is related to the fundamental frequency ?
- (g) What is Hermitian operator ?

(h) Calculate the degrees of freedom of H_2O molecule. (5)L-1064 1

Section A

- 2. (a) Derive an expression for Planck's Radiation law. How does it explain the spectral distribution of black body radiation ?
 - (b) What is photoelectric effect ? Explain the effect of frequency and intensity of incident radiation on photoelectric effect.
 4,2
- (a) Derive an expression for energy of a particle in one dimentional box.
 - (b) Evaluate the following :

(i)
$$\left(x\frac{d}{dx}\right)^2$$
 (ii) $\left(\frac{d}{dx}+x\right)^2$. **3,3**

- 4. (a) What do you understand by electrical polarisation of molecules ? Discuss the effect of temperature on it.
 - (b) Calculate the specific rotation of a substance, the solution of which contains 5 g of the substance dissolved in 25 ml of water and shows a rotation of 5°, when introduced in 20 cm long polarimeter tube.
 4,2

- 5. (a) Explain any *one* method for the measurement of dipole moment.
 - (b) What is magnetic susceptibility ? Discuss its applications.3,3

Section **B**

- 6. (a) Derive an expression for energies of the rotational transitions in a pure rotational spectrum. Discuss the possible rotational transitions on the basis of selection rules for pure rotational spectra.
 - (b) What is Born-Oppenheimer approximation ? 4,2
- (a) What do you understand by intensity of spectral lines ? Explain the factors on which it depends.
 - (b) Calculate the force constant for the bond in HCl from the fact that the fundamental vibrational frequency is $8.667 \times 10^{13} \text{ s}^{-1}$. **3,3**
- 8. (a) What is Raman Spectra ? Discuss the quantum theory of pure rotational Raman Spectra.
 - (b) What type of molecules exhibit IR spectra ? Out of the following, which are IR active :

 H_2 , HCl, CO₂, SF₄, H_2O , SF₆. 4,2

- 9. (a) Discuss the effect of isotopic substitution on rotational spectra.
 - (b) Arrange the following groups in decreasing order of their absorption frequencies :
 - (i) CF, CBr, CCl, CH
 - (ii) C = C, C C, C = C.
 - (c) What are the advantages of Raman spectroscopy over IR spectroscopy ? 2,2,2

(5)L-1064

Total Pages : 04

GSQ/D-20 1066

CHEMISTRY Organic Chemistry Paper : XVII (CH-303)

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Attempt *four* more questions, choosing *two* questions from each Section.

1. (a) Define carbohydrates. How are they classified ? 2

- (b) What are equivalent and non-equivalent protons ?Explain with examples. 2
- (c) How will you differentiate between cis and Trans1, 2-Dibromocyclopropane using PMR spectroscopy ?

- (d) What is Grignard's reagent ? Explain method of preparation of Grignard's reagent. 2
- (5)L-1066 1

Section A

- 2. (a) How many PMR signals are expected from the following compounds : 2
 - (i) $CH_3 CH_2 Br$ (ii) $CH_2 CH_2$ Br Br (iii) CH_3 H > C = C < H CH_3 CH_3
 - (b) Explain shielding and deshielding effects in PMR spectroscopy. Explain with examples. 2
 - (c) How can you differentiate between 1,
 2-Dibromoethane and 1, 1-dibromoethane using
 PMR spectroscopy.
- 3. (a) What is spin-spin coupling in PMR spectroscopy ?Explain with examples.2
 - (b) What is coupling constant ? How can be splitting constant used to distinguish between cis and trans isomers ?
 - (c) Discuss PMR spectra of ordinary ethanol and ultra pure ethanol. Explain the difference between them.

2

2

(5)L-1066

(iv)

4.	(a)	How	can	PMR	spectros	всору	v be	used	in
		differer	ntiating	; ethane,	ethene	and	ethyne	?	2

- (b) What do you mean by chemical shift ? Discuss the two factors which affect the chemical shift. 2
- (c) An organic compound having the molecular formula $C_{10}H_{14}$ gave the following PMR data : 2
 - (i) Singlet 8 0.88, 9H
 - (ii) Singlet 8 7.28, 5H

Assign the structure to the compound on the basis of above data.

