B.Sc - II, III, IV

Roll No. ..... Total Pages : 2

2081

NBAE/M-25

ZOOLOGY/FORENSIC SCIENCE

(Animal Diversity of Chordates)

Paper : B23-ZOO-201

(CC-2/MCC-3)

(5 Year Integrated)

Time : Three Hours] [Maximum Marks : 50

Note : Attempt *five* questions in all, selecting *one* question from each unit. Question No. 1 is compulsory. Support your answer with neat and labelled diagram(s) wherever necessary.

(Compulsory Question)

1. Answer the following in brief :

(a) Neural complex of *Herdmania.*

(b) Intestinal bulb.

(c) Missing link.

(d) Furcula.

(e) Homocercal fin. (5×2=10)

UNIT–I

2. Describe the basic characters of chordates. Give an outline classification of chordates upto classes with suitable examples. (10)

3. Explain the digestive system of *Herdmania*. (10)

UNIT–II

4. Describe respiratory system and mechanism of respiration in *Labeo*. (10)

5. Write short notes on the following :

   (a) Fish fins. (5)

   (b) General characters of Pisces. (5)

UNIT–III

6. Give an account of systematic position, habitat, habits and external morphology of frog. (10)

7. Write short notes on the following :

   (a) Neoteny in amphibians. (5)

   (b) General characters of reptiles. (5)

UNIT–IV

8. Describe the internal structure and working of heart of rat. (10)

9. What are volant adaptations? Describe the various types of adaptations for fight in birds. (10)

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7. (a) Describe the dehydrohalogenation of alkyl halides by taking suitable example. Explain the Saytzeff rule for the elimination of hydrogen and halogen atoms and how it relates to the relative stabilities of alkenes.

(b) Illustrate the mechanism of electrophilic addition to alkene by taking suitable reaction using curly arrows and intermediates.

(c) What are the exceptions to Markovnikov's rule.

(4, 4, 2)

UNIT–IV

8. (a) Define hydrogen bonding and explain its types with examples.

(b) Compare and contrast the effects of hydrogen bonding and Van der Waals forces on the physical properties of substances.

(c) Give two examples of substances that exhibit Van der Waals forces and explain how they influence their physical properties. (4, 4, 2)

9. (a) What is the valence bond theory of metallic bond and how does it explain the electrical conductivity of metals?

(b) What are the types of semiconductors and how do they differ in their band structures and doping mechanisms?

(c) Discuss some applications of semiconductors.

(4, 4, 2)

Roll No. ..... Total Pages : 4

2086

NBAE/M-25

CHEMISTRY

(Chemistry-II)

Paper : B23-CHE-201

(CC-2/MCC-3)

Time : Three Hours] [Maximum Marks : 50

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. Question No. 1 is compulsory. Log table and non-programmable calculator is allowed.

Compulsory Question

1. (a) Write any *two* limitations of radius ratio rule.

(b) Discuss Fajan's rule.

(c) What is half-life period?

(d) What is the theory of strainless rings?

(e) What is Van der Waals forces and how are they different from hydrogen bonding? (5×2=10)

UNIT–I

2. (a) Explain the valence bond theory approach for covalent bonding and how it accounts for the shapes of molecules.

(b) Draw the structures and name the hybrid orbitals of the following molecules and ions: NH^{4+} and XeF_4. Use the VSEPR theory to justify the shapes.

(c) Calculate the bond order of the oxygen molecule O_2 using Molecular Orbital Theory. Based on the bond order, predict whether the molecule is stable or not. (4, 4, 2)

3. (a) Describe the structure and coordination number of CsCl. Explain how the radius ratio rule is applied to predict the coordination number in this ionic compound. Discuss one limitation of the radius ratio rule.

(b) Using the Born-Haber cycle, calculate the lattice energy of CaF_2, given the following data : enthalpy of formation of CaF_2 = –1223 kJ/mol, first and second ionization energies of Ca = 590 and 1145 kJ/mol, electron affinity of F = – 328 kJ/mol, sublimation energy of Ca = 178 kJ/mol, bond dissociation energy of F_2 = 159 kJ/mol.

(c) Explain the concept of polarizing power and polarizability of ions. (4, 4, 2)

UNIT–II

4. (a) Define the rate of a chemical reaction and how does it relate to the order and molecularity of the reaction?

(b) How can the integrated rate expression for a zero-order reaction be derived from the differential rate law? What is the value of the half-life period for a zero-order reaction?

(c) A first-order reaction has a rate constant of 0.05 s^{-1} at 25°C. Calculate the time required for 90% completion of the reaction. (4, 4, 2)

5. (a) Discuss the modifications in the Nernst distribution law when the solute undergoes dissociation in one of the phases. Provide one example.

(b) Using the Nernst distribution law, explain how you would determine the degree of hydrolysis and the hydrolysis constant for aniline hydrochloride.

(c) An organic compound distributes itself between water and benzene. If the concentration of the compound in water is 0.2 M and in benzene is 0.05 M at equilibrium, calculate the distribution coefficient. If the compound dimerizes in benzene, what would be the correct distribution coefficient. (4, 4, 2)

UNIT–III

6. (a) What are cycloalkanes and how are they named? Explain the Baeyer's strain theory and its limitations for predicting the stability of cycloalkanes.

(b) Discuss the Kolbe reaction, and decarboxylation of carboxylic acids with suitable examples.

(c) What are the physical properties of alkanes and how do they vary with molecular weight and branching?(4, 4, 2)

Roll No. .....

Total Pages : 3

2088

NBAE/M-25

CHEMISTRY

(Chemistry-II)

Paper : B23-CHE-203

(CC-M2)

Time : Three Hours]

[Maximum Marks : 20

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

Compulsory Question

1. (a) Out of C, N and O; which has greater ionization energy.

(b) What is solvation energy?

(c) Define inductive effect.

(d) What is the numerical formula used for the calculation of average velocity? (1×4=4)

UNIT-I

2. (a) Why halogens have highest electron gain enthalpy? (2)

(b) Define electronegativity. Why halogens have highest value of electronegativity? (2)

3. (a) Define successive ionization energies. Why $I.E._2 > I.E._1$? Explain. (3)

(b) Out of which has greater electron gain enthalpy value: F, Cl, Br and I. (1)

UNIT–II

4. (a) What are stoichiometric and non-stoichiometric defects? (2.5)

(b) Why Frenkel defect has less density? (1.5)

5. (a) Define lattice energy. Explain the solubility of $MgCl_2$ is much higher than MgF_2? (1.5)

(b) Why is LiCl is more covalent than NaCl? (2.5)

UNIT–III

6. (a) Define Vander wall's interactions. Explain their types. (3)

(b) Complete the reaction : $CH_3CHO + H^+CN^- \rightarrow$ (1)

7. (a) Write the differences between inductive effect and electromeric effect. (2)

(b) Write short note on Hyperconjugation effect. (2)

UNIT–IV

8. (a) Define root mean square velocity. Calculate the root mean square velocity of Carbon monoxide at 37°C. ($R = 8.314\ J\ k^{-1}mol^{-1}$) (1,2)

(b) Define collision diameter. (1)

9. Define the following terms :

(i) Collision Number.

(ii) Collision frequency.

(iii) Mean free path.

(iv) Average velocity. (4)

Roll No. ..... Total Pages : 3

2089

NBAE/M-25

ELECTRONICS

(Electronic Devices and Basic

Digital Electronics)

Paper : B23-ELE-201

(CC-2/MCC-3)

Time : Three Hours] [Maximum Marks : 50

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

Compulsory Question

1. (a) Compare BJT and FET.

(b) What do you mean by weighted code and non-weighted code?

(c) State advantages of K-map.

(d) Define Propagation delay and Fan out.

(e) State the advantages of CMOS logic. (2×5=10)

UNIT–I

2. (a) Draw the Bias Circuit with Emitter Resistance and calculate the operating points. (5)

(b) A NPN Transistor circuit using the potential divider arrangement of biasing has $\alpha = 0.985$ and $V_{BE} = 0.3$ V. If $V_{cc} = 1$: Calculate R_1 and R_L to place the Q-point at $I_C = 2$ mA and $V_{CF} = 4$ volts. $R_E = 2$ k ohm and $R_2 = 20$ k ohm. (5)

3. (a) Show that the operating point in voltage divider biasing circuit is independent of β. (7)

(b) What do you mean by bias stabilization? What is the need of bias stabilization? (3)

UNIT–II

4. (a) Define various JFET parameters. Also draw the relation between them. (6)

(b) Discuss the small signal model for FET. (4)

5. (a) Describe the construction and characteristics of N-channel enhancement MOSFET. (5)

(b) Explain with the help of neat diagram construction, working & VI characteristics of p-channel JFET. (5)

UNIT–III

6. (a) Prove NOR gate as Universal gate. (3)

(b) Convert binary number 1011100010 to gray code. (1)

(c) Convert 378.95 to octal & Convert 5496 to binary. (3)

(d) $F = A'BC'D + A'BC'D + AB'CD + AB'CD' + ABCD + A'B'CD'$. (3)

7. (a) Find the Minimized logic function using K-Maps. $F(A, B, C, D) = m(1, 3, 5, 8, 9, 11, 15) + d(2, 13)$. Implement the minimal SOP using NAND gates. (6)

(b) State and prove De Morgan's theorems. (4)

UNIT–IV

8. (a) Describe the AND gate, its symbol and Truth Table. Also realize the truth table using the internal circuit of AND gate using discrete components. (5)

(b) Explain the operation of the DTL NAND gate. (5)

9. (a) Explain the operation of the RTL NOR gate with a suitable circuit diagram. (5)

(b) Explain the operation of the CMOS NAND gate. (5)

Roll No. ..... Total Pages : 3

2091

NBAE/M-25

ELECTRONICS

(Basic Electronics Components & Devices)

Paper : B23-ELE-203

(CC-M2)

Time : Three Hours] [Maximum Marks : 20

Note :(i) There are *nine* questions in this paper. All questions carry equal marks.

(ii) Attempt *five* questions in all.

(iii) Question No. 1 is compulsory.

(iv) Attempt remaining *four* questions by selecting only one question from each unit.

Compulsory Question

1. (a) Find the value of a carbon resistor using colour code scheme if the different bands are brown, black, brown, and gold. (1.0)

(b) Write the use of clipping circuits. (1.0)

(c) Why n-p-n transistors are preferred in electronic circuits? (1.0)

(d) What do you mean by series resonance frequency in RLC circuit? Find the impedance of the circuit at resonance. (1.0)

UNIT–I

2. (a) Describe the working of a PN Junction diode under forward and reverse biasing and also draw the I-V characteristics of the diode. (3.0)

   (b) Write short note on photo transistor. (1.0)

3. (a) Write the different types of relays available in market. Explain the working of any one relay. Also write their applications. (3.0)

   (b) Write short note on photo diode. (1.0)

UNIT–II

4. (a) Discuss the working of Zener diode as voltage regulator. (3.0)

   (b) Write the use of rectifiers. (1.0)

5. (a) Draw the circuit diagram of a full-wave rectifier using Centre-tap connection and explain its working. (3.0)

   (b) Explain why a bridge rectifier is preferred over a Centre-tape full wave rectifier. (1.0)

UNIT–III

6. Draw the circuit diagram and discuss the working of transistor as a switch. (4.0)

7. With the help of circuit diagram explain input/output characteristics of P-N-P transistor in Common Base configuration. (4.0)

UNIT–IV

8. (a) What is the impedance of series R-C circuit? Write the expression for current in this circuit. (2.0)

   (b) A series RLC circuit has R = 10Ω, L = 4 mH and C = 1000 pf. Calculate the resonant frequency and Q factor of the circuit. (2.0)

9. (a) What is the nature of power factor if the frequency is less than resonant frequency in RLC series circuit? (2.0)

   (b) What is the impedance of series R-L circuit? Write the expression for current in this circuit. (2.0)

Roll No. ..... Total Pages : 3

2093

NBAE/M-25

PHYSICS

(Elementary Electricity, Magnetism and EM Theory)

Paper : B23-PHY-202

(CC-M2)

Time : Three Hours] [Maximum Marks : 35

Note : Attempt *five* questions. Question No. 1 is compulsory. Attempt *four* more questions selecting *one* question from each unit. The symbols have their usual meaning.

Compulsory Question

1. (a) Define the gradient of a scalar ϕ. (2)

(b) What are the three different types of the magnetic material? (2)

(c) What is the concept of displacement currents? (1)

(d) What is the impedance of an a.c. circuit? (2)

UNIT–I

2. Define scalar and vector fields along with examples. Show that line integral of a vector over a close path is always zero, if the vector field is gradient of a scalar field. (7)

3. State and prove Stoke's theorem. Give its practical applications. (7)

UNIT–II

4. (a) What do you understand by the solenoidal nature of magnetic field vector $\vec{B}$? (3)

   (b) State and prove the properties of magnetic field vector $\vec{B}$. (4)

5. What do you mean by hysteresis? Discuss its application in selection of materials for permanent magnets, electro-magnet and transformer cores. (7)

UNIT–III

6. (a) Establish the relation $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ and explain the physics of this equation. (3)

   (b) Determine the boundary condition satisfied by magnetic field vector $\vec{B}$ at the interface of two media. (4)

7. State and prove Poynting theorem. Explain the meaning of each term occurring in the theorem. (7)

UNIT–IV

8. Define Thevenin's Theorem and calculate current I in branch AB of circuit shown in Fig. 1. (7)

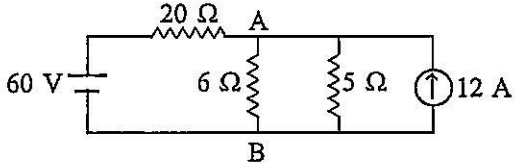


Fig. 1.

9. What are series and parallel resonant circuits? Compare these two circuits. (7)

Roll No. ..... Total Pages : 3

NBAE/M-25 **2092**

PHYSICS

(Electricity and Magnetism & EM Theory)

Paper–B23-PHY-201

(CC-2/MCC-3)

Time : Three Hours] [Maximum Marks : 50

Note : Attempt *five* questions. Question No. 1 is compulsory. Attempt *four* more questions, selecting *one* question from each unit. The symbol have their usual meaning.

Compulsory Question

1. (a) Define gradient of a scalar ϕ. (2)

(b) What is curl of an irrotational field? (2)

(c) A wire carries current along z-direction. Find direction of Magnetic field at point P(–5, 0, 0). (2)

(d) Give the characteristics of e.m. waves. (2)

(e) What do you mean by sharpness of a resonant circuit? (2)

UNIT–I

2. (a) Discuss the physical significance of divergence of a vector field. (7)

(b) Find div G, where G = grad$(x^2 + y^2 + z^2 - 3xyz)$. (3)

3. (a) Derive Poisson's and Laplace's equations. Write down their physical significance. (7)

(b) What is the charge density where electrostatic potential $V(x, y) = a - b(x^2 + y^2)$? (3)

UNIT–II

4. (a) Prove that $\nabla \times \vec{B} = \mu_0 \vec{j}$, where the terms have their usual meaning. (6)

(b) What is solenoid nature of magnetic vector field $\vec{B}$? (2)

(c) What will be the force experienced by a stationary charge in (i) an electric field, (ii) the magnetic field? (2)

5. (a) Give domain theory of ferromagnetism. (7)

(b) For a ferromagnetic material, permeability μ and H are related as :

$$\mu = \left(\frac{0.4}{H} + 12 \times 10^{-4}\right)$$ henry/meter. For B = 1 Tesla, find H. 3

UNIT–III

6. (a) State and prove Maxwell equations. (8)

(b) Differentiate scalar and vector potentials. (2)

7. (a) Explain the boundary conditions for $\vec{B}$ and $\vec{E}$ at the interface of two different media. (8)

(b) Find the velocity of light in vacuum give :

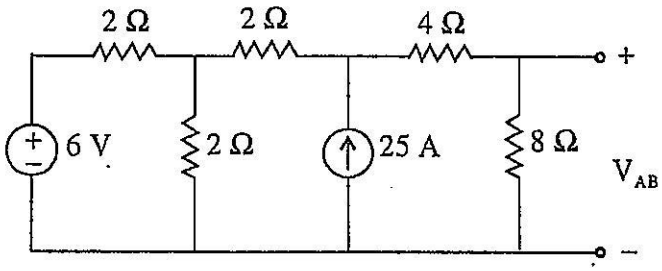
$\varepsilon_0 = 8.85 \times 10^{-12}\ C^2\ n^{-1}\ m^{-2}$

$\mu_0 = 4\pi \times 10^{-7}$ N (Ampere)$^{-1}$. (2)

UNIT–IV

8. (a) Give the statement of superposition theorem. Also give the procedure to analysis of a circuit using this theorem with an example. (5)

(b) Find the open circuit voltage across AB terminal shown in figure below by Thevenin's theorem. (5)



9. (a) Determine the impedance and phase difference between current and emf in an a.c. circuit containing resistance and inductance using j-operator. (8)

(b) What is the true value of the circuit? (2)

Roll No. ..... Total Pages : 3

2098

NBAE/M-25

BOTANY

(Plant Taxonomy and Ecology)

Paper : B23-BOT-201

(CC-2/MCC-3)

Time : Three Hours] [Maximum Marks : 50

Note : Attempt *five* questions in all. Question number 1 is compulsory. Attempt remaining *four* questions selecting at least *one* question from each unit. All questions carry equal marks.

Compulsory Question

1. (a) ICN stands for?

(b) Who proposed Binomial Nomenclature?

(c) Compound Inflorescense.

(d) Versatile Anther.

(e) Inflorescence of Ocimum.

(f) Timber Line.

(g) Vital Index.

(i) Biotic Potential.

(j) Food web.

(k) Red Data Book. (10)

UNIT–I

2. Discuss about Keys to Identification of plants. (10)

3. Write Notes on following :
   (a) Botanical Nomenclature.
   (b) Types of Flower. (5+5=10)

UNIT–II

4. Differentiate between Artificial, Natural and Phylogenetic system of classification. (10)

5. Write Notes on following :
   (a) Floral Diagramme and floral formulae of Brassica.
   (b) Floral Diagramme and floral formulae of Euphorbia. (5+5=10)

UNIT–III

6. Write Short notes on the followings :
   (a) Growth Curves.
   (b) Qualitative Characters of Community. (5+5=10

7. Write Short notes on the followings :
   (a) Energy flow models.
   (b) Edaphic factors. (5+5=10)

UNIT–IV

8. Write Short notes on the followings :
   (a) Significance of Biodiversity.
   (b) Sources of Air Pollution. (5+5=10)

9. Write Short notes on the followings :
   (a) Carbon Trading.
   (b) Phytogeographical regions in India. (5+5=10)

UNIT–IV

8. (a) Find all the solutions in positive integers of :

$$15x + 7y = 111.$$

(b) State Fermat's theorem and give an example to show that the converse may not be true.

9. (a) If p is prime, show that :

$$2(p - 3)! + 1$$

is a multiple of p.

(b) Find the least integer x such that :

$$x \equiv 5(\text{mod } 7); x \equiv 7(\text{mod } 11); x \equiv 3(\text{mod } 13).$$

Roll No. ..... Total Pages : 4

2101

NBAE/M–25

MATHEMATICS : ALGEBRA & NUMBER THEORY

Paper–B23–MAT–201

(CC–2/MCC–3)

Time : 3 Hours] [Maximum Marks : 50

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. (a) Define Hermitian matrix. If A and B are Hermitian, show that AB is Hermitian if and only if AB = BA.

(b) Show that the equation :

$$x^7 - 3x^4 + 2x^3 - 1 = 0$$

has at least four complex roots.

(c) Change the equation :

$$3x^4 - 10x^3 + x^2 - x + 2 = 0$$

into another with integral coefficients, the coefficient of whose leading term is unity.

(d) Show that :

$$3^{2x} + 7$$

is divisible by 8.

(e) Define Euler's function 'ϕ' and evaluate $\phi(462)$.

UNIT–I

2. (a) Find non-singular matrices P and Q such that PAQ is in normal form and hence determine the rank of A where :

$$A = \begin{bmatrix} 3 & 2 & -1 & 5 \\ 5 & 1 & 4 & -2 \\ 1 & -4 & 11 & -19 \end{bmatrix}.$$

(b) State Cayley-Hamilton theorem. Verify it for the matrix :

$$\begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}.$$

3. (a) Find unit Eigen vector corresponding to only one eigen value of the symmetric matrix :

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & -3 & 1 \\ 0 & 1 & -3 \end{bmatrix}.$$

(b) Define orthogonal matrix. If A is an orthogonal matrix and if B = AP, where P is non-singular then prove that PB^{-1} is orthogonal.

UNIT–II

4. (a) Solve the equation :

$$x^4 + x^3 - 16x^2 - 4x + 48 = 0,$$

having given the product of the roots is 6.

(b) Show that the equation :

$$f(x) = x^4 + 4x^3 + 12x^2 + 24x + 24 = 0$$

cannot have multiple roots.

5. (a) Transform the equation :

$$x^4 + 4x^3 - 19x^2 - 46x + 120 = 0$$

into another whose roots are increased by one than the roots of this equation. Hence find the roots of the equation.

(b) If α, β, γ are the roots of $x^3 - x^2 + 1 = 0$, form an equation whose roots are :

$$\alpha+\beta^2+\gamma^2, \beta+\gamma^2+\alpha^2, \gamma+\alpha^2+\beta^2.$$

UNIT–III

6. (a) Discuss the nature of the roots of the cubic

$$Z^3 + 3HZ + G = 0$$

by Cardon's method where H and G are integers.

(b) Solve the equation :

$$x^4 - 4x^3 + 5x + 2 = 0$$

by Descarte's method.

7. (a) Show that a number is divisible by 9 iff the sum of its digits is divisible by 9.

(b) Define a relation between greatest common divisor and least common multiple of two positive integers. Also find the l.c.m. of 306 and 657 by using this relation.

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2122

NBAE/M-25

COMPUTER SCIENCE

(Web Development)

Paper : B23-CSE-201

(CC-2/MCC-3)

Time : Three Hours] [Maximum Marks : 50

Note : Question Number 1 is compulsory. Attempt *five* questions in all selecting at least *one* question from each unit. All questions carry equal marks.

Compulsory Question

1. (a) List out any two features of web server and modern web browsers.

(b) What is the need of scripting languages in web Technologies?

(c) Name two popular search engines apart from Google and describe one distinguishing feature of each.

(d) Write any two differences between an unordered list (<ul>) and a description list (<dl>) in HTML.

(e) Mention any two new features introduced in HTML5 that enhance the capabilities of web pages.

UNIT–I

2. Describe HTTP. Explain how HTTP functions to enable the transfer of data between web servers and clients.

3. (a) Describe the evolution and history of the World Wide Web.

   (b) Describe the role of an Internet Service Provider (ISP) in web hosting. Explain how different types of hosting services offered by ISPs.

UNIT–II

4. (a) Explain the structure of the HTML webpage with an example.

   (b) Define Table tag and their attributes with an example.

5. Define Frameset, Frame Tag. Divide the web page into four equal parts each individual part displays different web page.

UNIT–III

6. Explain the following with examples :

   (i) Inline and Internal CSS.

   (ii) Normal flow box Layout.

7. Define Cascading and Inheritance and discuss their significance in CSS stylesheet management.

UNIT–IV

8. (a) What is JavaScript? Write the advantages of JavaScript.

   (b) Describe the evolution of scripting languages, highlighting the role of JavaScript in shaping the landscape of web development.