- 5. (a) Write the structural formulae for compounds with the following molecular formula and which give rise to only one PMR signal ?
 (i) C₆H₁₂ (ii) C₂H₆O (iii) C₂H₄Br₂ (iv) C₈H₁₀.
 (b) Explain the following :
 2
 - (i) Anisotropic effect (ii) Enantiotopic protons.(c) Discuss the applications of PMR spectroscopy. 2

Section **B**

- 6. (a) What are Glycosides ? Write Haworth Projection formula of methyl α, D (+) Glucopyroniside and β, D (+) Glucopyranoside.
 2
 - (b) What do you mean by Invert sugar ? Explain. 2
 - (c) What are organolithium compounds ? Why organolithium compounds are more realtive than Grignard's Reagent ? 2

(5)L-1066

7.	(a)	Explain the following : 2
		(i) What degradation
		(ii) Erythro and Threo diastereomers.
	(b)	What are Polysaccharides ? Explain. 2
	(c)	Complete the following $P\alpha^n$: 2
		(i) $O = C = O + C_6 H_5 MgBr \longrightarrow$
		(ii) $CH_3 - C - H + CH_3 - CH_2$
		$-CH_2 - CH_2 - hi \longrightarrow$
8.	(a)	What is Kiliani Fischer Synthesis ? Explain. 2
	(b)	Prepare 1°, 2° and 3° alcohol using Grignard's
		Reagent. 2
	(c)	Write the Haworth projection formula of maltose.
		Assign glycosidic linkage also. 2
9.	(a)	Write the modern mechanism for the formation of
		glucosazone. Why glucose and fructose form the
		same osazone ? 2
	(b)	Explain the following : 2
		(i) Mutarotation
		(ii) Organometallic Compounds.
	(c)	Give two methods of preparation of organolithium
		compound. 2

(5)L-1066

4

Total Pages : 03

GSQ/D-20 1070 BOTANY Plant Physiology Paper : I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. Attempt *two* questions from each Sections A and B. All questions carry equal marks.

(Compulsory Question)

1.	Defi	ne/Explain the following : 1×8=8
	(a)	Plasmolysis and Deplasmolysis
	(b)	Hypotonic Solution
	(c)	Ascent of Sap
	(d)	What are macronutrients and micronutrients ?
	(e)	What is the other name of "Hatch-Slack
		Pathway" ?
	(f)	Define Photophosphorylation.
	(g)	What is RQ ?
	(h)	What do you mean by Senescence ?

(5)L-1070

Section A

2.	(a)	Distinguish between Turgor Pressure and W	all
		Pressure.	3
	(b)	Write notes on DPD and Water Potential. How	do
		they differ from each other ?	5
3.	(a)	Define Transpiration. Why is it considered	as
		necessary evil ?	
	(b)	Write a note on stomatal apparatus and explain t	he
		mechanism of opening and closing of stomata.	4
4.	What	t are microelements and beneficial elements f	or
	plants	s ?	8
5.	Expla	ain Mass Flow Hypothesis. What evidences suppo	ort
	this a	and what are main objections against it ?	8
		Section B	
6.	Expla	ain the mechanism of Light Reaction in Plants.	8
7.	(a)	What is photorespiration ? Explain its significant	e.
			4
	(b)	Draw a flow diagram of C ₄ –Cycle.	4
(5)L	1070	2	
8.	(a)	What is respiration ? What are its types ? Expla	in
----	-----	---	----
		the factors affecting respiration.	5
	(b)	What is the significance of Kreb's Cycle ?	3
9.	(a)	Write notes on Florigen Hypothesis, Photoperiodis	m
		and Vernalization.	4
	(b)	Explain the significance of Senescence. What a	re
		different types of Senescence ?	4

Total Pages : 02

1071

1×8=8

GSQ/D-20 BOTANY Ecology Paper : II

Time : Three Hours]

[Maximum Marks : 40

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

(Compulsory Question)

- 1. Define the following :
 - (a) Halophytes
 - (b) Ecotone
 - (c) Vivipary germination
 - (d) Plant indicators
 - (e) Secondary Succession
 - (f) Ecotypes
 - (g) Biological Oxygen Demand
 - (h) Biomagnification.

Unit I

Describe the effect of Temparature as a climatic factor on plants.
 (5)L-1071

3.	Write	short	notes	on	the following :	3+5=8
----	-------	-------	-------	----	-----------------	-------

- (a) Soil Profile
- (b) Morphological and Anatomical adaptations in Xerophytes.
- Describe the various species interactions in Plants with examples.
 8
- What is Population ? Describe its different characteristics with suitable examples.
 8

Unit II

6.	Write short notes on the following :5+3=8(a) Qualitative characteristics of a Community(b) Food-Chain and Food-Web.
7.	What is Succession ? Explain ecological succession on abare rock (Lithosere).8
8.	Describe the various phytogeographical regions of India. 8
9.	What is Pollution ? Describe the various sources, types and control of Air Pollution. 8

(5)L-1071

Total Pages : 03

GSQ/D-20 1072

ZOOLOGY Environmental Biology Paper : I

Time : Three Hours]

[Maximum Marks : 40

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

(Compulsory Question)

1. Define the following :

10

- (a) Differentiate between habital and niche.
- (b) What do you mean by the euthermal and stenothermal animals ?
- (c) Differentiate between the lentic and lotic ecosystem.
- (d) Name the *three* major biotic components of an ecosystem.
- (e) Define the term ammonification and nitrification.
- (f) What is the carrying capacity of the environment ?

(5)L-1072

(g)	What are	e the bio	odive	ersity ł	not s	pots ?		
(h)	What is	the latit	udin	al mig	ratio	n ?		
(i)	Define (Commen	salis	m.				
(j)	What is	the gree	en h	ouse e	ffect	? 1	10×1	.5=15
		S	ecti	on A				
Discu	uss the	effects	of	light	on	animals	in	their

	envir	onment. 6.25
3.	Write	e notes on the following :
	(a)	Pond Biomass 3
	(b)	Lake Biomass.3.25
4.	(a)	Explain the mechanism of energy through the
		ecosystem. 3
	(b)	Discuss the various components of the ecosystem.
		3.25

5. What do you mean by sedimentary cycles ? Discuss the sulphur cycle.6.25

Section B

6. Write a note on natural control on population growth.6.25

(5)L-1072 2

2.

7.	Give	an	account	of	parental	care	in	Amphibians.	6.25
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- 8. Discuss the phenomenon of proto-cooperation by giving suitable examples.6.25
- 9. Describe the methods of control of water pollution 6.25

(5)L-1072

Total Pages : 03

GSQ/D-20 1073

ZOOLOGY Evolution and Developmental Biology Paper : II

Time : Three Hours]

[Maximum Marks : 40

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

(Compulsory Question)

1. Define the following :

- (a) Homologous Organs
- (b) Recapitulation Theory
- (c) Species
- (d) Atavism
- (e) Palaeontology
- (f) Vitellogenesis
- (g) Primitive Streak
- (h) Capacitation
- (i) Pfluger's law
- (j) Amphimixis.

(5)L-1073

1

Section A

2.	(a)	Give a brief account of Miller's Experiment. What
		is its importance in the Understanding of origin of
		life upon earth ? 4
	(b)	Explain the Symbiotic theory of origin of
		Eukaryotes. 3.5
3.	(a)	Define Connecting links. What is their
		Significance ? Give at least <i>three</i> examples. 5
	(b)	Darwin's Finches. 2.5
4.	Expl	ain the four basic steps of Organic Evolution as
	enlis	ted in modern concept of evolution. 7.5
5.	Desc	cribe the following :
	(a)	Lamarckism 5
	(b)	Mega evolution. 2.5
		Section B
6.	(a)	How is polyspermy prevented in animals ? 3.5
	(b)	Write about various types of eggs on the basis of

amount and distribution of yolk.