9. Describe how JavaScript enhances HTML documents by enabling dynamic content manipulation and interactivity.

Roll No. ..... Total Pages : 3

NBAE/M-25 **2145**

NUTRITION SCIENCE

Paper–B23-HSC-201

(CC-A2)

Time : Three Hours] [Maximum Marks : 35

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

नोट : प्रत्येक इकाई से **एक** प्रश्न चुनते हुए कुल पाँच प्रश्न कीजिए। प्रश्न सं. 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question (अनिवार्य प्रश्न)

1. Write short notes on the following :

(a) Nutrients. 2

(b) Balanced diet. 2

(c) BMR. 2

(d) Vitamin A 1

निम्नलिखित पर संक्षिप्त टिप्पणी लिखिए :

(क) पोषक तत्व।

(ख) संतुलित आहार।

(ग) BMR.

(घ) विटामिन A.

UNIT–I (इकाई–I)

2. Define Nutrition and recommended dietary allowances for Man and Women. 7

पोषण को परिभाषित करें और पुरुषों और महिलाओं के लिए अनुशंसित आहार भत्ते।

3. Describe the Fiber sources, requirements and health problems. 7

फाइबर स्रोतों, आवश्यकताओं और स्वास्थ्य समस्याओं का वर्णन करें।

UNIT–II (इकाई–II)

4. What are the excess and deficiency of Vitamin A, D and E? 7

विटामिन A, D और E की अधिकता और कमी क्या हैं?

5. Explain the types of fiber and their functions. 7

फाइबर के प्रकारों और उनके कार्यों की व्याख्या कीजिए।

UNIT–III (इकाई–III)

6. Briefly describe effects of excess and deficiency of various water soluble. 7

विभिन्न जल में धुलनशील पदार्थों की अधिकता और कमी के प्रभावों का संक्षेप में वर्णन कीजिए।

7. Write short notes on the following : (7)
   (a) Vitamin B2 (Riboflavin).
   (b) Vitamin B1 (Thiamine).

निम्नलिखित पर संक्षिप्त टिप्पणियाँ लिखिए :

(क) विटामिन B2 (राइबोफ्लेविन)

(ख) विटामिन B1 (थायमिन)

UNIT–IV (इकाई–IV)

8. Define Minerals and their classification. 7

खनिजों और उनके वर्गीकरण को परिभाषित कीजिए।

9. Describe functions of Micro minerals. 7

सूक्ष्म खनिजों के कार्यों का वर्णन कीजिए।

Roll No. .....

Total Pages : 3

NBAE/M-25

2146

HOME SCIENCE

(Family Resource Management)

Paper – B23–HSC–202

(CC–B2)

Time : Three Hours]

[Maximum Marks : 50

Note : Attempt *five* questions in all, selecting *one* question from each unit as well as compulsory question.

नोट : अनिवार्य प्रश्न के साथ प्रत्येक इकाई से **एक** प्रश्न चुनते हुए, कुल **पाँच** प्रश्न कीजिए।

Compulsory Question (अनिवार्य प्रश्न)

1. Define the following in 3-4 lines :
   (i) Management.
   (ii) Non Human Resources.
   (iii) Decision Making.
   (iv) Ergonomics.
   (v) Savings. (5×2=10)

   निम्नलिखित की परिभाषा 3–4 पंक्तियों में दीजिए :
   (i) प्रबंधन।
   (ii) गैर-मानव संसाधन।
   (iii) निर्णय लेना।

(iv) कर्मचारी परिस्थिति विज्ञान।

(v) बचत।

UNIT–I (इकाई–I)

2. What is Home Management? Write down its objectives. 10
गृह प्रबंधन क्या है? इसके उद्देश्य लिखें।

3. Explain process of Management. 10
प्रबंधन की प्रक्रिया की व्याख्या करें।

UNIT–II (इकाई–II)

4. Define standards. Explain characteristics of standards. 10
मानकों को परिभाषित करें। मानवों की विशेषताओं की व्याख्या कीजिए।

5. Explain steps in decision-making process. 10
निर्णय लेने की प्रक्रिया में पगों की व्याख्या कीजिए।

UNIT–III (इकाई–III)

6. What is time management? Why there is need of time management. 10
समय प्रबंधन क्या है? समय प्रबंधन की आवश्यकता क्यों है?

7. What are different types of fatigue? Write down various ways to overcome it. 10
थकान के विभिन्न प्रकार क्या हैं? इसे दूर करने के विभिन्न तरीकें लिखें।

UNIT–IV (इकाई–IV)

8. What are sources of money? Write down types of money income. 10
धन के स्रोत क्या हैं? धन आय के प्रकार लिखें।

9. What is budget? Explain its types. 10
बजट क्या है? इसके प्रकारों की व्याख्या कीजिए।

UNIT–II (इकाई–II)

6. Explain the following :
   (i) Light.
   (ii) Ventilation. (2×2=4)

   निम्नलिखित की व्याख्या कीजिए :
   (i) प्रकाश।
   (ii) वायु संचार।

7. Discuss types of house plans. 4

   घर की योजनाओं के प्रकारों की विवेचना कीजिए।

8. Explain principles of space planning. 4

   स्थान नियोजन के सिद्धांतों की व्याख्या कीजिए।

9. Discuss the following :
   (i) Landscape in house plan.
   (ii) Floor. (2×2=4)

   निम्नलिखित की विवेचना कीजिए :
   (i) घर की योजना में परिदृश्य।
   (ii) फर्श।

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2148

NGSE/M-25

HOME SCIENCE

(Housing and Space Management)

Paper–B-23-HSC-204

(CC-M2)

Time : Three Hours] [Maximum Marks : 20

Note : Attempt *five* questions in all, selecting at least *two* questions from each unit and compulsory question as well.

नोट : अनिवार्य प्रश्न के साथ प्रत्येक इकाई से कम-से-कम दो प्रश्न चुनते हुए, कुल **पांच** प्रश्न कीजिए।

Compulsory Question (अनिवार्य प्रश्न)

1. (i) Which of the following colours is most likely to improve productivity and focus in a work environment?
   (a) Red
   (b) Yellow
   (c) Blue
   (d) Orange.

   निम्नलिखित में कौन-सा रंग कार्य वातावरण में उत्पादकता और ध्यान केंद्रित करने में सुधार करने की सबसे अधिक संभावना रखता है?
   (अ) लाल
   (ब) पीला
   (स) नीला
   (द) नारंगी।

(ii) The size of a house depends on the :
(a) Budget
(b) Family Size
(c) Education of Owner
(d) None of these.
घर का आकार निर्भर करता है :
(अ) बजट पर
(ब) परिवार के आकार पर
(स) मालिक की शिक्षा पर
(द) इनमें से कोई नहीं।

(iii) A window sill height from the floor of the room should generally be :
(a) 20-30 cm
(b) 40-50 cm
(c) 56-60 cm
(d) 70-80 cm.
कमरे के फर्श से खिड़की की चौखट की ऊँचाई आमतौर पर होनी चाहिए :
(अ) 20-30 सेमी
(ब) 40-50 सेमी
(स) 56-60 सेमी
(द) 70-80 सेमी।

(iv) The general guidelines of work height for the task where there is frequent use of eyes and infrequent use of hands are :
(a) 2-8 cms below eye level
(b) 3-10 cms below eye level

(c) 5-10 cms below eye level
(d) 8-12 cms below eye level. (4×1=4)
ऐसे कार्य के लिए कार्य ऊँचाई के सामान्य दिशा-निर्देश जहां आंखों का लगातार उपयोग होता है और हाथों का कम उपयोग होता है :
(अ) आंखों के स्तर से 2-8 सेमी नीचे
(ब) आंखों के स्तर से 3-10 सेमी नीचे
(स) आंखों के स्तर से 5-10 सेमी नीचे
(द) आंखें के स्तर से 8-12 सेमी नीचे।

UNIT–I (इकाई–I)

2. Explain non-conventional material for construction of a house. 4
किसी घर के निर्माण के लिए गैर-परंपरागत सामग्री की व्याख्या करें।

3. Explain Advantage and disadvantage of owned and rented house. 4
खुद के और किराए के घर के फायदे और नुकसान की व्याख्या करें।

4. Explain factors affecting site selection. 4
कार्यस्थल के चयन को प्रभावित करने वाले कारकों की व्याख्या कीजिए।

5. Discuss Conventional material used for construction of a house. 4
किसी घर के निर्माण के लिए इस्तेमाल की जाने वाली पारंपरिक सामग्री की विवेचना कीजिए।

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GSE/M-25 **3352**

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. Question No. 1 is compulsory.

Compulsory Question

1. (a) Prove that if n is an integer, the product $n(n-1)(2n-1)$ is divisible by 6. (1½)

(b) Evaluate $\mu(187)$. (1½)

(c) Prove that $\cosh^2 x - \sinh^2 x = 1$. (1½)

(d) Prove that $\log(1 + i \tan \alpha) = \log \sec \alpha + i\alpha$, where α is a positive acute angle. (1½)

(e) If $2\cos\theta = x + \frac{1}{x}$, show that one of the values of x^n is $\cos n\theta + i \sin n\theta$. (2)

SECTION–I

2. (a) Show that there are infinitely many primes of the form $6n + 5$. (4)

(b) Find the general solution in positive integers of $13x - 17y = 5$. (4)

3. (a) Show that $a^{18} - b^{18}$ is divisible by 133 if a and b co-prime to 133. (4)

(b) Using Wilson's theorem, prove that 4, 29! + 5! is divisible by 31. (4)

SECTION–II

4. (a) Solve the congruences :

$x \equiv 1 (\text{mod } 4)$, $x \equiv 3 (\text{mod } 5)$, $x \equiv 2 (\text{mod } 7)$ simultaneously. (4)

(b) For an odd positive m, prove that the sum of the integers of any CRS (mod m) is congruent to zero modulo m. (4)

5. (a) Find the highest power of 180 in 102! (4)

(b) List all the quadratic residues of the prime 7. (4)

SECTION–III

6. (a) Show that the roots of the equation

$(5+x)^5 - (5-x)^5 = 0$ are given by $x = 5i \tan \frac{r\pi}{5}$, where $r = 0, 1, 2, 3, 4$. (4)

(b) Form an equation whose roots are

$\cos \frac{2\pi}{7}, \cos \frac{4\pi}{7}, \cos \frac{6\pi}{7}$. (4)

7. (a) If $|\cos(\alpha - i\beta)| = 1$, show that $\sin^2 \alpha = \sinh^2 \beta$. (4)

(b) If $\sin(\theta + i\phi) = \cos \alpha + i \sin \alpha$, prove that $\cos^2 \theta = \pm \sin \alpha$. (4)

SECTION–IV

8. (a) If the principal values are considered, prove that

$$\frac{(1+i)^{1-i}}{(1-i)^{1+i}} = \sin(\log 2) + i \cos(\log 2).$$ (4)

(b) Solve the equation

$$\tan^{-1} \frac{1}{1+2x} + \tan^{-1} \frac{1}{4x+1} = \tan^{-1} \frac{2}{x^2}.$$ (4)

9. (a) Prove that

$$\coth^{-1} \frac{2}{y} = \sinh^{-1} \frac{y}{\sqrt{4-y^2}}.$$ (4)

(b) Find the sum to infinity of the series

$$1 - \frac{1}{2}\cos\theta + \frac{1 \cdot 3}{2 \cdot 4}\cos 2\theta - \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6}\cos 3\theta + \ldots\ldots,$$ where $-\pi < \theta < \pi$. (4)

Roll No. ..... Total Pages : 3

3353

GSE/M-25

MATHEMATICS

(Ordinary Differential Equations)

Paper : BM-122

Time : Three Hours] [Max. Marks : B.A. : 26, B.Sc. : 40

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

Compulsory Question

1. (a) Define exact differential equation. 1

(b) Solve the differential equation

$(D^4 + 5D^2 + 6)y = 0$. 2

(c) Solve $p = \tan(px - y)$. 2

(d) Define Clairaut's equation. 1

(e) Differentiate between orthogonal trajectory and oblique trajectory. 2

SECTION–I

2. (a) Solve the differential equation

$x^2y\,dx - (x^3 + y^3)\,dy = 0$. 4

(b) Solve the differential equation

$(3x^2y^4 + 2xy)\,dx + (2x^3y^3 - x^2)\,dy = 0$. 4

3. (a) Solve the differential equation

$$y = 3x + \log p.$$ 4

(b) Find the complete primitive and singular solution of the equation $(xp - y)^2 = p^2 - 1$. 4

SECTION–II

4. (a) Find the orthogonal trajectory for the family of curves $r = a(1 + \sin \theta)$. 4

(b) Solve the differential equation

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{3x}.$$ 4

5. (a) Solve the differential equation

$$\frac{d^2y}{dx^2} - y = x^2 \cos x.$$ 4

(b) Solve the differential equation

$$x^2\frac{d^2y}{dx^2} + 8x\frac{dy}{dx} + 13y = \log x.$$ 4

SECTION–III

6. (a) Solve $\sin^2 x\frac{d^2y}{dx^2} = 2y$, given that $y = \cot x$ is a solution. 4

(b) Solve the differential equation

$$\frac{d^2y}{dx^2} - 2 \tan x \frac{dy}{dx} + 5y = 0$$

by removing the first derivative. 4

7. (a) Solve the differential equation

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

by changing the independent variable. 4

(b) Solve $\frac{d^2y}{dx^2} + y = x$ using the method of variation of parameters. 4

SECTION–IV

8. (a) Solve the simultaneous equations :

$$\frac{dx}{dt} + 5x + y = e^t$$

$$\frac{dy}{dt} - x + 3y = e^{2t}.$$ 4

(b) Solve the following equation :

$$\frac{dx}{1} = \frac{dy}{3} = \frac{dz}{5z + \tan (y - 3x)}.$$ 4

9. (a) Solve the total differential equation :

$$2yz\,dx + zx\,dy - xy\,(1 + z)dz = 0.$$ 4

(b) Solve the simultaneous equation :

$$\frac{dx}{y + z} = \frac{dy}{z + x} = \frac{dz}{x + y}.$$ 4

UNIT–IV

8. (a) Evaluate $\int_C \phi d\vec{r}$ for $\phi = x^2y + 2y$ from (1, 1, 0) to (2, 4, 0) along the parabola = x^2, z = 0.

   (b) Evaluate :

$$\iint_S \vec{f}.\hat{n}dS, \text{ where } \vec{f} = \left(x + y^2\right)\hat{i} - 2x\hat{j} + 2yz\hat{k}$$

   and S is the surface of the plane 2x + y + 2z in the first octant.

9. (a) Verify Green's theorem in the plan for :

$$\oint_C (xy + y^2)dx + x^2dy$$

   where C is the closed curve of the region bounded by y = x and $y = x^2$.

   (b) Apply Gauss's divergence theorem to evaluate :

$$\iint_S \vec{f}.\hat{n}dS, \text{ where } \vec{f} = 6z\hat{i} + (2x + y)\hat{j} - x\hat{k}$$

   taken over the region S bounded by the surface of the cylinder $x^2 + z^2 = 9$ included between x = 0, y = 0, z = 0 and y = 8.

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3354

GSE/M–25

MATHEMATICS : VECTOR CALCULUS

Paper–BM–123

Time : 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. (a) Find the volume of the parallelepiped whose edges are represented by :

$$\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}, \vec{b} = \hat{i} + 2\hat{j} - \hat{k}, \text{ and } \vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}.$$

   (b) Find the unit normal vector to the surface,

$$x^4 - 3xyz + z^2 + 1 = 0, \text{ at the point } (1, 1, 1).$$

   (c) Find square of the element of arc length in spherical co-ordinates.

   (d) Evaluate :

$$\int_3^4 \vec{r} \cdot \frac{d\vec{r}}{dt} dt \text{ where } \vec{r}(3) = 3\hat{i} + 2\hat{j} + \hat{k} \text{ and } \vec{r}(4) = 2\hat{i} - 5\hat{j} + \hat{k}.$$

   (e) Show that : div(curl $\vec{f}$) = 0.

UNIT–I

2. (a) If $\vec{a}, \vec{b}, \vec{c}$ are three unit vector such that :

$$\vec{b} \times (\vec{c} \times \vec{a}) = \frac{1}{2}\vec{c}.$$

Find angles which $\vec{b}$ makes with $\vec{a}$ and $\vec{c}$, $\vec{a}$ and $\vec{c}$ being non-parallel.

(b) If $\vec{a}', \vec{b}', \vec{c}'$ denote the reciprocal triad of vectors, prove that :

$$\vec{a} \times \vec{a}' + \vec{b} \times \vec{b}' + \vec{c} \times \vec{c}' = 0.$$

3. (a) Prove that the necessary and sufficient condition for a vector function $\vec{f}$ of a scalar variable t to have constant magnitude is $\vec{f} \cdot \frac{\overrightarrow{df}}{dx} = \vec{0}$.

(b) Find the directional derivative of :

$$\phi(x, y, z) = 3y^2 + yz^2$$

at the point (2, –1, 1) in the direction $-4\hat{j} - \hat{k}$.

UNIT–II

4. (a) Find the constant a and b so that the surface

$$ax^2 - byz = (a + 2)z$$

will be orthogonal to the surface $4x^2y + z^2 = 4$ at the point (1, –1, 2).

(b) If $\vec{f}$ and $\vec{g}$ are two vector point function having continuous second order partial derivative, then show that :

$$\text{curl}(\vec{f} + \vec{g}) = \text{curl } \vec{f} + \text{curl } \vec{g}.$$

5. (a) Show that the function $\frac{1}{r}$ where

$$r = |\vec{r}| = \sqrt{x^2 + y^2 + z^2}$$

is a harmonic function provided $\neq 0$.

(b) If $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and if $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, find :

$$\text{curl}\{(a \times r)r^n\} \text{ where } r = |\vec{r}|.$$

UNIT–III

6. (a) Derive an expression for $\nabla\phi$ in orthogonal curvilinear co-ordinates, where ϕ is a scalar point function.

(b) Transform the function

$$\vec{f} = \rho\hat{e}_\rho + \rho\hat{e}_\phi$$

from cylindrical to Cartesian coordinates.

7. (a) If = xyz , evaluate $\nabla\varphi$ in spherical coordinates.

(b) Express the velocity $\vec{v}$ and acceleration $\vec{a}$ of a particle in spherical coordinates.

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3357

GSE/M-25

PHYSICS

(Properties of Matter and Kinetic Theory of Gases)

Paper–I (PH-201)

Time : Three Hours] [Maximum Marks : 40

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

Compulsory Question

1. (a) Define moment of Inertia in term of Kinetic energy of rotation. (2)

(b) What are the limiting values of Poisson ratio? (2)

(c) Prove that the ratio of two specific heat for a polyatomic gas is $1 + \frac{2}{n}$. (2)

(d) Calculate the kinetic energy of O_2 molecule at 27°C. (2)

UNIT–I

2. (a) State and Prove theorem on parallel axis and perpendicular axis. (6)

(b) What are the applications of Flywheel? (2)

3. Derive an expression for the moment of inertia of a hollow sphere about any diameter and deduce the moment of inertia for a solid sphere. (8)

UNIT–II

4. (a) What do you mean by twisting of a cylinder? Derive an expression for torque per unit twist for a required for a cylindrical wire. (6)

   (b) Explain stress-strain diagram. (2)

5. Derive the relation $\frac{9}{Y} + \frac{3}{\eta} + \frac{1}{K}$, where the symbol has their usual meaning. (8)

UNIT–III

6. What do you mean by Brownian Motion? How it can be explain in term of diffusion of gas due to concentration gradient? Derive expression for diffusion coefficient. (8)

7. Under what condition, a gas deviates from ideal gas behaviors? On the basis of these limitations, what modification is made by Vander Waal in gas equation? (8)

UNIT–IV

8. Derive the expression for Most probable speed, Average speed and root mean square speed. (8)

9. Derive an expression for the coefficient of viscosity of gas at temperature (T) in term of mean free path and prove that it is independent of pressure of gas. (8)

Roll No. .....

Total Pages : 3

3358

GSE/M–25

PHYSICS

(Semiconductor Devices)

Paper–II–PH–202

Time : 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. Use of Scientific (non-programmable) calculator is allowed.

(Compulsory Question)

1. (a) In general, LED is not fabricated using Si, why? (2)

   (b) In a transistor, base is made thin and doped with little impurity atoms, why? (2)

   (c) What is meant by distortion in amplifier? What are its various types? (2)

   (d) Define an oscillator and tank circuit. (2)

UNIT–I

2. (a) Explain construction and working of a Light Emitting Diode. What mechanism is responsible for its working? (4)

   (b) Describe Zener Diode. How it is used as constant voltage regulator? (4)

3. (a) Explain principle construction and working of a Solar cell. Draw its V-I Characteristics. (4)

(b) What do you mean by ripples and ripple factor? Why a full wave rectifier is more useful than a half wave rectifier? (4)

UNIT–II

4. (a) What is a transistor? Describe with the help of circuit diagram the input, output and transfer characteristics of a PNP transistor in common emitter configuration. (6)

(b) The d.c. current gain of a transistor in common base configuration is 100. Find the current gain in common emitter configuration. (2)

5. (a) What is meant by thermal instability factor of transistor circuits? Explain how the stability factor is improved by providing various biasing techniques. (6)

(b) A germanium transistor having $\beta = 100$ and $V_{BE} = 0.3V$ is used in fixed bias amplifier circuit with $V_{cc} = 15$ V, $R_c = 4\ k\Omega$ and $R_B = 720\ k\Omega$. Determine its operating point. (2)

UNIT–III

6. (a) What do you mean by coupling of amplifiers and its various types? Discuss RC coupling in details using an example of two stage RC coupled amplifier. (6)

(b) An amplifier has a gain of 500 without feedback. The gain is reduced to 50 with negative feedback. Find the feedback fraction of the amplifier. (2)

7. (a) What do you understand by positive and negative feedback? Show that negative feedback decreases input impedance and increases output impedance of an amplifier. (5)

(b) Why fixed biasing is not preferred explain? (3)

UNIT–IV

8. (a) What is an oscillator? What are the conditions for sustained oscillations? (6)

(b) The voltage gain of a transistor is 100. The transistor is to be used as an oscillator. What type of feedback should be provided to the circuit? What will be frequency of the circuit if L=0.3 mH and C=300 pF? (2)

9. Describe the principle, construction and working a C.R.O. Discuss its applications. (8)

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3359

GSE/M-25

CHEMISTRY

(Inorganic Chemistry)

(Theory)

Paper : IV (CH-104)

Time : Three Hours] [Maximum Marks : 32

Note : Attempt *five* questions in all, selecting at least *two* questions from each section. Question Number 1 is compulsory.

Compulsory Question

1. (a) Can sodide ion exist?

(b) Out of Si or Ge, which has higher energy gap between conduction and valence bands?

(c) At which temperature water shows maximum density?

(d) Why p-nitrophenol has higher boiling point than o-nitrophenol?

(e) What is the harmful effect of using chlorofluoro-carbons?

(f) Why H_3PO_2 is monobasic acid?

(g) Name any one xenon compound which has explosive nature?