2

4

(5)L-1073

7.	(a)	Draw a labelled diagram of fate map of blastula of
		Chick. 3
	(b)	Give an account of types of Parthenogenesis. 4.5
8.	(a)	Explain the induction of Central Nervous System. 5
	(b)	Write difference between repairative and restorative
		regeneration. 2.5

9. Describe the process of Gastrulation in Frog. 7.5

Total Pages : 03

GSQ/D-20 1077 MICROPROCESSOR ARCHITECTURE AND PROGRAMMING-I Paper I

Time : Three Hours]

Roll No.

[Maximum Marks : 40

- Note : There are nine questions in this paper. All questions carry equal marks. Attempt *Five* questions in all. Q.
 No. 1 is compulsory. Attempt remaining *four* questions by selecting only *one* question from each Unit.
- (a) What do you mean by Micro-instruction and Macroinstruction ?
 - (b) What do you mean by one byte, two byte and three byte instructions ?2
 - (c) What is difference between CMP reg and SUB reg instructions ? Explain with suitable examples. 2
 - (d) What is the specialty of HL register pair over the other register pairs ?2

1

(2)L-1077

Unit I

- Draw the block diagram of SAP-I computer. Discuss the function of each block.
 8
- **3.** (a) Explain the instruction set of SAP-I computer. What is the size of MAR of the SAP-I computer ? **5**
 - (b) Write an assembly language program for SAP-I computer that will display the result of 8+3-2. **3**

Unit II

- 4. (a) Name and discuss the five different categories in which the instruction set of SAP-II computers are divided.
 6
 - (b) Discuss implied addressing to specify the data of instructions of SAP-II computers. 2
- 5. (a) Write a program in assembly language using SAP-II instructions to complement a number lying at 2000 H memory location. Store the result at 2100 H.
 3
 - (b) Write a program in assembly language for SAP-II computer to interchange (swap) the contents of two memory locations 2200 H and 2201 H.
 3
 - (c) Explain with an example the register addressing mode in SAP-II computer.2

(2)L-1077

Unit III

6.	(a)	If carry flag	is zero, then	shov	v that RAL in	nstruction
		produces a	multiplication	of	accumulator	contents
		by a factor	of 2.			2

- (b) Explain the following instruction of SAP-III computer. Also discuss which flags get affected with the execution of these instructions :
 ADD M, CMP B, POP PSW and MOV A, M. 6
- 7. (a) What is the difference between the stack and stack pointer ? 2
 - (b) What will be contents of accumulator and flags (CY, S, P and Z), after the execution of SUB D instruction; if A = C3 H and D = 3D H.
 3

(c) Explain PUSH and POP instructions. **3**

Unit IV

8.	(a)	Discuss the role of address buffer and address data
		buffer in the architecture of 8085 microprocessor. 4
	(b)	Discuss the following instructions of 8085 :
		XCHG, XTHL, SPHL and LHLD address. 4
9.	(a)	Discuss the functions of the following signals of 8085 microprocessor :
		ALE, \overline{WR} , \overline{RD} , S0 and S1. 4
	(b)	Mentionvariousflagsprovidedin8085microprocessoranddiscusstheir roles.4

3

(2)L-1077

Total Pages : 04

GSQ/D-20 1079 ELECTRONICS Paper II Electronic Communication

Time : Three Hours]

[Maximum Marks: 40

Note : There are nine questions in all carrying equal marks.
 Attempt *Five* questions in all. Q. No. 1 is compulsory.
 Attempt remaining *four* questions selecting *one* question from each Unit. Use of simple calculator is allowed.