(h) Why lithium is strongest reducing agent? (1×8=8)

SECTION–A

2. (a) Discuss n-type and p-type semiconductors with example? (2)

(b) Why ice always floats over water? (2)

(c) Why H_2O is a liquid whereas H_2S is a gas at room temperature? (2)

3. (a) Draw the structure of beryllium oxalate. (2)

(b) Explain why does Lithium form normal oxides, sodium form peroxides and potassium form superoxides? (2)

(c) Explain why sodium metal cannot be stored in water? (2)

4. (a) Out of $MgCO_3$ and $CaCO_3$, which will give flame coloration and why? (2)

(b) What is the importance of Ca^{2+} ions in the biological system? (2)

(c) Discuss the structures of XeO_2F_2 and XeO_3 molecules? (2)

5. (a) Why elements of first group show flame coloration? (2)

(b) Discuss Electron Sea Model of bonding in metals? (2)

(c) Discuss complexation tendency of Crown ethers? (2)

SECTION–B

6. (a) Compare acidic properties of BF_3 and BCl_3. (2)

(b) Explain why I_2 dissolves in KI solution? (2)

(c) write short notes on Freons? (2)

7. (a) Discuss structure and bonding in diborane. (2)

(b) What is back bonding? Explain it with reference to boron halides. (2)

(c) Discuss properties and uses of silicones. (2)

8. (a) Draw the structure of Pyrophosphoric Acid ($H_4P_2O_7$). (2)

(b) What is Catenation? (2)

(c) Write about important uses of hydrogen peroxide (H_2O_2). (2)

9. (a) Explain why Aluminum forms AlF_6^{3-} ion but boron does not form BF_6^{3-}? (2)

(b) Write a short note on Interhalogen Compounds? (2)

(c) What is back bonding? (2)

Roll No. ..... Total Pages : 3

GSE/M-25 **3360**

PHYSICAL CHEMISTRY (Theory)

Paper–V (CH-105)

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) Write an expression for zero order kinetics.

(b) What is the difference between the 'Rate Constant' and 'Rate of reaction'?

(c) What is the effect of catalyst on rate of reaction?

(d) In a reaction, $2A + 3B \rightarrow 2C$, the rate constant has value 3.2×10^{-4} $mol^{-3/2}/L^{3/2}$/sec. Identify the order of reaction.

(e) Define equivalent conductance and solubility product of a sparingly soluble salt.

(f) Name the best theory/law which describes the behavior of strong electrolytes.

(g) Define buffer solution and pH of a solution.

(h) Write the relationship between ionic conductance and transport number of an ion. 1×8=8

SECTION–A

2. (a) Define Temperature coefficient of a reaction. Why the rate of reaction becomes double at every 10°C rise in temperature? 3

(b) What is rate law? How does it differ from law of mass of action? 3

3. (a) Derive an expression for First order kinetics using integrated rate method. Discuss the relation between Half Life period ($t_{1/2}$) and k of the reaction. 3

(b) A first order decomposition reaction takes 40 minutes for 30 % decomposition. Calculate $t_{1/2}$ value for the reaction 60%. 3

4. (a) Write the units of rate constants for zero, first, second, third and n^{th} order of kinetics. 3

(b) The rate of reaction becomes ten times when the temperature changes from 27°C to 37°C. Calculate the activation energy of a reaction at the same condition. 3

5. (a) Discuss theory of absolute reaction rates. 3

(b) Write short note on Lindemann hypothesis of unimolecular reaction. 3

SECTION–B

6. (a) State and explain Ostwald dilution law. Define the following terms : 3

(b) State Kohlrausch's Law. How does Kohlrausch's Law help to calculate the equivalent conductance of CH_3COOH at infinite dilution?

7. (a) Write a short note on the following :

(i) Electrophoretic effect.

(ii) Relaxation effect. 3

(b) Discuss the postulates of Arrhenius theory of ionization. 3

8. (a) Discuss the titration curve obtained in the following conductometric titrations :

(i) HCl versus NaOH (ii) CH_3COOH versus NaOH. 4

(b) What is Buffer solution? Explain its different types with examples. 2

9. (a) From conductance measurements, the solubility of AgCl in water is calculated to be 1.2×10^{-2} g /L at 20°C. What is the solubility product of the salt at this temperature? (Molecular mass of AgCl=143.3) 3

(b) Discuss the factors affecting Transport number. 3

Roll No. ..... Total Pages : 3

3361

GSE/M-25

CHEMISTRY

(Organic Chemistry)

(Theory)

Paper : VI-(CH-106)

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.

Compulsory Question

1. (a) Write a note on Peroxide effect.

(b) Identify following as Isolated, Cumulated or Conjugated Dienes :

(i) $CH_2=C=CH_2$.

(ii) $CH_2=CH—CH_2—CH=CH_2$.

(iii) $CH_2=CH—CH=CH_2$.

(c) Write names and structures of the attacking species in Nitration and Sulphonation reactions of benzene.

(d) Draw energy profile diagrams for S_N1 and S_N2 reactions. (2×4=8)

SECTION–A

2. (a) Discuss the preparation of alkenes by Hofmann Elimination with mechanism.

(b) Give the mechanism of dehydration of *n*-butyl alcohol with conc. H_2SO_4. (3,3)

3. (a) What is the order of stability of 1-butene, cis-2-butene and trans-2-butene? Explain with reasons.

(b) Write the mechanism of Markownikoff's addition of HBr to propene. (3,3)

4. (a) Explain why $-NH_2$ group is *o,p*-directing and activating in nature.

(b) Give the reaction and mechanism of Nitration of benzene. (3,3)

5. (a) Write a note on aromatic, antiaromatic and non-aromatic compounds. Give one example each.

(b) Give the reaction and mechanism of Halogenation of benzene. (3,3)

SECTION–B

6. (a) Explain the structure and stability of 1,3-Butadiene.

(b) How will you prepare acetylene by Kolbe's electrolytic reaction? (3,3)

7. (a) Discuss Free radical addition of $BrCCl_3$ to 1,3-Butadiene with mechanism.

(b) Make the following conversions :

(i) $HC{\equiv}CH \rightarrow HOOC{-}COOH$.

(ii) $HC{\equiv}CH \rightarrow H_2C{=}CH_2$. (3,3)

8. (a) Discuss the mechanism and stereochemistry of S_N2 reactions.

(b) Discuss the factors affecting S_N1 reactions. (3,3)

9. (a) Give Addition-Elimination mechanism of Nucleophilic Aromatic Substitution in Aryl halides.

(b) Write Sandmeyer reaction for the preparation of chlorobenzene. Also mention which species provides chlorine atom in the product. (3,3)

Write a letter to the S.D.O. Electricity of your area, complaining about the frequent power failures/load-shedding in your area. (8)

Roll No. ..... Total Pages : 6

3362

GSE/M-25

ENGLISH

Paper–110/117

Time : Three Hours] [Maximum Marks : 40

Note : Attempt all questions.

1. Read the passage given below and answer the questions that follow :

Thirdly, our civilization is more secure than any that have gone before it. This is because it is much more widely spread. Most of the civilizations known to history came to an end because vigorous but uncivilized people broke in upon them and destroyed them. This was the fate of Babylon and Assyria; it happened over and over again in India and China; it brought about the end of Greece and the fall of Rome.

Questions :

(a) Name the lesson and its author.

(b) What makes our civilization more secure than other that existed before it?

(c) How did most of the earlier civilizations come to an end?

(d) Name some of the earlier civilizations.

(e) Give meanings of the following words :

secure, vigorous.

OR

The American forces there have fought a large-scale war throughout a country without suffering a single casualty. The war has been so mechanized, so automated, so distanced that one nation can bring down destruction on another – using proxy troops, to be sure, to mop up things on the ground – without experiencing in any fashion the consequences of warfare.

Questions :

(a) What did the American forces do in Afghanistan?

(b) What sort of war it was?

(c) How can one nation bring destruction on another nation?

(d) What does the author mean by 'proxy troops'?

(e) Find in the passage words which mean :

(i) results

(ii) a person who is killed in a war. (5)

2. Explain with reference to the context :

There are some surgeons who cannot live without operating. I would live quiet easily without operating. But I was very keen on exploring new ideas. And I was very fortunate to get involved in heart surgery it was starting.

OR

Every institution is sustained by some sort of a sanction. There are three kinds of sanction which supply life-force to an institution. They are legal, social and religious. The vitality of the institution depends upon the nature of the sanction. (3)

3. Answer any *three* of the following questions in about 30 words each :

(a) What does Narlikar say about rote-learning?

(b) Explain the three barriers in the matter of social intercourse which the ordinary uneducated Hindu must observe.

(c) What is the main feature of Whitman's war poetry?

(d) How have machines become our masters? (6)

4. Answer the following :

What according to Amartya Sen are the seven types of gender inequality? Explain in your own words.

OR

What steps does Narlikar suggest to encourage curiosity, creativity and originality in our education system? (6)

5. Translate the following passage into Hindi :

The greatest need of the whole world, not for our own country alone, is that of peace. Developing countries need it

more strongly than the developed ones. They are backward in many fields. They are commonly poor and their production of the necessities of life is low literacy in such countries is also limited. War means destruction in a short ime of the things produced and created during so many years. Developing countries stand to lose the most in case of war. That is why they endeavour for peace. (5)

OR

(For non-Hindi speaking / Foreign candidates only)

Language is a wonderful gift given to man. No animal possesses this gift but they have their way of expressing themselves. When a rabbit sees an enemy, it runs away into its hole. Its tail, which is white, bobs up and down as it runs. The other rabbits, see it and they run too. They know that there is a danger when a cobra is angry, it raises its hood and makes itself look fierce. This warns other animals. When a bee has found some food, it goes back to the hive. It cannot tell the other bees where the food is by speaking to them, but it does a kind of dance in the air. Some animals say things by making sounds. A dog barks when a stranger comes near.

Questions :

(a) How does a rabbit react when it sees an enemy?

(b) How does the rabbit give a signal of danger to other rabbits?

(c) How does a cobra give a warning to other animals?

(d) Where does a bee carry the food?

(e) How does it tell the other bees where the food is? (5)

6. Write a précis of the following passage and give it a title :

Among the manifold misfortunes that may befall humanity, the loss of health is one of the severest. All the joys which life can give cannot outweigh the sufferings of the sick. Give the sick man everything and leave him with his sufferings and he will fell that half the world is lost to him. Lay him on a soft, silken couch, he will nevertheless groan sleepless under the pressure of the sufferings, while the miserable beggar blessed with health, sleeps on the hard ground. Spread his table with dainty meals and choice drinks, and he will thrust back the hand that proffers them, and envy the poor man who thoroughly enjoys his dry crust. Surround him with pomp of kings; let his chain be a throne, and his crutch a world-swaying sceptre; he will look with contemptuous eye on marble, on gold and on purple and would deem himself happy, if he could enjoy, even were it under a thatched roof, the health of the meanest of his servants. (7)

7. Write a letter to the Editor of a newspaper, expressing your views on the students indiscipline in the Indian Universities.

OR

C

Roll No. ..... Total Pages : 2

3365

GSE/M-25

BOTANY

(Diversity of Archegoniates)

Paper : I

Time : Three 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. Comment on the following :

(i) Elaters.

(ii) Gemmae.

(iii) Synangia.

(iv) Heterosporous. (2×4=8)

UNIT–I

2. Describe the morphology and vegetative reproduction of *Marchantia* by giving suitable diagrams. (8)

3. Describe the morphology and anatomy of sporophyte of *Marchantia.* (8)

4. Describe the morphology and anatomy of sporophyte of *Anthoceros.* (8)

5. Describe the structure of antheridial and archegonial branch of *Funaria* with the help of labelled diagrams. (8)

UNIT –II

6. Describe the morphology and anatomy of *Rhynia* and also classify it. (8)

7. Describe the morphological nature and anatomy of rhizophore in *Selaginella.* (8)

8. Write in detail the morphology and anatomy of stem of *Equisetum.* (8)

9. Explain the alternation of generation in *Pteris* with the help of labelled diagrams. (8)

Roll No. .....

Total Pages : 3

3366

GSE/M-25

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. Write short answer of 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 cistron.

(g) What is translation?

(h) What is cytoplasmic inheritance. (8×1=8)

UNIT–I

2. Write notes on the following :

(a) Experiment which prove that DNA is genetic material. (5)

(b) Physical properties of DNA. (3)

3. Explain the following :

(a) Degeneracy and non-ambiguity of genetic code. (4)

(b) Repetitive DNA. (4)

4. Write brief notes on the following :

(a) Coupling and repulsion hypothesis. (4)

(b) Complete and incomplete linkage. (4)

5. Explain following in brief :

(a) Complementary gene interaction. (4)

(b) Duplicate genes. (4)

UNIT–II

6. Differentiate between :

(a) Gene and Chromosomal mutations. (2)

(b) Spontaneous and Induced mutations. (2)

(c) Morphological and Biochemical mutations. (2)

(d) Somatic and Germinal Mutations. (2)

7. Write note on the following :

(a) Complementation test. (4)

(b) Structure of tRNA. (4)

8. Explain briefly the structure of proteins. (8)

9. Write short notes on the following :

(a) Lac-operon in E-coli. (5)

(b) Function of mitochondrial and plastid DNA. (3)

Roll No. ..... Total Pages : 2

3367

GSE/M–25

ZOOLOGY : LIFE & DIVERSITY OF ANNELIDA TO ARTHROPODA & GENETICS–I

Paper–I

Time : 3 Hours] [Maximum Marks : 40

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

Compulsory Question

1. Explain the following in brief :
   (a) Metamerism.
   (b) Spermatheca.
   (c) Clitellum.
   (d) Haemocoel.
   (e) Malpighian tubules.
   (f) Epistasis.
   (g) Test cross.
   (h) Linkage.
   (i) Cytoplasmic inheritance.
   (j) Genotype. (10×1=10)

SECTION–A

2. Give an account of digestive system of *Pheretima*. (7.5)

3. Classify Phylum Annelida up to the order level, mentioning the characteristic features and suitable examples of each order. (7.5)

4. (a) Enlist the general characteristics of Phylum Arthropoda. (3.5)

   (b) Describe the economic importance of insects with suitable examples. (4)

5. Describe structure and working of compound eye of Grasshopper. (7.5)

SECTION–B

6. What is heredity? Explain Mendel's Law of Independent Assortment with a suitable example. (7.5)

7. (a) Explain mechanism of crossing over. (3.5)

   (b) Describe shell coiling in snails. (4)

8. Explain the chromosomal mechanisms of sex determination in animals with suitable examples. (7.5)

9. What is sex-linked inheritance'? Discuss in detail the inheritance of a recessive sex-linked trait in humans with a suitable example. (7.5)

Roll No. ..... Total Pages : 3

3368

GSE/M-25

ZOOLOGY

(Life and Diversity of Molluasca to Hemichordata and Genetics–II)

Paper – II

Time : Three 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. Answer the following questions :
   (a) What organs of Bojanus?
   (b) What is a sinistral shell?
   (c) Define Arlstotle Lantern.
   (d) What are tube feet? Give their function.
   (e) What are stomochord?
   (f) What is ABO incompatibility?
   (g) What are the other names of trisomics13, 18 and 21?
   (h) What is the cause of sickle cell anaemia?
   (i) What is hnRNA?
   (j) What is genetic counselling? (1×10=10)

SECTION–A

2. Give an illustrated account of nervous system of *Pila*, 7.5

3. Write notes on the following :
   (a) Ospharidium.
   (b) Torsion and detorsion.
   (c) Ctenidium of *Pila*. (2.5×3=7.5)

4. Describe the water vascular system in *Asterias*, along with well-labelled diagrams. 7.5

5. Write short notes on :
   (a) Madreporite.
   (b) Tiedemann's body in *Asterias*.
   (c) Bipinnaria larva. (2.5×3=7.5)

SECTION–B

6. Give an account of human ABO blood groups and their inheritance. 7.5

7. Write notes on :
   (a) Klinefelter's syndrome.
   (b) Albinism.
   (c) Single stranded DNA. (2.5×3=7½)

8. Describe three types of RNA and give their role in the process of protein synthesis. 7.5

9. Write notes on :
   (a) RNA polymerase.
   (b) Somatic mutation.
   (c) Autopolyploidy. (2.5×3=7½)

Roll No. ..... Total Pages : 3

3371

GSE/M-25

ELECTRONICS

(Electronic Devices and Circuits–II)

(Theory)

Paper : I

Time : Three 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. (a) Why is it important to have a stable Q-point in amplifier circuits?

(b) What is the main advantage of voltage divider bias over fixed bias?

(c) Why is direct coupling not suitable for amplification of high frequency

(d) What are the key advantages of JFET over BJT? (2×4=8)

UNIT–I

2. (a) Explain the need for biasing a transistor. Discuss the criteria for selecting an operating point.

(b) With the help of a circuit diagram, describe how a fixed-bias circuit works. (4+4=8)

3. (a) With the help of a Circuit diagram, calculate the operating points for the collector-to-base bias circuit.

(b) In a fixed-bias circuit, a transistor has $\beta = 100$, $V_{cc} = 15$ V, and $R_c = 1$ kΩ. If the base resistor R_b is 220 kΩ, calculate the operating point (I_C and V_{CE}). (4+4=8)

UNIT–II

4. (a) Explain the role of voltage divider biasing in transistor circuits. How is the Q point stable in it compared to fixed-bias circuits?

(b) Calculate the gain of a two-stage amplifier with stage gains of 20 and 30, respectively. (6+2=8)

5. (a) For a voltage divider bias circuit, $V_{cc} = 20$ V, $R1 = 100$ kΩ, $R2 = 10$ kΩ, $R_e = 2$ kΩ, and $R_c = 3$kΩ. Calculate the base, emitter, and collector voltages.

(b) With a neat circuit diagram, explain the working of an emitter-bias circuit. What are its advantages? (3+5=8)

UNIT–III

6. (a) What is the significance of coupling in multi-stage amplifiers? Compare RC coupling, transformer coupling, and direct coupling.

(b) Draw the frequency response curve of an RC-coupled amplifier. Explain the reasons for the gain fall at high and low frequencies. (4+4=8)

7. (a) Compare RC coupling, transformer coupling, and direct coupling in terms of efficiency, cost, and frequency response.

(b) Describe the construction and working principle of RC-coupled amplifiers. What are the key characteristics that define their frequency response. (3+5=8)

UNIT–IV

8. (a) Differentiate between JFET and MOSFET in terms of construction, operation, and characteristics.

(b) Write a short note on CMOS. (4+4=8)

9. Describe the transfer and drain characteristics of a depletion-mode MOSFET. How do these characteristics differ from those of an enhancement-mode MOSFET. (8)

Roll No. ..... Total Pages : 3

3372

GSE/M-25

ELECTRONIC

(Digital Electronics-I)

Paper–II

(Theory)

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *five* questions in all by selecting *one* question from each unit, Question number 1 is compulsory.

Compulsory Question

1. (a) Define octal number system. How counting in this number system is made. 2

(b) Explain Saturated logic circuit and Non-Saturated logic circuit. 2

(c) Noise Margin of a logic gate should be small or large. Justify your statement. 2

(d) Draw truth table of half adder and full adder. 2

UNIT–I

2. (a) Discuss EBCDIC code with example. 3

(b) Perform $(7506)_8 = (?)_{16} = (?)_2$ 2

(c) Explain with suitable example how BCD addition is performed. 3

3. (a) Explain ASCII Code with suitable example. 3

(b) Perform $(67DEF)_{16} = (?)_8 = (?)_2$ 2

(c) Explain the addition/subtraction method of signed numbers in 2's complement representation with suitable example. 3

UNIT–II

4. (a) Simplify using K-map

$f(a, b, c, d) = \Sigma(1, 3, 5, 7, 11, 15) + \Sigma\phi(0, 2, 4, 8)$. 6

(b) Design a circuit to perform AND operation using NOR gates only, 2

5. (a) What do you understand by negative logic? Discuss OR and NOR operation for three input variables. 6

(b) Explain how NAND gate can be used as AND gate. 2

UNIT–III

6. (a) Discuss the characteristics of IC's with reference to propagation delay and level of gating. 4

(b) Explain the working of three input RTL NOR gate. 4

7. (a) Draw and explain the working of three input TTL NAND gate. 6

(b) Draw the circuit of two input CMOS NOR gate. 2

UNIT–IV

8. Explain combinational circuits. Explain the design procedure & working of Parity bit generator. 8

9. (a) Explain the design procedure of BCD adder for four bits. 6

(b) Design a half adder using NOR/NAND gates only. 2

Roll No. .....

Total Pages : 3

3612

GSE/M-25

HUMAN PHYSIOLOGY

Paper : 111

Time : Three Hours]

[Maximum Marks : 40

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

नोट : प्रत्येक इकाई से **दो** प्रश्नों का चयन करते हुए, कुल **पाँच** प्रश्नों के उत्तर दीजिए। प्रश्न संख्या 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question

(अनिवार्य प्रश्न)

1. Write short notes on the following :

(a) Functions of Nucleus.

(b) Leucocytes.

(c) Functions of Uterus.

(d) Vision Defects. (2×4=8)

निम्नलिखित पर संक्षिप्त टिप्पणियाँ लिखिए :

(क) नाभिक के कार्य।

(ख) ल्यूकोसाइट्स।

(ग) गर्भाशय के कार्य।

(घ) दृष्टि दोष।

UNIT–I (इकाई–I)

2. Define cell division. Differentiate between mitosis and meiosis with the help of a table. 8

कोशिका विभाजन को परिभाषित करें। एक तालिका की सहायता से माइटोसिस और अर्धसूत्री विभाजन के बीच अन्तर करें।

3. Discuss various types of joints present in human body with help of suitable diagrams. 8

उपयुक्त चित्रों की सहायता से मानव शरीर में मौजूद विभिन्न प्रकार के जोड़ों पर चर्चा करें।

4. Give a detailed account of human digestive system. 8

मानव पाचन तंत्र का विस्तृत विवरण दीजिए।

5. Discuss the following :

(a) Structure of Heart.

(b) Cardiac Cycle. (4×2=8)

निम्नलिखित पर चर्चा करें :

(अ) हृदय की संरचना।

(ब) हृदय चक्र।

UNIT–II (इकाई–II)

6. Describe the structure and functions of spinal cord. 8

सुषुम्ना रज्ज की संरचना एवं कार्यों का वर्णन करें।

7. Explain the functioning of human excretory system with the help of suitable diagram. 8

उपयुक्त चित्र की सहायता से मानव उत्सर्जन तंत्र की कार्यप्रणाली को समझाइए।

8. Give a detailed account of human respiratory system. 8

मानव श्वसन तंत्र का विस्तृत विवरण दीजिए।

9. Discuss the structure and functioning of human ear in detail. 8

मानव कान की संरचना और कार्यप्रणाली पर विस्तार से चर्चा करें।

Roll No. ..... Total Pages : 3

GSE/M-25 **3613**

PRENATAL AND INFANT GROWTH AND CARE

Course No. - 112

Time : Three Hours] [Maximum Marks : 40

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

नोट : प्रत्येक इकाई से **दो** प्रश्न चुनते हुए, कुल **पाँच** प्रश्न कीजिए। प्रश्न क्रमांक 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question (अनिवार्य प्रश्न)

1. Write short note on :

(a) Weaning of infants.

(b) Reflex actions of new born baby.

(c) Pica and Morning sickness among pregnant women.

(d) Immunization chart. (4×2=8)

संक्षिप्त टिप्पणी लिखें :

(क) शिशु का दूध छुड़ाना।

(ख) नवजात शिशु की प्रतिवर्ती क्रियाएं।

(ग) गर्भवती महिलाओं में पीका (Pica) और मॉर्निंग सिकनेस।

(घ) टीकाकरण चार्ट।

UNIT–I (इकाई–I)

2. What are various physiological changes in women during pregnancy? (8)

   गर्भावस्था के दौरान महिलाओं में विभिन्न शारीरिक परिवर्तन।

3. What are various factors which affect the prenatal development? (8)

   वे कौन-से कारक हैं जो प्रसवपूर्व विकास को प्रभावित करते हैं?

4. Discuss the prenatal growth and activities in second and third trimester of pregnancy. (8)

   गर्भावस्था की दूसरी व तीसरी ट्रेमेस्टर में प्रसव पूर्व विकास और गतिविधियों पर चर्चा करें।

5. Explain the birth process of infant and various stages of delivery. (8)

   बच्चे के जन्म की प्रक्रिया तथा प्रसव के विभिन्न चरणों के बारे में विस्तार से बताएं।

UNIT–II (इकाई–II)

6. Describe the various physical characteristics of a child upto 2 years. (8)

   2 वर्ष तक के बच्चे की विभिन्न शारीरिक विशेषताओं का वर्णन करें।

7. What is the significance of social and emotional development of child? What are various social and emotional developmental milestones in infants upto 2 yrs? (8)

   बच्चे के सामाजिक एवं भावनात्मक विकास का क्या महत्त्व है? 2 वर्ष तक के शिशुओं में विभिन्न सामाजिक और भावनात्मक विकासात्मक मील के पत्थर क्या हैं?

8. Discuss about the care of an infant in terms of feeding, bathing and toilet training. (8)

   शिशु की देखभाल, भोजन, स्नान और शौचालय प्रशिक्षण के बारे में चर्चा करें।

9. Explain various common diseases in infancy and how they can be prevented? (8)

   शैशवावस्था में होने वाली विभिन्न सामान्य बिमारियों के बारे में बताएं तथा उन्हें कैसे रोका जा सकता है?

Roll No. .....

Total Pages : 3

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GSE/M–25

LAUNDRY SCIENCE & FINISHING OF FABRICS

Paper–113

Time : 3 Hours]

[Maximum Marks : 40

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

नोट : प्रत्येक इकाई से **दो** प्रश्नों का चयन करते हुए, कुल **पाँच** प्रश्नों के उत्तर दीजिए। प्रश्न संख्या **1** अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question (अनिवार्य प्रश्न)

1. Elaborate the following terms: (4×2=8)

   (a) Stiffening agents.

   (b) Tentering.

   (c) Napping.

   (d) Optical brighteners.

   निम्नलिखित शब्दों को विस्तृत कीजिए :

   (अ) सख्त करने वाले एजेंट।

   (ब) टैंटरिंग।

   (स) झपकी नैपिंग।

   (द) ऑप्टिकल ब्राइटनर।

UNIT–I (इकाई–I)

2. Discuss different stages involved in the laundry process. What are the main types of laundry equipment and their uses? (4,4)

कपड़े धोने की प्रक्रिया में शामिल विभिन्न चरणों पर चर्चा कीजिए। कपड़े धोने के उपकरण के मुख्य प्रकार और उनके उपयोग क्या हैं?

3. Explain various types of soaps and detergent. Give differences in their composition and usage. (4,4)

विभिन्न प्रकार के साबुन और डिटर्जेंट की व्याख्या कीजिए। दोनों की संरचना और उपयोग में अंतर बताइए।

4. What are blueing agents ? Explain their function and significance during laundry. (2,6)

ब्लूइंग एजेंट क्या हैं? कपड़े धोने के दौरान उनके कार्य और महत्व को समझाइए।

5. What is the importance of bleaching in laundry? Describe different types of bleaching agents and their effects on fabric. (4,4)

कपड़े धोने में ब्लीचिंग का क्या महत्व है? विभिन्न प्रकार के ब्लीचिंग एजेंटों और कपड़े पर उनके प्रभावों का वर्णन कीजिए।

UNIT–II (इकाई–II)

6. What do you mean by use and care of fabrics explain using a suitable example? (8)

कपड़ों के उपयोग और देखभाल से आपका क्या तात्पर्य है, एक उपयुक्त उदाहरण का उपयोग करके समझाइए।

7. Classify stains on fabric and explain various methods of removing them. (8)

कपड़े पर दागों को वर्गीकृत कीजिए और उन्हें हटाने के विभिन्न तरीकों की व्याख्या कीजिए।

8. What do you mean by special purpose fabric finishes? Differentiate between water repellent and waterproof finishes. (4,4)

विशेष प्रयोजन फैब्रिक फ़िनिश से आपका क्या तात्पर्य है? जलरोधी और जलरोधक फिनिश के बीच अंतर कीजिए।

9. Differentiate between physical and chemical finishes using two finishes from each category. (8)

प्रत्येक श्रेणी से दो फिनिश का उपयोग करके भौतिक और रासायनिक फिनिश के बीच अंतर कीजिए।

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Total Pages : 3

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GSE/M-25

INTRODUCTORY HOME MANAGEMENT

Course : 114

Time : Three 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.

नोट : प्रत्येक इकाई से कम-से-कम **दो** प्रश्नों का चयन करते हुए, कुल **पाँच** प्रश्नों के उत्तर दीजिए। प्रश्न संख्या 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question

(अनिवार्य प्रश्न)

1. Write short notes along with examples :
   (a) Long term goal.
   (b) Intrinsic values.
   (c) Conventional resources.
   (d) Nuclear family.

   उदाहरण देते हुए निम्न पर संक्षिप्त टिप्पणियाँ लिखें :

   (क) दीर्घकालीन लक्ष्य।

   (ख) आंतरिक मूल्य।

   (ग) पारंपरिक संसाधन।

   (घ) एकल परिवार।

8. Why sodium & potassium are essential for human body? Discuss in detail. 8

मानव शरीर के लिए सोडियम और पोटैशियम क्यों आवश्यक हैं? विस्तार से विवेचना कीजिए।

9. Explain the following :

(a) Vitamin C.

(b) Vitamin A. (2×4=8)

निम्नलिखित की व्याख्या कीजिए :

(क) विटामिन C.

(ख) विटामिन A.

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GSE/M-25 **3616**

BASIC NUTRITION

Course – 115

Time : Three Hours] [Maximum Marks : 40

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

नोट : प्रत्येक इकाई से **दो** प्रश्न चुनते हुए, कुल **पांच** प्रश्न कीजिए। प्रश्न सं. 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question

(अनिवार्य प्रश्न)

1. Answer the following in 2-3 lines (any *eight*) :

(a) Undernutrition.

(b) Balanced Diet.

(c) Deficiency of Vitamin D is known as ..... .

(d) Name of Fat-soluble Vitamins.

(e) Full form of RDA.

(f) Blanching.

(g) Kwashiorkor.

(h) Supplementation.

(i) Vitamin .... is responsible in coagulation of blood.

(j) Fat-soluble vitamins are ... . (8×1=8)

निम्नलिखित का उत्तर 2-3 पंक्तियों में दीजिए (कोई से **आठ**):

(क) कुपोषण।

(ख) संतुलित आहार।

(ग) विटामिन D की कमी ..... कहलाती है।

(घ) वसा घुलनशील विटामिन का नाम।

(ङ) RDA का पूरा नाम।

(च) ब्लैंचिंग।

(छ) क्वाशीओर्कर।

(ज) अनुपूरण।

(झ) रक्त के जमने में विटामिन ..... जिम्मेदार है।

(ञ) वसा में घुलनशील विटामिन ..... होते हैं।

UNIT–I (इकाई-I)

2. Describe the following :

(a) Proteins and its classification.

(b) Functions, effects of deficiency and excess of Carbohydrates on human body. (2×4=8)

निम्नलिखित का वर्णन कीजिए :

(क) प्रोटीन और इसका वर्गीकरण।

(ख) मानव शरीर पर कार्बोहाइड्रेट की कमी और अधिकता के कार्य, प्रभाव।

3. Give a detailed description on 'Importance of Water in human body'. 8

'मानव शरीर में जल के महत्व' पर विस्तृत विवरण दीजिए।

4. Discuss in detail :

(a) Carbohydrates and its classification.

(b) Functions, effects of deficiency Proteins on human body. (2×4=8)

विस्तार से विवेचना कीजिए :

(क) कार्बोहाइड्रेट और इसका वर्गीकरण।

(ख) मानव शरीर पर प्रोटीन की कमी के कार्य, प्रभाव।

5. Describe the types, functions and sources of fibre. 8

फाइबर के प्रकारों, कार्यों और स्रोतों का वर्णन कीजिए।

UNIT–II (इकाई-II)

6. Give a detailed description on the following :

(a) Folic Acid.

(b) Iodine. (2×4=8)

निम्न पर विस्तृत विवरण दीजिए :

(क) फोलिक एसिड।

(ख) आयोडिन।

7. Discuss Vitamin-B with its functions, effects of excess and deficiency on human being. 8

विटामिन-B की मनुष्य पर अधिकता और कमी के प्रभावों, इसके कार्यों के साथ विवेचना कीजिए।

Roll No. ..... Total Pages : 3

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GSE/M-25

NUTRITIONAL BIOCHEMISTRY

Course : 116

Time : Three Hours] [Maximum Marks : 40

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

Compulsory Question

1. Define and explain in brief :
   (a) Micronutrients.
   (b) Source of Vitamin A.
   (c) Dermatitis.
   (d) Soluble sugars. (2×4=8)

UNIT–I

2. (a) Classify carbohydrates and enlist the functions of each class in diet. (4)
   (b) Discuss the process of digestion and absorption, of proteins. (4)

3. Discuss the following :

(a) Structure of DNA.

(b) Types of RNA and their functions. (4×2=8)

4. (a) What is rancidity? How can we avoid it? (4)

(b) Define essential fatty acids. Give examples and explain their importance. (4)

5. (a) Enlist standard amino acids and essential amino acid. (4)

(b) Differentiate between energy giving and body building foods. Give examples. (4)

UNIT–II

6. (a) Describe the structure and physiological importance of vitamin D and its impact on human health. (4)

(b) Explain the biological roles of vitamins C and its significance in human nutrition. (4)

7. Discuss the physiological importance and biochemical functions of calcium and iron in human body. (8)

8. Explain the following :

(a) Classification of enzymes. (4)

(b) Functions and deficiency diseases of Vitamin B6 and B12. (4)

9. Describe the factors affecting enzyme activity. Explain the effect of changing pH and temperature on enzyme activity. (8)

(iii) The police arrested the smuggler.

(iv) Hockey was played by Harish.

(v) The player is taking extra time.

(vi) Rahul is known to me.

(vii) Where did you find my book ?

(viii) Children love chocolates.

Unit IV

8. Attempt a detailed note on vowel sounds of English. 8

9. Transcribe the following world with primary stress : 8

(i) Black

(ii) Doll

(iii) School

(iv) When

(v) Chain

(vi) Vision

(vii) Van

(viii) Father.

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Roll No. ..... **Total Pages : 04**

BSIT/M-25 **26475**

COMMUNICATION SKILLS (ENGLISH)-II

BSIT-201

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. Write short notes on the following : 4×2=8

(a) Importance of business letter

(b) format of letter of appreciation

(c) Action voice

(d) Intonation.

Unit I

2. How can business communication be effective ? Elaborate. 8

3. What are the major components of a business letter ? Discuss in detail. 8

Unit II

4. Write a letter to the business firm acknowledging the goods you had ordered and complaining about the damage caused in transit on account of bad packing. 8

5. Write a Precis of the following passage and also assign it a suitable topic. 8

People moan about poverty as a great evil; it seems to be an accepted belief that if people only had plenty of money, they would be happy and get more out of life. As a rule, there is more genuine satisfaction in life in the humble cottage of the poor men than in the palaces of the rich. I always pity the sons and daughters of rich men, who are attended by servants, and have governesses at a later age. It is because I know how sweet and happy and pure the home of honest poverty is, how free from perplexing cares and from social envies and jealousies, how loving and united its members are in the common interest of supporting the family that I sympathize with the rich man's boy and congratulate the poor man's son. It is for these reasons that from the ranks of the poor so many strong, eminent, self-reliant men have always sprung and

always will spring. If you read the list of the 'immortals who were not born to die', you will find that most of them have been born poor.

Unit III

6. (a) Fill in the blanks with appropriate articles : 4

(i) .....British exhibit calmness in public.

(ii) Each type of book serves.....different purpose.

(iii) Forester was.....English novelist.

(iv) Let's rebuild.....new world.

(b) Fill in the blanks with the correct form of the verb given in the bracket : 4

(i) Drilling for oil.....(be) a difficult process.

(ii) In refinery oil is.....(treat) with heat

(iii) Words are.....(print) on paper.

(iv) The farmers.....the crops. (harvest.)

7. Change the voice : 8

(i) Who sang the song ?

(ii) The work will be finished by the workers in a day.

9. (a) Use Lagrange's interpolation formula to find $f(6)$ from the following data : 4

x	2	5	7	10	12
$f(x)$	18	180	448	1210	2028

(b) Prove that the divided differences are symmetric functions of their arguments. 4

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Roll No. ..... Total Pages : 04

BSIT/M-25 **26476**

MATHEMATICAL FOUNDATION OF INFORMATION TECHNOLOGY-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) Show that the equation $x^5 - 5x + 2 = 0$ has three real roots. 2

(b) How many solutions are possible for a system of linear equations AX = B ? 2

(c) What is the iterative formula for Runga-Kutta method of fourth order ? 2

(d) Evaluate $\Delta^3 (1-x)(1-2x)(1-3x)$, interval of differencing being unity. 2

Unit I

2. (a) Find a real positive root of $x^3 - 2x^2 - 5 = 0$ using bisection method correct to three places of decimal. 4

(b) Using Newton-Raphson method, find the value of $\sqrt[4]{32}$. 4

3. (a) Use Regula-Falsi method for finding a real root of $x^3 - 9x + 1 = 0$. 3

(b) Prove that the order of convergence of Regula-Falsi method is 1.618. 5

Unit II

4. (a) Apply Gauss elimination method to solve the following equations :

$$4x_1 + x_2 + 3x_3 = 11$$
$$3x_1 + 4x_2 + 2x_3 = 11$$
$$2x_1 + 3x_2 + x_3 = 7.$$ 4

(b) Solve the following equations by Gauss-Jordan method :

$$10x + 3y + z = 67$$
$$2x + 5y + 2z = 10$$
$$3x - 2y + 5z = 40.$$ 4

5. Solve the following equations by triangularization method :

$$2x + y + 3z = 13$$
$$x + 5y + z = 14$$
$$3x + y + 4z = 17.$$ 8

Unit III

6. (a) Solve the following equations by Gauss-Seidel method :

$$54x + y + z = 110$$
$$2x + 15y + 6z = 72$$
$$-x + 6y + 27z = 85.$$ 4

(b) Evaluate $y(0.1)$ correct to four decimal places using Taylor's series method if $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$. 4

7. Given that $\frac{dy}{dx} = 2 + \sqrt{xy}$ and $y = 1$ at $x = 1$. Find an approximate value of y at $x = 2$ by Euler's modified method (taking step size $h = 0.2$). 8

Unit IV

8. (a) State and prove Newton-Gregory formula for backward interpolation. Also state when it is useful to apply. 4

(b) Given :

x	0	1	2	3	4	5
$f(x)$	1	4	17	46	97	176

Find $f(4.8)$. 4

Roll No. ..... Total Pages : 03

BSIT/M-25 **26477**

APPLICATIONS OF EM WAVE

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 critical frequency in ionospheric communioation ?

(b) What is an elementary doublet ?

(c) What are the effects of ground on antenna ?

(d) Uplink and downlink frequencies in satellite communication are different. Why ? **2×4=8**

Unit I

2. Explain the following phenomena : **8**

(i) Free Space Propagation

(ii) Tropospheric Scatter Propagation.

3. (a) Define the following terms related with sky-wave propagation : 6

(i) Virtual Height

(ii) Maximum Usable Frequency

(iii) Skip Distance.

(b) Sky-wave propagation is generally better at night than during day time. Why ? 2

Unit II

4. (a) What do you mean by Resonant and Non-Resonant antennas ? Compare them in terms of their performance parameters. 6

(b) Define antenna resistance. 2

5. (a) Show the voltage distribution, current distribution and radiation pattern for a Marconi antenna. 6

(b) What is the difference between the bandwidth and beam-width for an antenna ? 2

Unit III

6. (a) What factors affect the selection of feed point of a dipole antenna ? How do current feed and voltage feed differ ? 4

(b) What is an antenna array ? What are its special properties that make it useful at high frequencies ? 4

7. Explain the operation of Yagi-Uda Array. Why is it known as supergain antenna ? List its applications. 8

Unit IV

8. Define Kepler's laws of planetary motion. Also, explain their importance in satellite communication. 8

9. (a) Define the following terms for satellite communication : 4

(i) Elevation Angle

(ii) Azimuthal Angle.

(b) What are orbital perturbations ? Discuss various responsible factors and their effects on satellite communication. 4

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(b) What is a Direct Coupled Logic (DCL) ? Explain the working of DCL logic with the help of circuit diagram. What are its merits and de-merits ? 4

Unit IV

8. (a) What is a TTL logic ? Explain the working of TTL logic with the help of circuit diagram. What are its merits and de-merits ? 4

(b) Define V_{OL} , V_{OH} , I_{IL} and I_{IH} with the help of voltage level diagram(V_{OL}, V_{OH}) for a logic family. 4

9. (a) What are MOS and CMOS logic families ? Explain the working of CMOS NAND gate circuit with the help of circuit diagrams. 6

(b) Compare DTL and TTL logic families in terms of area, power dissipation and speed. 2

Roll No. ..... Total Pages : 04

BSIT/M-25 26478

DIGITAL ELECTRONICS-I

BSIT-204

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 Y in the given expression :

$(876)_{16} = (Y)_2$?

(b) Implement AND gate using NAND gates.

(c) Define De-Morgan laws of Boolean algebra.

(d) DTL logic is not preferred in the industrial environment. Why ? 4×2=8

Unit I

2. (a) Determine the values of P, Q, R and S : 4

(i) $(1010001)_2 = (P)_{10}$

(ii) $(11100.011)_2 = (Q)_{10}$

(iii) $(852)_{10} = (R)_2$

(iv) $(76.55)_{10} = (S)_2$.

(b) Convert the following decimal numbers into HEXADECIMAL system numbers and then from HEXADECIMAL system number into binary system numbers : 4

(i) 846

(ii) 622.

3. (a) Convert the following binary numbers into OCTAL system numbers and then from OCTAL system number into decimal system numbers : 4

(i) 11001101

(ii) 11100011.101010.

(b) Convert the following decimal numbers into Excess-3 codes : 2

(i) 76

(ii) 824.86.

(c) Implement using 2's complement : 2

(i) 65 – 56.

Unit II

4. (a) Design a 2-input AND gate using PN-Diodes. Make its equivalent symbol and explain its working with the help of its truth table. 4

(b) Convert the following Boolean expressions into their CANONICAL forms : 4

(i) $F_1(A,B,C) = AB' + A'C' + C$

(ii) $F_2(A, B, C, D) = (A + B + D)(A' + C' + D')(A + D')$.

Note : A′ represents complement of A and similarly other variables.

5. (a) What is a K-Map ? Minimize the given Boolean expression using K-Map and implement the minimized function using NOR gates only. 6

$F(A, B, C, D) = \pi (1, 4, 6, 9, 12, 13) + \phi (2, 3, 11)$.

(b) NOR gate is known as universal gate. Why ? 2

Unit III

6. (a) What is DTL logic ? Explain the working of DTL logic with the help of circuit diagram. What are its merits and de-merits ? 4

(b) What do you understand by noise margins and why are they necessary ? Explain with the help of voltage level diagram. 4

7. (a) What are unipolar and bipolar logic families ? Explain in brief detail with their respective advantage and disadvantages. 4

Roll No. ..... Total Pages : 03

BSIT/M-25 **26479**

ELECTRONIC COMMUNICATION-II

BSIT-205

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) Define ASK and draw its conceptual view. 2
   (b) What are different types of error control codes ? 2
   (c) Define Hamming distance and weight of the code. 2
   (d) What do you understand by discrete message ? 2

Unit I

2. (a) Describe the generation of binary FSK signal. How the FSK signal is detected ? 6
   (b) What are the differences between pulse and digital modulation technique ? 2
3. Explain the modulation and demodulation techniques in QPSK in detail. 8

Unit II

4. (a) What are the types of error present in digital communication and define parity check matrix ? 4

   (b) Design a linear block code with a minmum distance of three and a message block size of eight bits. 4

5. (a) The generator matrix for a (6, 3) block code is given below. Find all code vectors of this code :

$$G=\left[\begin{array}{ccc:ccc} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{array}\right].$$ 6

   (b) What are the important aspects of error control coding ? 2

Unit III

6. (a) Explain the algebric structure of cyclic codes in detail. 4

   (b) Design an encode for (7, 4) binary cyclic code generated by $1+x+x^3$ and verify its operation using the message vector 0101. 4

7. (a) Explain and draw the $(n-k)$ syndrome calculation for the (n, k) cyclic code. 4

   (b) The generator polynomial of a (7, 4) cyclic code is $g(x)=1+x+x^3$. Find the code word of the 1010 using systematic form. 4

Unit IV

8. Discuss the Shanon-Fano coding and apply it with following messages ensemble :

$$[X]=[X_1 \quad X_2 \quad X_3 \quad X_4 \quad X_5 \quad X_6]$$

$$[P]=[0.30 \quad 0.25 \quad 0.15 \quad 0.12 \quad 0.08 \quad 0.10].$$ 8

9. Explain the Shanon- Hartley theorem and its complications. 8

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Roll No. ..... Total Pages : 3

NGSM/M-25 **2261**

BIOMOLECULES AND MAMMALIAN PHYSIOLOGY

Paper–CC-4/MCC-6:B23-ZOO-401

Time Allowed : 3 Hours] [Maximum Marks : 50

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. Answer the following : 10×1=10

   (a) Peptide Bond.

   (b) Heteropolysaccharides.

   (c) Diffusion.

   (d) Single Muscle Twitch.

   (e) Osmoregulation.

   (f) Role of Vitamin K in Blood clotting.

   (g) Differentiate between External and Internal respiration.

   (h) Why Insulin and Glucagon are antagonistic hormones ?

(i) Oestrous cycle.

(j) Saltatory conduction of Nerve Impulse.