(Compulsory Question)

1.	(a)	Define the terms modulation index and deviation
		ratio. 2
	(b)	What are the essential requirements of an ideal
		limiter ? 2
	(c)	Why is scanning necessary in T.V. transmission $?2$
	(d)	Calculate highest approximate modulating frequency
		f_h , that 625 line television must be able to handle.
		2

(3)L-1079

Unit I

- 2. (a) Define DSB-SC, SSB-TC and SSB-SC. What amount of power is carried by each when modulation is 100 per cent ?
 - (b) Analyze the expression for the sinusoidal carrier voltage which is amplifier modulate by another modulating signal of the same type.
- 3. (a) A transmitter radiates 10 kW with unmodulated carrier wave and about 12.15 kW when amplitude modulated. Calculate the modulation index. One another sine wave produces 30% of modulation. What will be the total radiated power if both sine waves modulate the carrier simultaneously ?
 - (b) Derive the relation between the depth of modulation and output power of an AM transmitted wave. **4**

Unit II

- (a) Prove that sideband terms produced in frequency modulation may be extended theoretically to infinity.
 - (b) How the information can be recovered using phase shift detector ? Explain in detail with the help of circuit diagram.4

(3)L-1079

5.	(a)	What do you mean by frequency demodulation ?
		How can we demodulate the frequency signal ? 3

- (b) Define modulation index in FM and frequency deviation.3
- (c) What do you understand by significant sidebands in frequency modulation ?2

Unit III

- 6. (a) Define Kell factor. How it affects vertical resolution of a television picture. Show that vertical resolution increases with increase in number of scanning lines.
 - (b) What is progressive and interlaced scanning ? Explain. How inter-laced scanning reduces flickers ?

4

- 7. (a) Discuss components of composite video signal in brief.5
 - (b) Explain, why the number of lines in TV system are kept odd ?3

Unit IV

 Draw a neat and clean block diagram of TV Receiver. Explain in detail.
 8

3

(3)L-1079

9. (a) Explain the terms :

- (i) complementary colours
- (ii) hue
- (iii) saturation
- (iv) chrominance.
- (b) What do you understand by compatibility in TV transmission ? Enlist the requirements that composite colour signal must meet to make the system fully compatible.

4

Roll No.

Total Pages : 02

GSQ/D-20 1080

COMPUTER SCIENCE

Paper I

Fundamentals of Database Systems

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 Data and Information and give their differences ?
 - (b) Define Physical Data independence and logical data independence.
 - (c) Define Entity and give its types.
 - (d) Define various relationship with example. 8

Unit I

- Define Data base. Differentiate Traditional file system and Data base system.
 8
- 3. What is DBMS ? Explain its components and functions. 8

1

(3)L-1080

Unit II

4.	Explain	architecture	e of Da	tabase s	system	with	emphas	sis
	on three	e views and	explain	the rol	e of D	BA in	n this.	8

5. Discuss DSL, DDL, DML, DCL with examples. 8

Unit III

- 6. (a) Define Attributes, Relation and various relationship.
 (b) Discuss object based data model and Conceptual Model.
 8
- What is E-R diagram and its symbols and make an ER diagram for Online book Store.
 8

Unit IV

- Explain Client server and Centralised Data model with properties.
 8
- **9.** (a) What is a key and explain the role of Primary key, Secondary, Foreign key and Super key in data base access.

(b) Explain constraints and its types. 8

(3)L-1080

Total Pages : 03

GSQ/D-20 1082 COMPUTER SCIENCE Paper II Web Designing

Time : Three Hours]

[Maximum Marks: 40

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

(Compulsory Question)

- 1. (a) What are the most commonly used top level domain names ?
 - (b) What is IPv6 ?
 - (c) Write the purpose of ALT attribute in tag.
 - (d) How can you move a image on web page ? 8

Unit I

2.	(a)	What is Internet ? Briefly explain its history.	
	(b)	Describe different Internet Services.	8

1

(3)L-1082

- **3.** (a) What is Web Casting ? Discuss different Web Casting techniques.
 - (b) Write short notes on the following :(i) URL
 - (ii) Hypertext Transfer Protocol. 8