UNIT–I

2. Discuss the mode of action of enzymes. Describe the comparative and non-competitive inhibitors giving one example each. 10

3. Give an account of Steroids. How do Fibrous and Globular proteins differs ? 10

UNIT–II

4. Explain the digestion of Carbohydrates, Proteins and Lipids. 10

5. Describe the Ultra structure of Striated muscle. Give an account of Muscle contraction. 10

UNIT–III

6. (a) Describe the mechanism of Blood coagulation. 7

   (b) Write a note on Electro cardiogram and its significance. 3

7. (a) What is Oxygen dissociation curve of Haemoglobin ? Describe Bohr's effect with reference to Oxygen dissociation curve. 7

(b) Describe Ornithine Cycle. 3

UNIT–IV

8. Explain the conduction of Nerve impulse across Synapse. Add a note on Synaptic delay and Synaptic fatigue. 10

9. (a) Draw a well labelled diagram of Human Sperm. Give an account of Spermatogenesis. 7

   (b) Name the Hormones secreted by Thyroid gland. 3

(b) The Equilibrium constant of a reaction becomes double of its value when the temperature is raised from 25°C to 35°C. Calculate $\Delta H°$ for the reaction. 3

(c) Write the expressions for K_p and K_c equilibrium constants and derive relation between them. 3

UNIT–IV

8. (a) Explain the relative acidic strength of o-, m- and p-nitrophenols. 3

(b) Give any two methods of preparation of phenols from benzene. 3

(c) Describe the preparation of alcohols by reduction of aldehydes and ketones. 4

9. (a) Explain the Cannizzaro reaction with mechanism. 4

(b) Describe the following reactions with mechanism :

(i) Benzoin condensation. 3

(ii) Mannich Reaction. 3

Roll No. ..... Total Pages : 4

NGSM/M-25 **2265**

CHEMISTRY–IV

Paper–CC–4/MCC–6 : B23–CHE–401

Time Allowed : 3 Hours] [Maximum Marks : 50

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

Compulsory Question

1. Answer the following questions :

(a) First ionization energy of 5d elements is higher than those of 3d and 4d elements. Why? 2

(b) What are Mish metals? 1

(c) When a Gas expands against vacuum then there is no work done? Give the reason. 1

(d) Calculate the solubility of $PbCl_2$ if its solubility product is 1.0×10^{-6} at 298 K. 2

(e) Distinguish between 1°, 2° and 3° alcohols by Lucas reagent. 2

(f) Benzoin condensation is catalysed by CN^- ion not by OH^- ion. Explain. 2

UNIT–I

2. (a) Compare second and third transition series with first transitio series in the following properties :

(i) Ionic Radii. 2½

(ii) Magnetic properties. 2½

(b) Calculate the expected magnetic moment (spin magnetic moment) in Bohr Magneton of Fe(III) and Cu(I) metal ions. 2

(c) Give the structure, preparation and important properties of $Ni(CO)_4$. 3

3. (a) Discuss the colour and spectral properties of lanthanides. 3

(b) Give the differences between lanthanides and actinides. 5

(c) Write a short note on Transuranic elements. 2

UNIT–II

4. (a) Discuss the chemistry of detection of Cl^-, Br^- and I^- in presence of each other. 4

(b) What is common ion effect? Discuss the importance of common ion effect in qualitative analysis. 3

(c) Discuss the theory and reaction of Match-stick test for sulphates. 3

5. (a) How does supersaturation play its role in determining the size of precipitate? 3

(b) Write the suitable conditions for precipitation. 3

(c) Write short notes on the following : 2,2

(i) Flame test.

(ii) Borax bead test.

UNIT–III

6. (a) Derive an expression for the efficiency of a Reversible heat engine working between T_1 and T_2 temperatures ($T_2 > T_1$). 3

(b) Derive the expressions for w, q, ΔU and ΔH for isothermal reversible expansion of an ideal gas. 4

(c) State first law of thermodynamics and derive its mathematical expression. 3

7. (a) Derive Clausius-Clapeyron equation in the integrated form for solid-liquid equilibrium. 4

Roll No. ..... Total Pages : 3

NGSM/M-25 2269

OPERATIONAL AMPLIFIER & SINUSOIDAL OSCILLATORS

Paper–CC–4/MCC–6 : B23–ELE–401

Time Allowed : 3 Hours] [Maximum Marks : 50

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 : 5×2=10

   (a) Define the CMRR is OP-AMP and what is its importance?

   (b) Define input and output offset voltages for an OP-AMP and what should be there values for a good practical OP-AMP?

   (c) What are different feedback topologies? Make the diagram for voltage series feedback topology.

   (d) What should be the input and output impedances for an ideal and practical voltage amplifier?

   (e) What is Barkhausen Criterion? What type of feedback is used in oscillators?

UNIT–I

2. (a) What is Inverting configuration of operational amplifier and derive an expression for its voltage gain? 5

   (b) Derive an expression for the effect of negative feedback on input impedance in inverting configuration.

3. (a) What is a double ended differential amplifier? Make the circuit diagram and derive an expression for its gain. Also plot its transfer characteristics. 5

   (b) Why do we use feedback in operational amplifier? 5

UNIT–II

4. (a) Draw the circuit diagram for OP-AMP as a differentiating amplifier and derive an expression for its output voltage. 5

   (b) Draw the circuit diagram for OP-AMP as a summing amplifier in inverting configuration and derive an expression for its output voltage. 5

5. (a) Draw the circuit diagram for OP-AMP for multiplication/division operation and derive an expression for its output voltage. 5

   (b) Draw the circuit diagram for OP-AMP as an integrating amplifier and derive an expression for its output voltage. 5

UNIT–III

6. (a) What should be the value of R_i and R_o with respect to R_s and R_L for a voltage amplifier? Justify it with the help of equivalent circuit diagram. 5

   (b) Derive an expression for the effect of negative feedback on output impedance (R_o) of voltage series feedback topology. 5

7. (a) What should be the value of R_i and R_o with respect to R_s and R_L for a current amplifier. Justify it with the help of equivalent circuit diagram. 5

   (b) Derive an expression for the effect of negative feedback on output impedance (R_o) of current shunt feedback topology. 5

UNIT–IV

8. What is RC phase shift oscillator? Explain its working and derive an expression for its frequency with the help of circuit diagram. 10

9. What is Hartley oscillator? Explain its working and derive an expression for its frequency with the help of circuit diagram. 10

(b) Explain the properties of Laser in detail. 4

9. (a) Explain the working and theory of He: Ne laser with energy level diagrams. 6

(b) An optical fiber core and its cladding have refractive index of 1.545 and 1.495 respectively. Calculate the critical angle, acceptance angle, numerical aperture. 4

Roll No. ..... Total Pages : 4

NGSM/M-25 **2270**

WAVES AND OPTICS

Paper–CC–4/MCC–6 : B23–PHY–401

Time Allowed : 3 Hours] [Maximum Marks : 50

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. 1 is compulsory. All questions carry equal marks. Use of scientific (non-programmable) calculator is allowed.

Compulsory Question

1. (a) Discuss specific rotation. 2

(b) What are the conditions for Good Interference Fringes? 2

(c) What is Obliquity and Obliquity factor? 2

(d) What is Acceptance angle and Acceptance cone? 2

(e) Discuss the principle behind the coherence of LASER. 2

UNIT–I

2. (a) What is the principle of optical reversibility. Show that a phase change of π occurs when reflection takes place at the surface of denser medium. 6

(b) Sodium light has two wavelengths $\lambda_1 = 5890 Å$ and $\lambda_2 = 5896 Å$. As the path difference increases, when the visibility of the fringes will be minimum? 4

3. (a) Explain the formation of fringes of Newton's rings in transmitted light. Also, give the reason, as the radii of rings increases, the distance between the rings decreases. 7

(b) A thin film of a transparent material of refractive index 1.45 when introduced in one of the arms of Michelson interferometer, there is a shift of 6.5 fringes. If wavelength of light used is $5890 Å$, then calculate thickness of the film introduced. 3

UNIT–II

4. (a) Explain the concept of rectilinear propagation of light. 3

(b) Prove that only first order is possible if the value of grating element (a+b) is less than the twice of wavelength of light. 3

(c) What is zone plate and explain its working and the way it is constructed? 4

5. (a) Describe the action of a plane transmission grating and find the condition for absent spectra. What is the condition for the second order spectrum to be absent? 7

(b) Calculate the radius of hundredth half period zone of a zone plate of focal length 50 cm for the wavelength $5000 Å$. 3

UNIT–III

6. (a) Describe the construction and working of Nicol prism. Explain how it is used to produce and analyze plane polarized light? What are parallel and crossed position of these prisms? 6

(b) Define optic axis of a Crystal, principle plane of a Crystal and Ordinary and extra-ordinary refractive indices. 4

7. (a) What is Optical rotation? Explain Fresnel's theory of Optical rotation. 5

(b) Write a short note on Half Wave Plate. 3

(c) Calculate the specific rotation of Sugar solution from the given data : length of the tube containing Sugar solution = 10 cm, volume of solution = 40c.c, amount of Sugar solution = 3gm and angle of rotation = 4057. 2

UNIT–IV

8. (a) What is graded index, single mode and multimode fibers. 6

Roll No. ..... Total Pages : 3

NGSM/M-25 2275

CYTOLOGY AND GENETICS

Paper–CC-4/MCC-6:B23-BOT-401

Time Allowed : 3 Hours] [Maximum Marks : 50

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 : 10×1=10

   (a) Allelomorphs.

   (b) Chiasma.

   (c) Name any two Chemical Mutagens.

   (d) Tunnel Proteins.

   (e) Aneuploidy.

   (f) Name the organelle which help in synthesis of Proteins.

   (g) Euchromatin.

   (h) Who proposed chromosomal theory of Linkage ?

   (i) Phragmoblast.

(j) Pleiotropy.

UNIT–I

2. Describe the various models of structure of Plasma membrane. Also discuss about the functions of Plasma membrane. 10

3. Write notes on the following : 4,3,3

(a) Peroxisomes. (b) Vacuoles.

(c) Lysosomes.

UNIT–II

4. Describe the detailed mechanism of DNA replication. 10

5. Write notes on the following : 3,3,4

(a) Genetic code. (b) Structure of DNA.

(c) Polytene Chromosome.

UNIT–III

6. Describe the Cytoplasmic inheritance in detail with examples. 10

7. Explain the following : 5.5

(a) Complementary Gene Interaction

(b) Law of Co-dominance.

UNIT–IV

8. Describe complete and incomplete linkage with at least one example in each case. 10

9. Explain the following : 4,3,3

(a) Alkylating Agents. (b) Base Analogue

(c) Acridines.

$$\vec{a}\left(\frac{d\vec{a}}{du}\times\frac{d^2\vec{a}}{du^2}\right)=0.$$

(b) If $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, prove that $div\left(\frac{\vec{r}}{r^3}\right)=0$. 5

9. (a) Evaluate $\int_C \vec{F}.d\vec{r}$, where $\vec{F}=(x^2+y^2)\hat{i}-2xy\hat{j}$, the curve C is the rectangle in xy plane bounded by $y=0, x=a, y=b, x=0$. 5

(b) Verify stoke's theorem for the function $\vec{F}=(x^2+y^2)\hat{i}-2xy\hat{j}$ taken round the rectangle bounded by $x=\pm 9, y=0, y=b$. 5

Roll No. ..... Total Pages : 4

NGSM/M-25 **2279**

ANALYTICAL GEOMETRY & VECTOR CALCULUS

Paper–CC–4/MCC–6 : B23–MAT–401

Time Allowed : 3 Hours] [Maximum Marks : 50

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) What conic does the equation : 2

$6x^2+5xy-6y^2+14x+5y+4=0$ represent?

(b) Find the equation of a sphere whose centre is $(2,-3,4)$ and radius 5. 2

(c) Show that the two spheres : 2

$x^2+y^2+z^2+6y+2z+8=0$,

$x^2+y^2+z^2+6x+8y+4z+20=0$ are orthogonal.

(d) Find the equation of the cone, reciprocal to the cone $ax^2+by^2+cz^2+2fyz+2yzx+2hxy=0$. 2

(e) Find a unit tangent water to any point on the curve $x = a\cos t, y = a\sin t, z = bt$. 2

UNIT–I

2. (a) What curves are represented by the equation : 5

$x^2 + 2xy + (1+\lambda)y^2 + 2\lambda y - 1 = 0$, for different values of λ.

(b) Find the equation of the directer circle of the conic $11x^2 + 24xy + 4y^2 - 2x + 16y + 11 = 0$. 5

3. Find the centre, lengths and the equations of the axes, eccentricity, foci and directrices of the conic $x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0$. 10

UNIT–II

4. (a) Find the equation of the sphere, triangle the circle $x^2 + y^2 + z^2 = 1$, $2x + 4y + 5z = 6$ and touching the plane $z = 0$. 5

(b) The spheres of radius 3 cm. and 4 cm. cut each other orthogonally. Find the radius of the common circle. 5

5. (a) Find the equation of the cone with vertex (1,1,1) and passing triangle the cause of intersection of $x^2 + y^2 + z^2 = 1$ and $x + y + z = 1$. 5

(b) Show that the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ where $l^2 + 2m^2 - 3n^2 = 0$, is a generates of the cone $x^2 + 2y^2 - 3z^2 = 0$. 5

UNIT–III

6. (a) Find the equation of the right circular cylinder of Radius 2 and axis as the line : 5

$$\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}.$$

(b) Find the equation to the cylinder, where generators are paralleled to the line $\frac{x}{1} = \frac{-y}{2} = \frac{z}{3}$ and where guiding curve is the ellipse $x^2 + 2y^2 = 1, z = 3$. 5

7. (a) Prove that locus of the pole of a given straight line w.r.t. a system of confocal conics is a straight line. 5

(b) Show that all the conics which pass through the intersection of two rectangular hyperbola are themselves rectangular hyperbola. 5

UNIT–IV

8. (a) If $\vec{a} = \vec{p}\cos u + \vec{q}\sin u$, where $\vec{p}$ and $\vec{q}$ are constant vector, prove that : 5

Roll No. ..... Total Pages : 3

NGSM/M-25 **2306**

DATA MANAGEMENT WITH DBMS

Paper–CC-4/MCC-6:B23-CSE-401

Time Allowed : 3 Hours] [Maximum Marks : 50

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. Answer any **seven** of the following questions in brief :

   (i) What is a Database Management System (DBMS) ?

   (ii) What are the key roles and responsibilities of a Database administrator ?

   (iii) Define entity and attribute using a suitable example.

   (iv) What is Referential integrity ?

   (v) Discuss the various data types supported by SQL.

   (vi) Provide one example of a Tuple relational calculus query.

   (vii) Describe any one kind of anomaly that can occur in Non-normalized relations.

(viii) Illustrate Transitive dependency using an example.

UNIT–I

2. Define the following terms : Data, Information, records, files, schema, and instance in the context of database. Also, list any two advantages and any two disadvantages of using a DBMS.

3. (a) Compare 1-tier, 2-tier and 3-tier architecture models for Database Systems.

   (b) Discuss the concept of Data independence, distinguishing between Logical and Physical Data Independence.

UNIT–II

4. Discuss the characteristics of the Network Data model and compare it with other data models such as hierarchical and relational.

5. (a) Explain the concept of keys in database design and discuss their role in ensuring data integrity and uniqueness.

   (b) Illustrate the process of designing a database schema using the Relational Data model, including entity types, attributes and Relationships.

UNIT–III

6. (a) Provide on example of a basic SQL query for retrieving data from a database.

   (b) Discuss the role of views and indexes in SQL databases and explain how they are implemented ?

7. Define relational algebra and explain any of its four basic operations using examples.

UNIT–IV

8. Illustrate Functional Dependency using an example. Discuss the types of Functional dependencies commonly encountered in Database design.

9. Discuss the role of 4NF (Fourth Normal Form) in addressing multivalued dependencies and the role of 5NF (Fifth Normal Form) in addressing join dependencies.

Roll No. ..... Total Pages : 3

NGSM/M-25 2324

EARLY CHILDHOOD EDUCATION AND SPECIAL NEED CHILDREN

Paper–CC–B4 : B23–HSC–402

Time Allowed : 3 Hours] [Maximum Marks : 50

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

प्रत्येक इकाई में से **एक** प्रश्न का चयन करते हुए, कुल **पाँच** प्रश्नों के उत्तर दीजिए। प्रश्न संख्या 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question (अनिवार्य प्रश्न)

1. Write short notes on the following : 5×2=10

निम्नलिखित पर संक्षिप्त टिप्पणियाँ लिखिए:

(a) Role of Anganwadies.

आंगनवाड़ियों की भूमिका।

(b) Indoor Play.

इनडोर खेल।

(c) Special Needs Children.

विशेष आवश्यकता वाले बच्चे।

(d) Teaching Aids in E.C.C.E.

ई.सी.सी.ई. शिक्षण में मददगार सामग्री।

(e) Visual Disability.

दृश्य विकलांगता।

UNIT–I (इकाई–I)

2. Elaborate the objectives and scope of early Childhood Education. 10

प्रारंभिक बाल्यावस्था शिक्षा के उद्देश्यों और दायरे पर विस्तार से प्रकाश डालिए।

3. Discuss the components of E.C.C.E. and activities designed in preschool program. 10

ई.सी.सी.ई. के घटकों और प्रीस्कूल कार्यक्रम में तैयार की गई गतिविधियों पर चर्चा कीजिए।

UNIT–II (इकाई–II)

4. Describe the importance points for selection of Outdoor play equipment. 10

आउटडोर खेल उपकरण के चयन के लिए महत्वपूर्ण बिंदुओं का वर्णन कीजिए।

5. Classify various types of Physical impairment and explain their etiology and parameters for identification. 10

विभिन्न प्रकार की शारीरिक दुर्बलताओं को वर्गीकृत करें और उनकी पहचान के लिए हेतुविज्ञान और मापदंडों की व्याख्या कीजिए।

UNIT–III (इकाई–III)

6. Discuss the classification, causes and identification of Hearing impairment. 10

श्रवण हानि के वर्गीकरण, कारण और पहचान पर चर्चा कीजिए।

7. Explain the classification, causes and symptoms of Learning impairment. 10

सीखने की दुर्बलता के वर्गीकरण, कारण और लक्षणों की व्याख्या कीजिए।

UNIT–IV (इकाई–IV)

8. Give a detailed account of classification, causes and symptoms of Gifted children. 10

प्रतिभाशाली बच्चों के वर्गीकरण, कारण एवं लक्षणों का विस्तृत विवरण दीजिए।

9. Discuss various government schemes related for care and Education of special needs children. 10

विशेष आवश्यकता वाले बच्चों की देखभाल और शिक्षा से संबंधित विभिन्न सरकारी योजनाओं पर चर्चा कीजिए।

Roll No. ..... Total Pages : 3

NGSM/M-25 2325

FOOD MICROBIOLOGY & BIOCHEMISTRY

Paper–CC–C4 : B23–HSC–403

Time allowed : 3 Hours] [Maximum Marks : 50

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

प्रत्येक इकाई से एक प्रश्न का चयन करते हुए, कुल पाँच प्रश्नों के उत्तर दीजिए। प्रश्न संख्या 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question (अनिवार्य प्रश्न)

1. Attempt all questions: 4×2½=10

सभी प्रश्नों के उत्तर दीजिए:

(i) Give classification of foods based on shelf life.

शेल्फ लाइफ के आधार पर खाद्य पदार्थों का वर्गीकरण दीजिए।

(ii) Differentiate between bactericidal and bacteriostatic agents.

जीवाणुनाशक और जीवाणुनाशक एजेंटों के बीच अंतर बताइए।

(iii) Give brief account of digestion of carbohydrates.
कार्बोहाइड्रेट के पाचन का संक्षिप्त विवरण दीजिए।

(iv) List the factors affecting enzyme activity.
एंजाइम गतिविधि को प्रभावित करने वाले कारकों की सूची बनाइए।

UNIT–I (इकाई–I)

2. What is food spoilage? What are its causes and how can it be prevented? 10
खाद्य पदार्थों का खराब होना क्या है? इसके क्या कारण हैं और इसे कैसे रोका जा सकता है?

3. Discuss in detail the methods of household and commercial food storage. 10
घरेलू और व्यावसायिक खाद्य भंडारण के तरीकों पर विस्तार से चर्चा कीजिए।

UNIT–II (इकाई–II)

4. What are the different methods of preservation by use of temperature? 10
तापमान के उपयोग से संरक्षण के विभिन्न तरीके क्या हैं?

5. Give an account of food adulteration. 10
खाद्य पदार्थों में मिलावट का विवरण दीजिए।

UNIT–III (इकाई–III)

6. Explain digestion and absorption of fats. 10
वसा के पाचन और अवशोषण की व्याख्या कीजिए।

7. How are proteins metabolised in our body? 10
हमारे शरीर में प्रोटीन का चयापचय कैसे होता है?

UNIT–IV (इकाई–IV)

8. Describe classification of enzymes. 10
एंजाइमों के वर्गीकरण का वर्णन कीजिए।

9. Give an account of metabolism of nucleic acids. 10
न्यूक्लिक एसिड के चयापचय का विवरण दीजिए।

9. (a) Show that $\sum_{n=1}^{\infty} \frac{1}{n^p} \cdot a_n (p \geq 0)$ is convergent if $\sum_{n=1}^{\infty} a_n$ is convergent. 2½,4

(b) Discuss the convergence of the infinite product $\left(1-\frac{1}{2}\right)\left(1+\frac{1}{2}\right)\left(1-\frac{1}{2}\right)\left(1+\frac{1}{2}\right)\ldots\ldots\ldots$ 2½,4

Roll No. ..... Total Pages : 4

GSM/M-25 **3452**

SEQUENCE AND SERIES

Paper–BM–241

Time Allowed : 3 Hours] [Max. Marks : B.A. : 27, B.Sc. : 40

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

Compulsory Question

1. (a) Give an example of a set which is neither bounded above nor bounded below. 1½,1½

(b) Define Interior point of a set and give example of a set which has no interior point. 1½,1½

(c) Define Null sequence. 1½,1½

(d) Discuss the convergence of the series $\sum_{n=1}^{\infty} \sin\frac{1}{n}$. 1½,1½

(e) Show that the infinite product $\prod_{n=1}^{\infty}\left(1+\frac{1}{n^2}\right)$ is convergent. 1,2

UNIT–I

2. (a) Prove that the union of an arbitrary family of open sets is an open set. 2½,4

(b) Find the supremum and infimum of the set : 2½,4

$\left\{-2, \frac{-3}{2}, \frac{-4}{3}, \frac{-5}{4}, \ldots\ldots\ldots\right\}$. Which of these belong to the set?

3. (a) Prove that the derived set of any set is not a closed set. 2½,4

(b) Prove that the set of Rationals is a compact set. 2½,4

UNIT–II

4. (a) Using Cauchy's first theorem on limits, prove that :

$$\lim_{x\to\infty} \frac{1}{n}\left[\frac{2}{1}+\frac{3}{2}+\frac{4}{3}+\ldots\ldots\ldots+\frac{n+1}{n}\right]=1. \quad 2\frac{1}{2},4$$

(b) Show 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 $x^2-x-2=0$. 2½,4

5. (a) If $\sum_{n=1}^{\infty} a_n$ is a convergent series of positive terms, prove that $\sum_{n=1}^{\infty} a_n^2$ is also convergent, Is the converse true? If not, show by an example. 2½,4

(b) Discuss the convergence of the series : 2½,4

$$\sum_{n=1}^{\infty}\left[\sqrt{n^2+1}-\sqrt{n^2-1}\right].$$

UNIT–III

6. (a) State and prove D' Alembert's Ratio Test. 2½,4

(b) Test the convergence of the series : 2½,4

$$\frac{x}{1}+\frac{1}{2}.\frac{x^3}{3}+\frac{1.3}{2.4}\frac{x^5}{5}+\frac{1.3.5}{2.4.6}\frac{x^7}{7}+\ldots\ldots\ldots;x>0.$$

7. (a) State and prove Cauchy's Integral Test. 2½,4

(b) Test the convergence of the series $\sum_{n=2}^{\infty}\frac{1}{n(\log n)^p}$. 2½,4

UNIT–IV

8. (a) Show that the series $\sum_{n=1}^{\infty}\frac{\sin nx}{n^p}, p>0$ converges for all real x. 2½,4

(b) Show that the Cauchy product of the convergent series $\sum_{n=1}^{\infty}\frac{(-1)^n}{\sqrt{n+1}}$ with itself is divergent. 2½,4

9. (a) Using Fourier transform, solve the following differential equation : 2½, 4

$$\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}.$$

with the initial conditions

$u(0,t) = 0; u(x,0) = e^{-x}, x > 0; u(x,t)$ is bounded, when $x > 0, t > 0$.

(b) If $F\{f(x)\}$ and $F\{g(x)\}$ are the Fourier transforms of the functions $f(x)$ and $g(x)$ respectively, then prove that the fourier transform of convolution of $f(x)$ and $g(x)$ is the product of their Fourier transform. 2½, 4

Roll No. ..... Total Pages : 4

GSM/M-25 **3453**

SPECIAL FUNCTIONS & INTEGRAL TRANSFORMS

Paper–BM–242

Time Allowed : 3 Hours] [Max. Marks : B.A. : 26, B.Sc. : 40

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

Compulsory Question

1. (a) Derive Bessel function $J_1(x)$ in the form of series. 1½, 2

(b) Using Rodrigue's formula for Legendre's polynomial, evaluate $P_3(x)$. 1½, 2

(c) If the Laplace transform of the function $f(t)$ is $F(s)$, then show that $L\left[f\left(\frac{t}{a}\right)\right] = a\,F(a\,s)$. 1½, 2

(d) Find the Fourier cosine transform of $6e^{-2x} + 7e^{3x}$. 1½, 2

UNIT–I

2. (a) Find the power series solution of the following differential equation in powers of x: 2½, 4

$$(x^3-1)\frac{d^2y}{dx^2}+x^2\frac{dy}{dx}+xy=0.$$

(b) Solve the equation in terms of Bessel's function : 2½, 4

$$x\frac{d^2y}{dx^2}+2\frac{dy}{dx}+\frac{1}{2}xy=0.$$

3. (a) Show that $\frac{d}{dx}\left(x^nJ_n(x)\right)=x^n\ J_{n-1}(x)$. 2½, 4

(b) Prove that $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)}=\sum_{n=-\infty}^{\infty}J_n(x).t^n$ 2½, 4

UNIT–II

4. (a) Express $4x^3-2x^2-3x+8$ in terms of Legendre's polynomials. 2½, 4

(b) Show that $(n+1)P_{n+1}(x)+nP_{n-1}(x)=(2n+1)xP_n(x)$. 2½, 4

5. (a) Prove that $H_n(x)=2^n\left[\exp.\left(-\frac{1}{4}\frac{d^2}{dx^2}\right)\right]x^n$. 2½, 4

(b) Show that $2xH_n(x)=2n\,H_{n-1}(x)+H_{n+1}(x);\ n\geq 1$. 2½, 4

UNIT–III

6. (a) Find the Laplace transform of the function $e^{4t}\sin 2t\cos t$. 2½, 4

(b) Evaluate : $L\left[\int_0^t\frac{e^t\sin t}{t}dt\right]$. 2½, 4

7. (a) Find the inverse Laplace transform of the function : 2½, 4

$$\frac{s^2+s}{(s^2+1)(s^2+2s+2)}.$$

(b) Solve the following differential equation by Transform method $\frac{d^2y}{dt^2}+2\frac{dy}{dt}-3y=Sin\ t$, 2½, 4

where $y(0)=0,\ y'(0)=0$.

UNIT–IV

8. (a) Find the Fourier transform of $f(x)=e^{-a|x|}$, where $a>0$ and $x\in(-\infty,\infty)$. 2½, 4

(b) Find the Fourier cosine transform of $\frac{1}{1+x^2}$. 2½, 4

9. Solve the following equations using Triangularization method : 4,6

$$2x-6y+8y=24$$
$$5x+4y-3z=2$$
$$3x+y+2z=16.$$

Roll No. ..... Total Pages : 4

GSM/M-25 **3454**

PROGRAMMING IN C AND NUMERICAL METHODS

Paper–BM–243

Time Allowed : 3 Hours] [Max. Marks : B.A. : 20, B.Sc. : 30

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) How does a flowchart differ from an algorithm? 1,1½

(b) What is the difference between = and ==. 1,1½

(c) What is an array? Define one dimensional array. 1,1½

(d) What is order of convergence of Bisection method and Newton Raphson method? 1,1½

UNIT–I

2. (a) What do you understand by programmer's model of a Computer? 2,3

   (b) Describe the process of computation and compilation of a source program in C. 2,3

3. (a) What is an Operand? What is an Operator? What is the relationship between the two? Explain with example. 2,3

   (b) What is the purpose of the Scanf() and printf() functions? How it is used within a C program? 2,3

UNIT–II

4. Write short notes on any **two** of the following :

   (a) Nested if. 2,3

   (b) While and do-while loop. 2,3

   (c) Continue and Goto. 2,3

5. (a) Distinguish between local and global variables. 2,3

   (b) Define Multi-dimensional array? How it is declared? 2,3

UNIT–III

6. (a) What are Concatenations in C ? What function is used to achieve this operation? 2,3

   (b) What is Pointer? Write a program to swap two numbers using pointers. 2,3

7. (a) Find a real root of the equation $x^3 - x - 11 = 0$ by Regula false method upto three decimal places. 2,3

   (b) Find the Cube root of 5. 2,3

UNIT–IV

8. (a) Solve the following equations by Gauss Jorden method : 2,3

$$2x - 3y + z = -1$$
$$x + 4y + 5z = 25$$
$$3x - 4y + z = 2.$$

   (b) Solve the following equations by Gauss Elimination method : 2,3

$$2x + 3y - z = 5$$
$$4x + 4y - 3z = 3$$
$$2x - 3y + 2z = 2.$$

(c) Why AgCl is soluble in NH_4OH? 1

9. (a) Explain Co-precipitation and post-precipitation. 2

(b) Describe essential conditions for pure precipitation. 2

(c) How will you detect Cl^-, Br^- and I^- in presence of each other? 2

Roll No. ..... Total Pages : 4

GSM/M-25 **3459**

INORGANIC CHEMISTRY (THEORY)

Paper–XI, CH–204

Time Allowed : 3 Hours] [Maximum Marks : 32

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

Compulsory Question

1. Write short notes on the following : 8×1=8

(a) Why Ce exhibits +4 oxidation state?

(b) What happens when Zinc amalgam is added to $Eu(NO_3)_3$?

(c) Name two minerals of Actinides.

(d) Write electronic configuration of Thorium.

(e) Write the name of three Acidic radicals which evolve gas with dil. H_2SO_4.

(f) Conc. HNO_3 is added in group III analysis. Why?

(g) Name the Cations of Group IV in the basic qualitative analysis.

(h) What are Interfering radicals?

UNIT–I

2. (a) Explain the Ion-exchange method of separation of lanthanides. 2

(b) Lanthanides have a Poor tendency to form complexes. Explain. 2

(c) Out of $La(OH)_3$ and $Lu(OH)_3$, which is more basic and why? 2

3. (a) What are Consequences of Lanthanide contraction? 2

(b) Discuss the Oxidation states of Lanthanides. Why is +3 state more stable? 2

(c) Explain the colour of ions in case of lanthanides. 2

4. (a) What are Transuranic elements? Explain. 2

(b) Actinides forms oxo-cations but Lanthanides do not. Explain. 2

(c) Explain the similarities between Lanthanides and Actinides. 2

5. (a) What is Actinide contraction? Explain. 2

(b) Why the Magnetic moment values of Actinides are smaller than that of Theoretical Magnetic moment values? 2

(c) Give two examples of Nuclear fuel. 2

UNIT–II

6. (a) Explain the chemistry of : 4

(i) Chromyl chloride test for chloride.

(ii) Lake test for aluminium.

(b) Explain the Borax-bead test. 2

7. (a) What is common-ion effect? Illustrate its applications in qualitative analysis. 2

(b) Explain the Zirconyl nitrate method for removal of Phosphate. 2

(c) Why is H_2S is passed in basic medium to precipitate cations of group IV? 2

8. (a) Explain the chemistry of analysis of basic radicals of group Ist. 3

(b) How will you detect carbonate in presence of sulphite. 2

(b) Derive Nernst equation for measuring the E.M.F. of a cell. 3

9. (a) What are concentration cells? Derive an expression foe E.M.F. of Electrode concentration cell without transference. 4

(b) Calculate the free energy change of the following cell at 25°C : 2

$Sn \mid Sn^{2+}$ (a = 0.6) $\parallel Pb^{2+}$ (a = 0.3) $\mid Pb$

Standard E.M.F. of the cell is 0.014 Volts.

Roll No. ..... Total Pages : 4

GSM/M-25 **3460**

PHYSICAL CHEMISTRY (THEORY)

Paper–XII, CH–205

Time Allowed : 3 Hours] [Maximum Marks : 32

Note : Attempt **five** questions in all, selecting **two** questions from each Unit. Question No. **1** is compulsory. All questions carry equal marks. Use of calculator and log table is allowed.

Compulsory Question

1. Write short notes on the following :

(a) Give three statements of second law of Thermodynamics. 2

(b) State and Explain Nernst Heat Theorem. 2

(c) Define reversible and irreversible cell giving examples. 2

(d) Explain the following : 2

(i) Liquid Junction Potential.

(ii) Electrode Potential.

UNIT–I

2. (a) What is a Cyclic process? How does efficiency of a Carnot heat engine lead us the definition of Entropy? 3

   (b) Show that $\Delta G = \Delta H + T\left[\partial(\Delta G)/\partial T\right]_P$. 3

3. (a) Derive an expression for the efficiency of a reversible heat engine working between temperatures T_2 and T_1. 3

   (b) Calculate the entropy change of mixing of 0.4 moles of nitrogen and 0.8 moles of helium at 25°C assuming that behave as ideal gases. 3

4. (a) Calculate the maximum efficiency of a steam engine operating between two Temperatures 120°C and 25°C. What would be the efficiency of engine if the boiler temperature is raised to 145°C ? The temperature of the Sink remaining the same. 3

   (b) Explain the term entropy. Show that entropy is a state function. 3

5. (a) Show that for a reversible process : 2

   $\Delta S_{System} + \Delta S_{Surrounding} > 0.$

   (b) What is residual entropy? What is its origin and how it can be calculated? 2

   (c) Explain the concept of Gibb's function (G) and Helmholtz function (A). 2

UNIT–II

6. (a) Explain the Construction and Working of Electrochemical cell. 3

   (b) What are Reversible and Irreversible cell? Explain with example. 2

   (c) What is Reference electrode? Explain with example. 1

7. (a) What is Buffer solutions? Explain Buffer action in acidic buffer and in basic buffer. 3

   (b) Write a short note on the following : 3

   (i) Standard Hydrogen Electrode.

   (ii) Calomel Electrode.

8. (a) Discuss the application of E.M.F. measurements in Potentiometric titrations : 3

   HCL acid Vs NaOH base.

Roll No. ..... Total Pages : 2

GSM/M-25 **3466**

LIFE & DIVERSITY OF CHORDATES–II

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. Support your answer with neat and labelled diagram(s) wherever necessary.

Compulsory Question

1. Explain the following in about 20 words each: 10×1½=15

   (i) Vocal sacs (ii) Fangs

   (iii) Hemipenes (iv) Vibrissae

   (v) Pecten (vi) Amplexus

   (vii) Diastema (viii) Scrotum

   (ix) Furcula (x) Pterosaurs.

UNIT–I

2. Describe structure and working of heart of frog. 6¼

3. (a) Distinguish between poisonous and non–poisonous snakes. 3

   (b) Describe characteristics of class Reptilia. 3¼

4. Give an account of digestive system of *Hemidactylus*. 6¼

5. Give a brief note on the following:

   (a) Care of eggs in Amphibians. 3¼

   (b) Internal ear of Frog. 3

UNIT–II

6. What are flight adaptations? Describe morphological and physiological adaptations of flight in birds. 6¼

7. Describe the structure of eye of Pigeon. 6¼

8. (a) Adaptive radiations in mammals. 3¼

   (b) Dentition in mammals. 3

9. Give a detailed account of male reproductive system in rat. 6¼

Roll No. ..... Total Pages : 2

GSM/M-25 3467

MAMMALIAN PHYSIOLOGY–II

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. Draw well labelled diagrams also.

Compulsory Question

1. Answer the following in about 20 words each:
   (i) Open Circulatory System
   (ii) Myogenic Heart
   (iii) Cardiac Output
   (iv) Total Lung Capacity
   (v) Uricotelic animals
   (vi) Addison's disease
   (vii) Resting Potential
   (viii) Glands of Emergency
   (ix) Partuirition
   (x) Medullated Nerve Fibre. 10×1½=15

UNIT–I

2. What is Cardiac Cycle? Describe different phases of cardiac cycle. 6¼

3. (a) What is Chloride Shift? Write it's significance during respiration. 3

(b) Differentiate between aerobic and anaerobic respiration. 3¼

4. (a) Give the composition of Human blood. 3¼

(b) Describe Ornithine Cycle for Urea formation. 3

5. Give details of process of Urine Formation in a Nephron. 6¼

UNIT–II

6. (a) What is nerve impulse? Discuss it's propagation through non–medullated nerve fibres. 6¼

7. (a) Describe second messenger hypothesis of hormone action. 3

(b) Draw a well labelled diagram of a human sperm. 3¼

8. Describe the functions and disorders of various hormones of Thyroid gland. 6¼

9. Write notes on the following:

(a) Spermiogenesis. 2

(b) Menstrual Cycle in Human. 4¼

Roll No. ..... Total Pages : 3

GSM/M-25 **3471**

ADVANCE DIGITAL ELECTRONICS (THEORY)

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. Attempt all questions: 4×2=8

   (i) What is monotonic DAC? Give an example.

   (ii) Which is the fastest ADC and why? What do you mean by quantization error?

   (iii) How many address lines does the 4K×16 memory consist of ?

   (iv) What are the advantages of using ROM as PLDs?

UNIT–I

2. (a) Explain the working of R–2R ladder type DAC. 5

   (b) If the maximum output voltage of a 7 bit D/A Converter is 25.4 V, what is the smallest change in the output as binary count increases? 3

3. (a) Enlist the advantages of binary ladder network over weighted resistor in DAC. 3

(b) Explain the operation of switched capacitor type DAC. 5

UNIT–II

4. (a) Explain the working of successive approximation ADC. Mention the advantages and disadvantages. 5

(b) Define the following terms: 3

(i) Accuracy (ii) Resolution

(iii) Conversion Time.

5. (a) With the appropriate circuit diagram, describe the working of Dual Slope Analog to Digital Converter. 5

(b) Draw the Sample and Hold Circuit and explain how analog signal is converted into digital form? 3

UNIT–III

6. (a) Desired memory size is 2K×8 bits available is 1K×4 bits. Show how memory can be expanded? 6

(b) What do you mean by volatile and non volatile memory? 2

7. (a) Explain the operation of six transistor TTL RAM. 5

(b) Compare and contrast SRAM and DRAM. 3

UNIT–IV

8. (a) Differentiate between PAL (Programmable Array Logic) and PLA (Programmable Logic Array). 4

(b) Implement the Full Adder Circuit using PLA. 4

9. Write a short note on the following: 8

(a) CPLDs (b) FPGA.

Roll No. ..... Total Pages : 2

GSM/M-25 3472

OBJECT ORIENTED PROGRAMMING WITH C ++

Paper–I

Time allowed : 3 Hours] [Max. Marks : { B.Sc. : 40 / B.A. : 25

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. Attempt all questions:

   (i) How you use scope resolution operator? 2, 1

   (ii) Compare Constructor and Destructor. 2, 2

   (iii) What is the use of the pointer? 2, 1

   (iv) List the operators that can not be overloaded. 2, 1

UNIT–I

2. (a) Discuss the various benefits of using Object–Oriented Programming. 5, 3

   (b) How does a class in C++ differs from structure? 3, 2

3. Using examples, explain Static Data Members and Static Member Functions. Why we need it? 8, 5

UNIT–II

4. (a) What is a Constructor with default argument? How it is different from default Constructor? 5, 3

   (b) Discuss Copy Constructor with suitable example. 3, 2

5. (a) What is destructor? How it is defined? Explain with examples. 5, 3

   (b) Explain Unformatted Console I/O operations in C++. 3, 2

UNIT–III

6. (a) What is a Friend Function? What are the objectives of using it? 3, 2

   (b) Write a program in C++ to add any *n* numbers. (Use friend function for addition) 5, 3

7. (a) What are Reference Variables? How they are declared? Explain with example. 3, 2

   (b) Write a program to swap values of two variables using function. (Pass parameters by reference) 5, 3

UNIT–IV

8. (a) What is Function Overloading? Discuss rules of using it. 3, 2

   (b) Write a program to find Area of Circle and Rectangle using the concept of Function Overloading. 5, 3

9. What is Static Polymorphism? How it is implemented in C ++ ? Discuss its Merits and Demerits. 8, 5

Roll No. .....

Total Pages : 3

GSM/M-25

3458

WAVE & OPTICS–II

Paper–VIII

Time allowed : 3 Hours]

[Maximum Marks : 40

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

Compulsory Question

1. Attempt all questions:

   (i) The transmission axes of two polarizers are oriented at 60° to one another. Unpolarized light of intensity I_0 falls on them. What fraction of light is transmitted through them? 2

   (ii) What is importance of Fourier theorem? Explain it's limitations. 2

   (iii) What are positive and negative crystals? Give examples. 1

   (iv) Why is matrix method superior to old conventional method to find the position of image? 1

   (v) Define nodal planes. 1

   (vi) State convolution theorem. 1

UNIT–I

2. (a) Why is arrangement of two crossed Nicol's alone not preferred in study of rotatory polarization? 2

   (b) How you distinguish between elliptical polarized light and a mixture of plane polarized light and unpolarized light? 6

3. (a) What is polarization of light? What information do we get about the nature of light from this phenomenon? 2

   (b) Give construction and working of Bi–quartz polarimeter and discuss the merits of a Bi–quartz polarimeter over the half shade polarimeter. 6

UNIT–II

4. (a) Expand $f(x)= x^2$ $(-\pi \le x \le \pi)$ in Fourier series. 3

   (b) Analyse the output of a full wave rectifier using Fourier theorem. 5

5. (a) Expand $f(x) = Ax^2 + Bx + C$ $(-\pi \le x \le \pi)$, where A, B and C are constants, in Fourier series. 3

   (b) What is complex wave? Apply Fourier theorem to analyse a rectangular wave. 5

UNIT–III

6. (a) What is similarity theorem of Fourier transform? 3

   (b) Show that the Fourier transform of the Gaussian function is also a Gaussian function. 5

7. (a) Find the sine and cosine transform of e^{-x}. 5

   (b) What are Fourier transforms and Fourier integrals? Explain. 3

UNIT–IV

8. (a) State and explain the modes of propagation and numerical aperture. 5

   (b) Calculate the critical angle and acceptance angle of an optical fibre with refractive index 1.6 and 1.3 of core and cladding respectively. 3

9. (a) Explain briefly the aberrations–Astigmatism and Distortion. Mention some methods to reduce Astigmatism. 3

   (b) Derive an expression for focal length of a thin lens by method of system matrix under paraxial approximation. 5

(ii) Knoevengal reaction

9. (a) Write a note on acidity of α-hydrogen of Aldehydes and Ketones. 3

(b) (i) What is Wolff- Kishner reduction? 1

(ii) Write Cannizzaro reaction. Give mechanism also. 2

Roll No. ..... Total Pages : 4

GSM/M-25 **3461**

ORGANIC CHEMISTRY (THEORY)

Paper–XIII. CH–206

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. Attempt any **eight** of the following questions : 8×1=8

(a) What is Hook's Law ?

(b) Why is Methanol a good solvent for UV but not for IR determination ?

(c) Complete the reaction :

$$C_6H_5NH_2 + CHCl_3 + KOH \rightarrow$$

(d) Write IUPAC name of $C_2H_5COC_2H_5$.

(e) What is Gattermann reaction?

(f) Write Blomstrand formula for Diazonium salt.

(g) What is Sarett reagent?

(h) Prepare ketone from acid chloride.

(i) Write IUPAC name of $C_2H_5NHCH_3$.

UNIT–I

2. (a) State and explain Stretching Vibrations in IR spectroscopy. 2

(b) What is the effect of resonance on absorption frequency in infrared spectra? Explain with examples. 2

(c) Give selection rules for Infrared spectroscopy. 2

3. (a) Calculate number of fundamental vibrations possible for each of the following molecules: (i) H_2O (ii) CO_2. 2

(b) How will you distinguish between alcohol and carboxylic acid using IR spectroscopy? 2

(c) Explain the factors which control the intensity of IR absorption bands. 2

4. (a) Distinguish between 1°, 2° and 3° amines using Nitrous acid. 3

(b) Convert the following : 3

(i) Nitrobenzene to Aniline.

(ii) Acetamide to Methylamine.

5. (a) Arrange the following in order of Increasing basic strength and explain this order : 3

p-methoxy aniline, p-nitroaniline, aniline.

(b) What is Hinsberg's reagent? How can it be used to distinguish between three classes of amines? 3

UNIT–II

6. (a) What is Diazotization? Give its mechanism. 3

(b) How will you prepare the following using Benzene diazonium chloride : 3

(i) Benzoic acid. (ii) Iodobenzene.

(iii) Nitrobenzene.

7. (a) Discuss the role of pH in the coupling reactions of Diazonium salts. 2

(b) Write the Reaction and Mechanism of the following :

(i) Coupling reaction with phenol. 2

(ii) Sandmeyer reaction. 2

8. (a) What is Corey's reagent? Give its advantages. 3

(b) Write the Reaction and Mechanism of the following : 3

(i) Benzoin condensation.

Roll No. ..... Total Pages : 2

GSM/M-25 3473

OPERATING SYSTEM

Paper–II

Time allowed : 3 Hours] [Max. Marks : { B.A. : 25 / B.Sc. : 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. Attempt all questions: 5,8

   (i) What do you mean by System Call?

   (ii) What do you mean by PCB?

   (iii) Differentiate between Single user and Multi user Operating system.

   (iv) What do you mean by File protection?

   (v) What is Mutual exclusion condition?

UNIT–I

2. Explain Distributed and Real Time Operating System. 5,8

3. Explain the Characteristics and structure of operating system. 5,8

UNIT–II

4. What is CPU Scheduling Algorithm? Explain various Scheduling Algorithm. 5,8

5. Write short note on the following: 5,8

   (a) Multithreading

   (b) Process Hierarchy.

UNIT–III

6. Explain various algorithms which implement mutual exclusion. 5,8

7. Explain the concept of semaphores. What are its advantages? 5,8

UNIT–IV

8. Explain various File Access and Allocation methods? 5,8

9. Explain various Disk scheduling algorithm with example. 5,8

Roll No. .....

Total Pages : 3

GSM/M-25

3470

OSCILLATORS & MULTIVIBRATORS (THEORY)

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. Attempt all questions: 4×2=8

   (i) What is transconductance amplifier? What is the difference between transconductance and transresistance amplifier?

   (ii) Why a power amplifier is also known as a large–signal amplifier?

   (iii) Write the condition for sustained oscillation. Why crystal oscillators are more popular?

   (iv) What is Schmitt trigger? Write its one use.