Unit II

- **4.** (a) Discuss the parameters that need attention for planning a Website.
 - (b) What is a home page ? Give some suggestions to develop home page for your personal website. 5,3
- 5. (a) What is Web Hosting ? Write down different factors that need attention while choosing a Web Host.
 - (b) Explain the Web Publishing Process. 8

Unit III

- Explain Ordered List, Unordered List and Definition List with examples.
 8
- Waht are the taes used for formatting text ? Explain with examples.
 8
- (3)L-1082 2

Unit IV

- 8. (a) How table is created in HTML ? Explain <TR>, <TD> and <TH> tags.
 - (b) Discuss the role of <COLSPAN> and <ROWSPAN> attributes in table. Give example.8
- **9.** Write the advantages of using frames in HTML. Using an example divided the browser screen into three horizontal sections and display different web page in each section.

8

(3)L-1082

Total Pages : 02

GSQ/D-20 1089 BIOTECHNOLOGY Paper XI Animal Biotechnology

Time : Three Hours]

[Maximum Marks : 40

Note : Q. No. **1** is compulsory. Attempt *four* other questions selecting *two* questions from each Section.

- **1.** Explain the following :
 - (a) 70% alcohol for sterilization
 - (b) Substrates for adherent cells
 - (c) Cell lines vs. primary culture
 - (d) Serum vs. plasma. $2 \times 4=8$

Section I

- **2.** (a) Discuss in detail about growth factors required for animal cell culture.
 - (b) Differentiate cell culture media with serum and without serum. 4,4
- **3.** (a) Discuss about various ways of tissue diaggregation which are required for primary cell culture.
 - (b) Write a note on secondary cell culture. 4,4

(3)L-1089

4.	(a)	What is cell line ? Elaborate about commonly used
		cell lines.

(b) Write a detailed note on Karyotyping. 4,4

Section II

5.	(a)	Discuss about selectable markers diagrammatically.
		What are they important to cloning vectors ?
	(b)	Write a note on vaccine production. 4,4
6.	(a)	Discuss about embryo transfer technology.
	(b)	How do we make transgenic mice ? Discuss about
		its application. 4,4
7.	(a)	What is the genetically engineering product ?
		Discuss in detail about insulin ?
	(b)	Write a detailed note on gene therapy. 4,4

(3)L-1089

Total Pages : 03

GSQ/D-20 1090 BIOTECHNOLGY Paper XII Plant Biotechnology

Time : Three Hours]

[Maximum Marks : 40

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

(Compulsory Question)

1.	(a)	What are the somaclonal variation ? 1
	(b)	Describe the PDR approach. 1
	(c)	Write the four examples of auxin and cytokinin
		each. 2
	(d)	Describe the main contribution of the scientistis
		'Skoog and Miller' in plant tissue culture. 2
	(e)	What is the significance of fructans production in
		transgenic plants ? 2

1

(3)L-1090

Unit I

2.	Write	e notes on the following :
	(a)	Somatic embryogenesis. 4
	(b)	Embryo rescue. 4
3.	(a)	Write a note on production of cybrids and their
		significance. 4
	(b)	Discuss in brief the significance and limitations of
		callus and suspension cultures. 4
4.	(a)	Differentiate between the organogenesis and somatic
		embryogenesis. 4
	(b)	Describe the importance and methods of selection
		of hybrid fusion products. 4
		Unit II
5.	(a)	Discuss the Binary and Co-integrate vectors with

5.	(a)	Discuss the Binary and Co-integrate vectors	with
		examples.	4
	(b)	Write a note on industrial enzymes production	n in
		transgenic plants.	4

(3)L-1090

6.	(a)	Explain briefly various methods of direct gene
		transfer. 4
	(b)	Discuss the nutritional enhancement of plants by
		manipulations in seed storage proteins. 4
7.	Write	notes on the following :
	(a)	Development of abiotic stress tolerance in crop
		plants. 4
	(b)	Fungal disease resistance development. 4

(3)L-1090