UNIT–I

2. (a) Explain the effect of negative feedback on non–linear distortion of an amplifier. 4

(b) Explain the effect of negative voltage shunt feedback on input resistance of an amplifier. 4

3. (a) Explain the effect of negative current shunt feedback on output resistance of an amplifier. 4

(b) Explain the effect of negative feedback on frequency response of an amplifier. 4

UNIT–II

4. (a) What is power amplifier? Give the classification of power amplifier. Compare directly coupled class A and transformer coupled Class A amplifier. 4

(b) With the help of basic circuit diagram explain the working of Class AB power amplifier. 4

5. (a) Draw the circuit diagram and explain the working of Class A amplifier. 4

(b) With the help of basic circuit diagram discuss the working of push pull amplifier. 4

UNIT–III

6. Draw the circuit diagram of Wein Bridge Oscillator and discuss its operation. Also find the expression for frequency of oscillations and the condition for sustained oscillations. 8

7. Draw the circuit diagram of Hartley Oscillator and explain its working. Also find the expression for the frequency of oscillations. 8

UNIT–IV

8. (a) Draw the circuit diagram of Astable multivibrator. Also explain its operation and find the expression for output pulse width. 5

(b) Explain the construction and working of Triac and also write its applications. 3

9. (a) Design Monostable multivibrator using IC 555 and explain its operation. 4

(b) Draw the circuit diagram of a triangular waveform generator and explain its working. Also find the frequency of waveform. 4

Roll No. ..... Total Pages : 3

3618

GSM/M-25

APPLIED AND COMMUNITY NUTRITION

Course : 211

Time : Three Hours] [Maximum Marks : 40

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

नोट : प्रत्येक इकाई से **दो** प्रश्नों का चयन करते हुए, कुल **पाँच** प्रश्नों के उत्तर दीजिए। प्रश्न संख्या 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question

(अनिवार्य प्रश्न)

1. Write short notes on the following :

(a) Pasteurization.

(b) W.H.R.

(c) Proximate Analysis.

(d) Malnutrition. (2×4=8)

निम्नलिखित पर संक्षिप्त टिप्पणी लिखिए :

(क) पास्तुरीकरण।

(ख) डब्ल्यू.एच.आर.।

(ग) निकटतम विश्लेषण।

(घ) कुपोषण।

UNIT–I (इकाई–I)

2. Discuss various anthropometric measurements used for determination of nutritional status of an obese adult. 8
एक मोटा व्यस्क के पोषण सम्बन्धी स्थिति के निर्धारण के लिए उपयोग किए जाने वाले विभिन्न मानवशास्त्रीय मापों पर चर्चा करें।

3. (a) Causes and symptoms of marasmus. 4
(b) Causes and types of anemia. 4
(क) मरास्मस के कारण और लक्षण।
(ख) एनीमिया के कारण और प्रकार।

4. Discuss in detail the etiology, symptoms and prevention of vitamin A deficiency disorders. 8
विटामिन ए की कमी से होने वाले विकारों के कारण, लक्षण और रोकथाम पर विस्तार से चर्चा करें।

5. Enlist various dietary methods to assess the nutritional status of community. Discuss 24-hour recall method in detail. 8
समुदाय की पोषण स्थिति का अवकलन करने के लिए विभिन्न आहार विधियों को सूचीबद्ध करें। 24–घण्टे की रिकॉल पद्धति पर विस्तार से चर्चा करें।

UNIT–II (इकाई–II)

6. What is food storage? Describe the general principles of food storage with suitable examples. 8
खाद्य भंडारण क्या है? खाद्य भंडारण के सामान्य सिद्धांतों का उपयुक्त उदाहरणों सहित वर्णन करें।

7. (a) Household Preservatives. 4
(b) Canning Method. 4
(क) घरेलू परिरक्षक।
(ख) डिब्बाबंदी विधि।

8. Discuss the following :
(a) Methods to prevent food spoilage.
(b) Prevention of Food Adulteration Act. (2×4=8)
निम्नलिखित पर चर्चा करें :
(क) भोजन को खराब होने से बचाने के तरीके।
(ख) खाद्य अपमिश्रण निवारण अधिनियम।

9. Define Food Preservation. Discuss the significance and methods of food preservation. 8
खाद्य संरक्षण को परिभाषित करें। खाद्य संरक्षण के महत्त्व एवं तरीकों पर चर्चा करें।

Roll No. ..... Total Pages : 2

3621

GSM/M-25

FAMILY RESOURCE MANAGEMENT

Course : 214

Time : Three Hours] [Maximum Marks : 40

Note : The candidate will attempt *five* questions in all, selecting at least *one* question from each unit and Question No. 1 is compulsory.

नोट : कुल मिलाकर किन्हीं **पाँच** प्रश्नों के उत्तर दीजिए। प्रत्येक इकाई से कम-से-कम **एक** प्रश्न का चयन करें। प्रश्न संख्या 1 अनिवार्य है।

Compulsory Question

(अनिवार्य प्रश्न)

1. Define the following terms : (4×2=8)

   (a) Resource.

   (b) Efforts.

   (c) Money.

   (d) Investment.

   निम्नलिखित को परिभाषित करें :

   (क) संसाधन।

   (ख) प्रयास।

   (ग) धन।

   (घ) निवेश।

UNIT–I (इकाई–I)

2. Discuss the characters to considered in making time and utility plan. 8
समय एवं उपयोगिता योजना बनाते समय विचार किये जाने वाले पात्रों की चर्चा करें।

3. How do you control and evaluate the Time Plan? 8
आप समय योजना को कैसे नियंत्रित और मूल्यांकन करतें हैं?

4. Write down the relationship of energy to the stages of the family life cycle. 8
पारिवारिक जीवन चक्र के चरणों के साथ ऊर्जा का संबंध लिखिए।

5. What is work Simplification? Discuss its techniques. 8
कार्य सरलीकरण क्या है? इसकी तकनीकों पर चर्चा करें।

UNIT–II (इकाई–II)

6. Write a note on sources of money. 8
धन के स्रोतों पर एक नोट लिखे।

7. Define budget with its types. 8
बजंट को उसके प्रकारों सहित परिभाषित करें।

8. Discuss the meaning, objectives and types of savings. 8
बचत के अर्थ, उद्देश्य और प्रकार पर चर्चा करें।

9. Describe the process of Marketing. 8
विपणन की प्रक्रिया का वर्णन करें।

Roll No. .....

Total Pages : 03

BSIT/M-25 **26481**

DIGITAL ELECTRONICS-III

BSIT-401

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) Mention the applications of counters. 2
   (b) Mention the various modes in which the data can be entered or taken out from a register. 2
   (c) Compare PROM and EPROM. 2
   (d) What is the step size of a 12 bit D/A converter, if the full scale output is + 10 volts ? 2

Unit I

2. (a) Design Mod-5 asynchronous ripple binary counter. 6
   (b) What is a ripple counter ? How does it work ? 2

3. Explain the design of synchronous decade counter. 8

Unit II

4. (a) Explain the operation of parallel in serial out shift register. 4

   (b) Draw and explain the circuit of Twisted Ring Counter. 4

5. (a) Draw and explain the circuit of bidirectional shift register. 4

   (b) Design a sequence generator to generate a sequence 10101. 4

Unit III

6. (a) How we can expand word capacity ? Obtain a 2048 × 8 memory using 256 × 8. 6

   (b) Compare bipolar and MOS RAM. 2

7. (a) Draw a diode matrix ROM that converts Excess-3 code to cyclic code. 4

   (b) Differentiate between Static RAM and Dynamic RAM. 4

Unit IV

8. (a) Explain the working of R-2R ladder type DAC. 6

   (b) How many bits are required at the input of D/A converter to achieve a resolution of 10mV, if the full scale output is 10 volts ? 2

9. (a) Define the following terms : 4

   (i) Resolution

   (ii) Monotonicity.

   (b) Describe the successive approximation method for A/D conversion. 4

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26482**

OSCILLATORS AND MULTIVIBRATORS

BSIT-402

Time : Three Hours] [Maximum Marks : 40

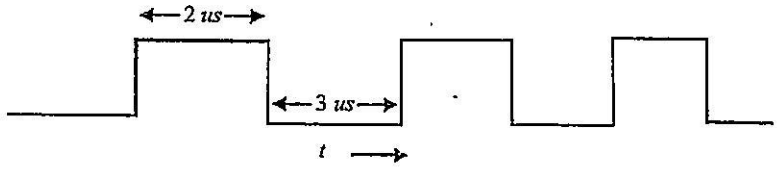
Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) Define output offset voltage and what is its value for an ideal OP-AMP ? **2**

(b) What are different feedback topologies ? Make the diagram for voltage shunt feedback topology. **2**

(c) What is Barkhausen Criterion in oscillators ? What type of feedback is used in oscillators ? **2**

(d) Calculate the duty cycle for the given waveform : **2**



Unit I

2. (a) Draw the circuit diagram for OP-AMP as an integrating amplifier and derive an expression for its output voltage. 6

   (b) What is error introduced by input offset voltage in non-inverting configuration of OP-AMP ? 2

3. Explain the working of an active low pass filter using OP-AMP and derive an expression for its voltage gain and plot the frequency response. 8

Unit II

4. (a) What should be the value of R_i and R_o with respect to R_S and R_L for a voltage amplifier ? Justify it with the help of equivalent circuit diagram. 4

   (b) Derive an expression for the effect of negative feedback on output impedance (R_o) of voltage series feedback topology. 4

5. (a) What should be the value of R_i and R_o with respect to R_S and R_L for a trans-resistance amplifier ? Justify it with the help of equivalent circuit diagram. 4

   (b) Derive an expression for the effect of negative feedback on output impedance (R_o) of current series feedback topology. 4

Unit III

6. What is RC phase shift oscillator ? Explain its working and derive an expression for its frequency with the help of circuit diagram. 8

7. What is Colpitt Oscillator ? Explain its working and derive an expression for its frequency with the help of circuit diagram. 8

Unit IV

8. What is a Multivibrator ? Explain the working Monostable multivibrartor using transistor with the help of its circuit diagram. Write its at least *two* applications. 8

9. Explain with the help of its internal architecture, how 555 IC Timer is used as Astable Multivibrator. Draw its various waveforms. 8

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26483**

TELECOMMUNICATION AND NETWORKING-II

BSIT-403

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) Explain the function of gateway in network. **2**

(b) What is mobility management in wireless network ? **2**

(c) What do you mean by critical angle in optical fiber cable ? **2**

(d) What do you understand by attenuation in optical fiber cable ? **2**

Unit I

2. (a) Discuss the function of four network devices. **4**

(b) How co-axial cable is better than twisted pair in transmission ? Give their advantage and disadvantage. **4**

3. (a) Explain different types of network switches used in transmission. 4

(b) Discuss different types of unguided media used for transmission. 4

Unit II

4. (a) Explain the concept of Handoff and channel assignment in wireless network. 4

(b) Explain GSM architecture in detail. 4

5. (a) What is frequency reuse and how is it useful in cellular network ? 4

(b) Discuss the 3G and 4G technology in cellular system and their difference. 4

Unit III

6. (a) Explain how light is propagated through fiber optic cable ? 4

(b) Discuss the benefits of fiber optic cable over electrical cable for communication. 4

7. (a) Explain the materials and different layers used in the construction of optic fiber cable. 4

(b) Discuss the application of fiber optic cable. 4

Unit IV

8. (a) On the basis of variation in index of refraction explain different types of optic fiber cable. 4

(b) Discuss Photodiode optical fiber receiver in detail. 4

9. (a) Explain different types of connectors used in fibers optic cable. 4

(b) Discuss different types of loses in fiber optic cable and how can they be decreased ? 4

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26484**

MICROPROCESSOR ARCH. AND PROGRAMMING-II

BSIT-404

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 are the advantages of 8255 in interfacing the I/O devices with Microprocessor ? 2

   (b) How 20 bit address is managed during fetch cycle in 8086 ? 2

   (c) What is the difference between Do-While and Repeat-Until statement ? 2

   (d) Write the control word format for 8255 in BSR mode. 2

Unit I

2. Discuss interfacing of ADC 0801 converter with 8085 using memory mapped I/O and interrupt RST 6.5. Write a program to read the converter output data. 8

3. Discuss the interfacing circuit of 8255A in mode 0 with port B and Port C_L as output port and port A and port Cu as input port Calculate the port address as shown in figure below. Write a program to read the switches and display the reading from port A at port B and from port C_u at port C_L. 8

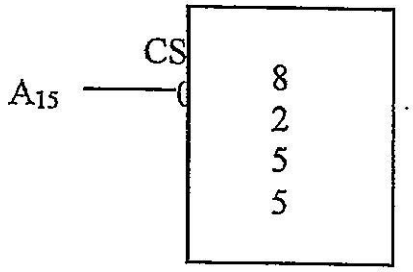

Fig. 1

Unit II

4. Why 8254 is required in microprocessor ? Calculate the port address of the control register and counter1 as shown in figure 1. Write a program to initialize counter1 in mode1 with a count value of 50000_{10}. Write a main program to display seconds by calling the subroutine. 8

5. Discuss the working of 8253 in mode 4 & mode 5 with timing diagram. 8

Unit III

6. (a) Discuss the flag register of 8086 in detail. 4

(b) Discuss the segment registers and their pointer in 8086. Calculate the physical address if base address is 2004H and offset address is 5000H. 4

7. Draw the pin diagram of 8086 and working of each pin in minimum and maximum mode. 8

Unit IV

8. Write the op-code for the following instructions : 4×2=8

(i) MOV CL, [BX]

(ii) MOV [BX] [SI], DX

(iii) MOV CX, [5000H] .

(iv) MOV BX, CX.

9. Discuss IF-THEN, IF-THEN-ELSE and multiple If-THEN-ELSE statement using flow chart and assembly language program. 8

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26485**

OPERATING SYSTEM-II

BSIT-405

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. Write short notes on the following : **4×2=8**

(a) What is the concept of memory fragmentation and how does it affect memory utilization in contiguous memory management systems ?

(b) LRU page replacement algorithm

(c) Tree Directory Structure

(d) Trojan Horse.

Unit I

2. Explain the concepts of logical and physical address space. How does the operating system manage the translation between them ? **8**

3. Discuss the role of hardware support in paging for memory management. How does paging facilitate protection and sharing in a computer system ? 8

Unit II

4. What is Thrashing in the context of virtual memory ? Discuss the causes of thrashing and how it can be mitigated ? 8

5. Explain, how demand paging works in virtual memory systems. Discuss the role of the operating system in managing demand paging. 8

Unit III

6. Describe different file types and access methods used in file management systems. Discuss their advantages and limitations. 8

7. Discuss in detail various techniques used for free space management in file systems. 8

Unit IV

8. Define authentication and elaborate on the various authentication techniques. 8

9. Identify and describe various types of system threats. How can these threats impact computer systems and what measures can be taken to mitigate them ? 8

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26486**

COMPUTER PROGRAMMING WITH C-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) Define File Inclusion preprocessor directive. **2**

(b) Specify the use of typedef **2**

(c) Distinguish between user defined and built in functions. **2**

(d) What do you mean by File Pointer ? **2**

Unit I

2. What do you mean by preprocessor directive ? Explain various compiler control directives. **8**

3. What do you mean by String ? Write a program to find whether a given string is palindrome or not. **8**

Unit II

4. (a) What are actual and formal parameters ? Illustrate with example. 4

   (b) Write a program to swap two numbers using call by reference concept. 4

5. What is Recursive function ? Write a program using recursive function to convert decimal to binary number. 8

Unit III

6. (a) What is Pointer ? Explain various operations that can be performed on pointers. 4

   (b) Write a program to generate prime numbers between 1 to 100. 4

7. Define Structure. How a union is different from structure ? Explain with example. 8

Unit IV

8. What is a storage class ? Explain the various storage classes in C with suitable examples. 8

9. (a) Explain various modes of opening a data file. 4

   (b) Write a program to copy the text from one file to another. 4

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Section IV

8. (a) State and prove Cauchy Schwarz's inequality in an inner product space. 3(5)

   (b) If u and v are vectors in an inner product space, then show that : 2(3)

   $\| u + v \|^2 + \| u - v \|^2 = 2\| u \|^2 + 2\| v \|^2$.

9. (a) Every finite dimensional inner product space has an orthonormal basis. 2.5(4)

   (b) A linear operator T on a unitary space V is Hermitian if and only if $< T(\alpha), \alpha >$ is real for every α. 2.5(4)

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Roll No. ..... Total Pages : 04

GSQ/M-25 3553

LINEAR ALGEBRA

Time : Three Hours] [Maximum Marks : B.A.:26 B.Sc. :40

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

Compulsory Question

1. (a) For what value of k will the vector $(1, k, 5)$ in R^3 (R) be linear combination of vectors $(1, -3, 2)$ and $(2, -1, 1)$ in R^3 (R) ? 2(2)

   (b) Define annihilator of a subset of a vector space. 1(1)

   (c) Find the co-ordinates of the vector (1, 1, 1) relative to the basis B = {(1, 1, 2), (2, 2, 1), (1, 2, 2)}. 1(2)

   (d) Define null space of a linear transformation. 1(1)

   (e) In an inner product space $(V_{F=C}, <.,.>)$, prove that $< u, av > = \overline{a} < u, v >$. 1(2)

Section I

2. (a) The union of two subspaces of a vector space is a subspace if and only if one of the subspaces is contained in the other. 2.5(4)

   (b) The linear sum of two subspaces W_1 and W_2 of a vector space V is a subspace generated by the union of W_1 and W_2 i.e., $W_1 + W_2 = < W_1 \cup W_2 >$. 2.5(4)

3. (a) Every linearly independent subset of a finitely generated vector space V(F) can be extended to form a basis of V. 3(5)

   (b) Prove that :

   $S = \{(1, 0, 0), (1, 1, 0), (1, 1, 1), (0, 1, 0)\}$ spans the vector space $R^3(R)$ but is not a basis. 2(3)

Section II

4. (a) Two finite dimensional vector spaces over the same field are isomorphic if and only if they have the same dimension. 2.5(4)

   (b) Show that the linear transformation $T : R^2 \rightarrow R^3$ defined by $T(x, y) = (x, x - y, x + y)$ is a linear transformation and is one-one but not onto. 2.5(4)

5. (a) Prove that every n-dimensional vector space V (F) is isomorphic to F^n. 2.5(4)

   (b) Find a linear transformation $T : R^3 \rightarrow R^2$ such that $T(1, 1, 1) = (1, 0)$ and $T(1, 1, 2) = (1, -1)$. 2.5(4)

Section III

6. (a) If U and V be vector spaces over the same field F and $T_1 : U \rightarrow V$ and $T_2 : U \rightarrow V$ are linear Transformations, then prove that $\rho(T_1 + T_2) \leq \rho(T_1) + \rho(T_2)$. 2.5(4)

   (b) A linear transformation $T : U \rightarrow V$ is non-singular if and only if T is one-one. 2.5(4)

7. (a) Show that the linear transformation $Y = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 3 & 1 \\ -2 & 3 & 5 \end{bmatrix}$

   X is singular and the images of linearly independent vectors (1, 1, 1), (2, 1, 2) and (1, 2, 3) are linearly dependent. 2.5(4)

   (b) Show that the linear operator $T : R^3 \rightarrow R^3$ defined by $T(x, y, z) = (x + z, x - z, y)$ is invertible. Hence find T^{-1}. 2.5(4)

Section IV

8. (a) Find the image of $|z-3i|=3$ under the mapping $w=\frac{1}{z}$. 4(2½)

   (b) Prove that cross ratio remains invariant under Mobius transformation. 4(2½)

9. (a) Find the image of the regions inside and outside the unit circle under the transformation : 4(2½)

$$w=\frac{iz+1}{z+i}$$

   (b) Find the region of the w-plane into which the region $\frac{1}{2} \leq x \leq 1$ and $\frac{1}{2} \leq y \leq 1$ is mapped by the transformation $w = z^2$. 4(2½)

Roll No. ..... Total Pages : 04

GSQ/M-25 3552

REAL & COMPLEX ANALYSIS

Time : Three Hours] [Maximum Marks : B.A.: 27, B.Sc. : 40

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

Compulsory Question

1. (a) Find the stereographic projection of the point $1 - i$ on the sphere of radius 1 and centre (0, 0, 0). 2(1½)

   (b) Show that the function $\sinh z$ is analytic. 1(1)

   (c) Evaluate : 2(1½)

$$\int_0^{\pi/2} \cos^5 x\,dx$$

   (d) Change the order of integration of $\int_0^1 \int_{4y}^{y} e^{x^2}\,dxdy$ 1½(1½)

   (e) Find the coefficient of magnification at $z = 2 + 3i$ for the conformal transformation z^2. 1½(1½)

Section I

2. (a) Express $\int_0^\infty \frac{x^{m-1}}{(a+bx)^{m+n}}dx$ in terms of Beta function, where $m > 0$, $n > 0$; $a > 0$, $b > 0$. 4(2½)

(b) Show that the functions $u = x+y+z$, $v = xy+yz+zx$, $w = x^3+y^3+z^3-3xyz$ are not independent of each other. Also find the relation between them. 4(2½)

3. (a) State and prove Duplication formula. 4(2½)

(b) Evaluate : 4(2½)

$$\iint \sqrt{a^2-x^2-y^2}\,dxdy$$

over the semicircle $x^2+y^2 = ax$ in the positive quadrant.

Section II

4. (a) Expand $f(x) = x\sin x$ as a Fourier series in $(0, 2\pi)$. 4(2½)

(b) Find the Fourier series expansion of the function f in $(0, 2\pi)$ defined as : 4(2½)

$$f(x) = \begin{cases} x, & \text{if } 0 < x < \pi \\ 2\pi - x, & \text{if } \pi < x < 2\pi \end{cases}$$

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots = \frac{\pi^2}{8}$.

5. (a) State and prove Parseval's Indentity for Fourier series. 4(2½)

(b) Obtain half range cosine series for the function $\sin\left(\frac{\pi x}{\lambda}\right)$ in the range $0 < x < \lambda$. 4(2½)

Section III

6. (a) Prove that $f(z) = |z|$ is nowhere differentiable but continuous everywhere in the complex plane. 4(2½)

(b) Find the analytic function whose real part is $x^3-3xy^2+3x^2-3y^2+2x+1$. 4(2½)

7. (a) State and prove the necessary conditions for a function $f(z)$ to be analytic. 4(2½)

(b) Show that the function $f(z) = e^{-z^{-4}}$ $(z \neq 0)$ and $f(0) = 0$ is not analytic at $z = 0$, although C–R equations are satisfied at $z = 0$. 4(2½)

Roll No. .....

Total Pages : 03

GSQ/M-25

3554

DYNAMICS

BM-363

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 9 (Unit V) is compulsory.

Unit I

1. A particle moves along a circle $r = 2a\cos\theta$ in such a way that its acceleration towards the origin is always zero. Show that the transverse acceleration varies as the fifth power of $\operatorname{cosec}\theta$. **8**

2. (a) A particle executing S.H.M. has amplitude a. Find the distance of the point from the centre at which the velocity is half of the maximum velocity. **4**

   (b) A particle describes the curve $r = ae^{m\theta}$ with constant velocity. Find the components of velocity and acceleration along the radius vector and perpendicular to it. **4**

Unit II

3. (a) State and prove principle of conservation of Energy. 4

   (b) If a string of an Atwood machine can bear a strain of one quarter of the sum of two weights. Find the least possible acceleration. 4

4. A force of 150 Newtons moves a body through 27 mt. from rest in $4\frac{1}{2}$ seconds. The force then ceases to act. Find the resistance required to reduce the body to rest in a distance 3 mt. 8

Unit III

5. (a) Find the velocity and direction of shot which passes in a horizontal direction over the top of a wall 64 ft. high and 192 ft. distance from the gun. 4

   (b) If V_1 and V_2 be the velocities at the ends of a focal chord projectile path and U the horizontal component of velocity. Show that : 4

$$\frac{1}{V_1^2}+\frac{1}{V_2^2}=\frac{1}{U^2}$$

6. A particle slide down a rough curve under gravity in a vertical plane. Discuss the motion. 8

Unit IV

7. To establish the equivalence of Kepler's laws for planetary motion and Newton's law of Gravitation. 8

8. (a) If V_1 and V_2 are the linear velocities of a planet when it is respectively nearest and farthest from the sun, then prove that : 4

$$(1-e)V_1=(1+e)V_2$$

   (b) Find the differential equation of central orbit in pedal form. 4

Unit V

(Compulsory Question)

9. (a) Define K.E. and P.E. 2

   (b) Define central force and central orbit. 2

   (c) Define angular acceleration along a plane curve. 2

   (d) Prove that acceleration of a point moving in a curve with uniform speed is $\rho\left(\frac{d\psi}{df}\right)^2$. 2

9. (a) What are Carbon Nanotubes (CNT) ? Discuss about SWCNT and MWCNT. 6

(b) List some important applications of Nanotechnology in the fields of science and technology. 2

Roll No. ..... Total Pages : 04

GSQ/M-25 3557

SOLID STATE AND NANO PHYSICS

Paper : XI

PH-601

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. Use of Scientific (Non-programmable) calculator is allowed.

1. (a) What are Miller Indices ? Write down their important features. 2

(b) Calculate packing fraction for FCC crystal system. 2

(c) A superconducting wire has a critical temperature of 6.4 K and a critical field of 8.2 T at 0K. if critical temperature is given at zero critical field, find the critical field at 4.2 K. 2

(d) Why is there a drastic change in physical and chemical properties of materials at nano-scale ? 2

Unit I

2. (a) Explain the structure of sodium chloride and zinc sulphide. 6

   (b) A plane makes intercepts of 1, 2 and 3 Å on the crystallographic axis of an orthorhombic crystal with $a : b : c = 3 : 2 : 1$. Determine the Miller indices of the plane. 2

3. (a) Explain various symmetry operations in a crystal. Why can't crystals have fivefold symmetry operation ? 6

   (b) What are important lattice parameters of a unit cell ? 2

Unit II

4. (a) The primitive translation vectors of hexagonal space lattice are :

$$\vec{a} = \frac{a}{2}\hat{i} + \frac{\sqrt{3}}{2}\hat{j}$$

$$\vec{b} = -\frac{a}{2}\hat{i} + \frac{\sqrt{3}}{2}\hat{j}$$

and $\vec{c} = c\hat{k}$

Find the volume of the primitive cell. 2

   (b) State and explain Bragg's law for diffraction of X-rays by crystals. Give its characteristic features. 6

5. (a) Discuss the construction of reciprocal Lattice and also explain the reciprocal Lattice vectors. 4

   (b) Explain that reciprocal lattice for a body centred cubic crystal is face centred lattice. 4

Unit III

6. (a) Discuss BCS theory of superconductivity. How are Cooper pairs formed ? 6

   (b) What are type-I and type-II superconductors ? 2

7. (a) Prove that magnetic flux within the superconducting ring is quantized in units of $h/2e$. 4

   (b) What is Josephson effect ? Discuss DC and AC Josephson effects. 4

Unit IV

8. (a) What is Transmission Electron Microscopy (TEM) ? Explain its construction and working. 6

   (b) What are the vision and objectives of nanotechnology ? 2

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Total Pages : 03

GSQ/M-25

3558

ATOMIC AND MOLECULAR SPECTROSCOPY

PH-602

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. (i) Evaluate the possible value of the quantum numbers j and m_j for states in which $l = 1$. **2**

(ii) Explain the classical model of sodium atom with $n = 4$. **2**

(iii) Consider a p-electron in one electron atom. Calculate the value of L, S and J. **2**

(iv) Calculate the Lande g-factor and total magnetic moment in the state $^2D_{5/2}$ term in week magnetic field. **2**

Unit I

2. (i) Describe the origin of line spectra. 4

   (ii) Describe Bohr's Postulates and limitations of Bohr's theory. 4

3. Write the characteristics of Sommerfeld's elliptical orbits. Show that the s-electron orbit is most elliptic in any family of orbits having the same major axis. 8

Unit II

4. (i) What is Bohr magneton ? Calculate its value. 3

   (ii) State and prove the Larmor's theorem. 5

5. What are the main features of the fine-structure in the spectra of alkali elements ? Explain how the concepts of spinning electron account for doubling of levels. 8

Unit III

6. Assuming LS coupling, find the Russell-Saunders terms for *sp* and *pd* configurations. 8

7. Describe the helium atom spectrum and give the differences between ortho-helium and para-helium. 8

Unit IV

8. Describe Zeeman Effect. Give the quantum theory of normal Zeeman Effect. 8

9. What are molecular spectra ? Describe the rotational and vibrational energy levels of diatomic molecules. Give their characteristics features. 8

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9. (a) Write the uses of room temperature vulcanizing (RTV) elastomers. 2

(b) What are homomorphic and heteromorphic π-systems ? Explain. 2

(c) Complete the reaction occurring at 250°C. 2

Cyclic $(NPCl_2)_3 \rightarrow$

What happens on further heating the product to 350°C.

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Roll No. ..... Total Pages : 04

GSQ/M-25 3559

INORGANIC CHEMISTRY (TH)

CH-304

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. (a) Out of BCl_3 and $B(CH_3)_3$, which is a better Lewis acid ?

(b) Define hard acid giving suitable example.

(c) Give an example of π-acid.

(d) What is Wilkinson's catalyst ?

(e) Name the essential non-metal which constitutes the living system.

(f) Name two essential trace metals.

(g) Name the metal present in chlorophyll.

(h) What are Phosphazenes ? 1×8=8

Section A

2. (a) Explain why Cl—OH is an acid whereas NaOH is a base. 2

   (b) Which is a stronger acid HCN *or* HOCN ? 2

   (c) What are the limitations of Pearson's HSAB principle ? 2

3. (a) $HClO_4$ is a stronger acid than HClO, why ? 2

   (b) Explain out of RNH_2 or NR_3 which is a stronger base. 2

   (c) Explain the feasiblity of the reaction : 2

   $LiF + CsI \rightarrow LiI + CsF$.

4. (a) Calculate EAN value for $[Cr(C_5H_5)(CO)_3$ and $[Mn(CO)_5C_2H_4]^+$. 2

   (b) Discuss the structure and bonding of metal-olefin complexes. 2

   (c) Write *two* methods for preparation of organotin compounds. 2

5. (a) What is a Heptacity ? Give *one* example. 2

   (b) Draw the structure of ferrocene and discuss its important features. 2

   (c) Give *three* methods of preparation of metal carbonyls. 2

Section B

6. (a) Discuss the role of the following elements in biological systems : 4

   (i) Fe

   (ii) Ca

   (iii) Mg

   (iv) Zn.

   (b) Sodium pump is electrogenic in nature. Justify. 2

7. (a) What is Bohr effect ? Explain with the help of oxygen binding curves. 3

   (b) Discuss the nature of heme-oxygen binding in Hb and Mb. 3

8. (a) What are the similarity and difference in the structure Haemoglobin and Myoglobin and give their functions. 4

   (b) Why do polyphasphazenes chain prefer a *cis-trans* conformation to a *trans-trans* conformation ? 2

8. (a) Define molal depression constant. Derive the relationship between depression in freezing point and molality of the dissolved solute. 4

(b) 10 g of a substance dissolved in 100 g of water raised its boiling point by 0.98°C. Calculate the molecular weight of the substance. The molal elevation constant for water is 0.52 °C per molality. 2

9. (a) Giving reasons, arrange the following aqueous solutions in the order of ascending values of their osmotic pressure : 2

(i) 0.1 M Na_2SO_4 solution

(ii) 0.1 M Glucose solution

(iii) 0.1 M Na_3PO_4 solution

(iv) 0.2 M Urea solution.

(b) What are ideal solutions ? Give two examples. 2

(c) What are colligative properties ? How can you say that 'Relative lowering of vapour pressure' is a colligative property ? 2

Roll No. ..... Total Pages : 04

GSO/M-25 3560

PHYSICAL CHEMISTRY (TH)

CH-305

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) Give one example of a photochemical reaction in which the quantum yield is very low.

(b) What is photosensitization ?

(c) What is statistical mechanics ?

(d) Write the basic relation which links thermodynamics with statistical mechanics.

(e) What is a condensed system ?

(f) Define the term 'Degrees of freedom' as used in Phase Rule.

(g) What are isotonic solutions ?

(h) State Raoult's law for non-volatile solutes. 8×1=8

Section A

2. (a) Draw Jablonski diagram depicting the various radiative and non-radiative transitions. 2

   (b) What do you understand by quantum yield of a photochemical reaction ? Why some reactions have high quantum yield whereas some others have very low value ? 2

   (c) Differentiate between photochemical reactions and thermochemical reactions. 2

3. (a) The photodecomposition of HI vapours was carried out with radiation of wavelength 2070 Å. Absorption of each calorie gave 1.44×10^{-5} g of H_2. Calculate the quantum yield. 3

   (b) Define Second Law of Photochemistry. Derive the relationship between an Einstein of energy (in kcal) and the wavelength of the radiation (in Å). 3

4. (a) Write expression for Maxwell-Boltzmann distribution law taking degeneracy of states into consideration. What do different symbols signify ? 2

   (b) What do you understand by Partition Function ? Show that the total partition function for a system may be expressed as a product of translational, rotational, vibrational and electronic partition functions. 3

   (c) Write the expression for rotational partition function. What do the different symbols signify ? 1

5. (a) What are the two main points of difference between classical statistical mechanics and quantum statistical mechanics ? 2

   (b) Discuss the following : 4

   (i) Thermodynamic Probability

   (ii) Born-Oppenheimer Approximation.

Section B

6. (a) State 'Gibbs Phase Rule'. Explain the application of phase rule in the extraction of silver from an ore of lead. 3

   (b) Calculate the number of Phases and Components present in the following systems : 3

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

   (ii) $CaCO_3(s) \rightleftharpoons CaO\ (s) + CO_2(g)$.

   (iii) Rhombic Sulphur in equilibrium with Monoclinic Sulphur.

7. (a) Draw a well labelled phase diagram of water system. Discuss the effect of change of temperature at constant pressure on this system. 4

   (b) Calculate the total number of variables for a heterogeneous system consisting of C components distributed among P phases. 2

9. (a) Giving suitable examples explain the difference between Step growth and Chain growth polymerization.

(b) Give the monomers of the following :

(i) Nylon-6

(ii) PMMA.

(c) In presence of CCl_4 styrene undergoes polymerization at the same rate but the polystyrene formed has a low molecular mass. Explain. **3,2,1**

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GSQ/M-25 3561

ORGANIC CHEMISTRY

CH-306

Time : Three Hours] [Maximum Marks : 32

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

(Compulsory Question)

1. (i) pKa value of Ethyl acetate is 25 and that of Malonic ester is 13. Justify.

(ii) How will you explain the low acidity and low basicity constant of amino acids ?

(iii) Draw the two enantiomeric forms of α-amino acid.

(iv) Name and explain the process used for increasing the quality of Natural rubber.

(v) Complete the following equation :

Pyrrole + CH_2Cl_2 + $2C_2H_5O^-Na^+ \rightarrow$?

(vi) Draw the resonance structures of Pyridine.

(vii) Tautomerism is acid and base catalyzed. Explain.

(viii) Isoquinoline is more basic than Quinoline. **1×8=8**

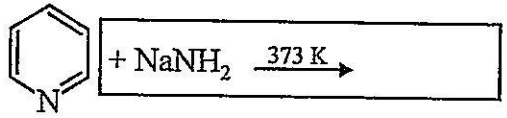
Section A

2. (a) How will you convert Pyrrole into :

   (i) 3-Chloropyridine

   (ii) Pyrrole 2-sulphonic acid.

   (b) Complete the following equation along with its mechanism :



   (c) Explain various steps involved in Hantzsch synthesis of Pyridine. **1,2,3**

3. (a) Write the mechanism of Fischer Indole Synthesis.

   (b) Explain why electrophilic substitution reactions occur at C-3 in Indole and at C-2 in Pyrrole. **4,2**

4. (a) What are Enolates ? How will you convert Malonic ester into :

   (i) *n*-Valeric acid

   (ii) Succinic acid.

   (b) Discuss the mechanism of Claisen condensation. **4,2**

5. (a) What are active methylene compounds ? Give at least two examples.

   (b) Sketch the synthesis of 3-Methyl-2-Pentanone and n-butanoic acid from EAA. **2,4**

Section B

6. (a) Write notes on the following :

   (i) Isoelectric point

   (ii) Electrophoresis.

   (b) Discuss suitable method for the Synthesis of phenylalanine.

   (c) Explain Edman's method for N-terminal analysis of proteins. **2,2,2**

Unit IV

7. (a) What are Peptides ? Discuss the geometry of a peptide bond.

   (b) Illustrate various steps involved in the synthesis of glycyl-alanine a dipeptide. **2,4**

8. (a) What is Ziegler-Natta polymerization ? How does it overcome the limitations of free radical polymerization ?

   (b) Give the preparation and uses of the following polymers :

   (i) Neoprene

   (ii) PVC

   (iii) Dacron. **1½,4½**

Roll No. ..... Total Pages : 03

GSQ/M-25 3564

BIOCHEMISTRY AND PLANT BIOTECHNOLOGY

Paper : I

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. Illustrate your answers with well labelled diagrams.

(Compulsory Question)

1. Write short notes on the following : 4×2=8

(i) Holoenzyme

(ii) Phytochrome

(iii) Leghaemoglobin

(iv) Cellular totipotency.

Unit I

2. Briefly describe any *two* of the following : 4+4=8

(i) Enzyme characteristics

(ii) Enzyme nomenclature

(iii) Apoenzyme and its significance.

3. What are different phases of growth and development ? Explain in detail with a suitable example. 8

4. Explain the discovery and structure of gibberellins. Also state their physiological roles in agriculture. 8

5. Write short notes on the following : 4+4=8

(i) β-oxidation

(ii) Biosynthesis of fatty acids.

Unit II

6. Briefly describe the following : 4+4=8

(a) Ammonium assimilation

(b) Nitrate reductase and its working.

7. Discuss the various steps of nitrogen fixation with special emphasis on biological nitrogen fixation. 8

8. Describe different tools and techniques of recombinant DNA technology. 8

9. Discuss the various vectors for gene transfer. Explain the biology of agro-bacterium. 8

Roll No. ..... Total Pages : 03

GSQ/M-25 3565

ECONOMIC BOTANY

Paper-II

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *Five* questions in all. Question No. 1 is compulsory. Attempt two questions from each Unit. All questions carry equal marks.

Compulsory Question

1. (a) Mention the botanical name of Gram
   (b) Mention the botanical name of Tomato.
   (c) Mention the botanical name of Jute
   (d) Mention the botanical name of Coconut.
   (e) Mention the botanical name of Ginger
   (f) Mention the botanical name of Neem.
   (g) Mention the botanical name of Teak
   (h) Mention the botanical name of Pea. 8

Unit I

2. Write about origin ,distribution, Botanical description and uses of Wheat. 8

3. Write Short notes on the origin, Botanical description and uses of the following : 4+4

(a) Pigeon Pea

(b) Jute.

4. Write Short notes on the origin, Botanical description and uses of the following : 4+4

(a) Groundnut

(b) Rice.

5. Discuss Briefly about origin, distribution, botanical description, cultivation and uses of Potato. 8

Unit II

6. Write short notes on Morphology of the plant part used, cultivation and uses of the following : 4+4

(a) Turmeric

(b) Opium

7. Write short notes on Morphology of the plant part used, cultivation and uses of the following : 4+4

(a) Cloves

(b) Coffee.

8. How did Tetraploid Cotton originate ? Write about the cultivation and preparation of cotton threads. 8

9. Give an account of timber yielding plants of India. 8

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Roll No. ..... Total Pages : 03

GSQ/M-25 3566

AQUACULTURE AND PEST MANAGEMENT-I

Paper-I

Time : Three Hours] [Maximum Marks : 40

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

1. Answer the following in about **20** words each : **10×1.5=15**

(a) Reservoir fishery.

(b) Lead line in a fishing net

(c) Fishing Crafts

(d) Tuticorin Boat

(e) EEZ

(f) Edible Oysters

(g) Zoological Name of Cotton grey weevil

(h) Damage causing stage of Gurdaspur Borer

(i) Systematic Position of Gundhi Bug

(j) Define crop rotation.

Section A

2. Write short notes on the following : 3+3¼
   (a) Brahmputra riverine fisheries.
   (b) East Coast River System.

3. (a) Enumerate the capture and culture fisheries in India.
   (b) Write all you know about Lacustrine Fishery. 2+4¼

4. What do you mean by Fishing Gears ? Describe various types of nets used in fisheries. 6¼

5. Give a detailed account of Pearl Culture. 6¼

Section B

6. Describe systematic position, damage caused, life cycle and control measure of Pyrilla perpusilla. 6¼

7. Write zoological name, systematic position and damage caused of :
   (a) The Pumpkin Fruit Fly
   (b) Rice stem borer. 3+3¼

8. What is the zoological name of Wheat stem borer ? Give its systematic position, habits, damage caused and life cycle. 6¼

9. Give zoological name and systematic position of : 2+2+2¼
   (a) Red Cotton bug
   (b) Hadda Beetle
   (c) Cotton Jassid.

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Roll No. .....

Total Pages : 03

GSQ/M-25 3567

AQUACULTURE AND PEST MANAGEMENT-II

Paper : II

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory and answer to each part should not exceed **20** words. Attempt any *two* questions from Section A and any *two* questions from Section B. Draw well labelled diagrams wherever they are required.

(Compulsory Question)

1. (a) Name any *three* sources of fish seed.

(b) What are detriphagus fish ? Give an example.

(c) What is cage culture ?

(d) What is monoculture in aquaculture ?

(e) What is transgenic fish ?

(f) What is an insecticide ?

(g) What is Zoological name of Khapra beetle ?

(h) Define biological pest control.

(i) Describe IPM.

(j) What are pestiferous birds ? **10×1=10**

Section A

2. Write notes on the following : **3.5+4=7.5**

   (a) Polyculture

   (b) Cage culture.

3. (a) Explain the process of Cryopreservation.

   (b) Explain the *three* ways of gene manipulation in making a transgenic fish. **3.5+4=7.5**

4. Describe various types of ponds and their layout in a fish farm. **7.5**

5. Write notes on the following : **3.5+4=7.5**

   (a) Bandh breeding

   (b) Hatching Happa.

Section B

6. Write notes on the following : **3.5+4=7.5**

   (a) Nature of damage and habits of Rust red flour beetle

   (b) Nature of damage and habits of Lesser grain borer.

7. Explain the systematic position, habits, life cycle and nature of damage of Pulse Beetle. **3.5+4=7.5**

8. Give a comprehensive account on Integrated Pest Management. **7.5**

9. Define the following : **3.5+4=7.5**

   (a) Role of bacterial parasites as biological control agents

   (b) Synthetic organic pesticides.

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Roll No. 2/20330/6..... Total Pages : 03

GSQ/M-25 **3570**

MICROPROCESSOR ARCHITECTURE AND PROGRAMMING-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. All questions carry equal marks.

Compulsory Question

1. (a) Differentiate between Maskable and Non-Maskable interrupts. 2

(b) Write BSR control words to first set and then reset PC4 bit of Port C in IC 8255. 2

(c) Explain how to enable RST 5.5, disable RST 6.5 and RST 7.5. 2

(d) What is the function of HRQ and HLDA signals of IC 8257 DMA controller ? 2

Unit I

2. (a) Draw and discuss the interrupt control circuit of microprocessor 8085. 6

   (b) Explain EI and DI instructions. 2

3. (a) What are Interrupts ? Explain hardware and software interrupts of microprocessor 8085 in detail. 5

   (b) Differentiate between Memory mapped I/O and I/O mapped I/O data transfer schemes. 3

Unit II

4. (a) Explain Programmable Peripheral Interface IC 8255 with the help of its block diagram. 6

   (b) How Port addresses are selected in IC 8255-1 ? 2

5. (a) Draw the pin diagram of IC 8255 and explain its control signals. 5

   (b) Write Assembly language programme to generate a square wave of one kHz frequency using 8255. The wave should be made available at PA1 pin of Port A. 3

Unit III

6. Draw and explain pin diagram and block diagram of IC 8253 programmable interval timer. 8

7. (a) Explain how chip select logic is utilised for interfacing of 8253 with microprocessor 8085. 6

   (b) Write a programme in assembly language to load counter 0 in mode 0 for the count value 6047H in binary. 2

Unit IV

8. Draw block diagram of IC 8257 DMA and explain each block. 8

9. Design and discuss the working of microprocessor based on Traffic Light System. 8

Roll No. .....

Total Pages : 03

GSO/M-25 3572

RELATIONAL DATABASE MANAGEMENT SYSTEM

Time : Three Hours] [Maximum Marks : B. Sc. : 40, B.A. : 25

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

(Compulsory Question)

1. (a) List any *four* rules proposed by Dr. E.F. Codd for relational model.

(b) Differentiate between tuple relational and domain relational calculus.

(c) What are SQL scalar functions ?

(d) Outline the structure of PL/SQL block. **5(8)**

Unit I

2. What do you mean by data model ? Discuss the components and features of network data model. Draw a comparison between hierarchical, network and relational data model. **5(8)**

3. What is the need of relational algebra ? How a SQL query is converted to an equivalent algebraic operation ? Discuss projection and join operation with the help of an illustration. 5(8)

Unit II

4. What do you mean by functional dependency and closure of functional dependency ? Discuss different types of functional dependency with example. 5(8)

5. Explore the role of normalization in designing of database. Write the properties of normalization. Discuss how BCNF is simpler and stronger that 3NF with the help of an example ? 5(8)

Unit III

6. What is SQL ? Write the purpose, syntax and example for the following SQL statements : 5(8)

   (i) Create

   (ii) Alter

   (iii) Delete

   (iv) Insert

   (v) Update.

7. (a) Write a SQL query to implement check and like constraint.

   (b) Write a SQL query to implement primary and foreign key constraint. 5(8)

Unit IV

8. Write the advantages of PL/SQL over SQL. How do we declare variables ? Write about %Rowtype in PL/SQL ? 5(8)

9. What are the three types of control statements in PL/SQL ? Discuss each with illustration. 5(8)

❖❖❖❖❖❖❖

7. Describe the Ethernet LAN technology. What are its key features and components ? Also, describe one key difference between Fast Ethernet and Gigabit Ethernet.

ईथरनेट LAN तकनीक का वर्णन कीजिए । इसकी प्रमुख विशेषताएँ और घटक क्या हैं ? इसके अलावा, फास्ट ईथरनेट और गीगाबिट ईथरनेट के बीच एक प्रमुख अंतर का वर्णन कीजिए ।

Unit IV (इकाई IV)

8. (a) Explain the flooding routing algorithm
फ्लडिंग रूटिंग एल्गोरिद्म की व्याख्या कीजिए

(b) Explain how choke packets are used in congestion control strategies ?
बताइए कि भीड़ नियंत्रण रणनीतियों में चोक पैकेट का उपयोग कैसे किया जाता है ?

9. (a) Describe any *two* common security attacks in computer networks.
कम्प्यूटर नेटवर्क में किन्हीं दो सामान्य सुरक्षा हमलों का वर्णन कीजिए ।

(b) Discuss the role of Firewalls and Digital Signature in network security.
नेटवर्क सुरक्षा में फायरवॉल और डिजिटल हस्ताक्षर की भूमिका पर चर्चा कीजिए ।

Roll No. ..... Total Pages : 04

GSO/M-25 3573

COMPUTER NETWORKS

Time : Three Hours] [Maximum Marks : B. Sc. : 40, B.A. : 25

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.
प्रत्येक इकाई से एक प्रश्न चुनते हुए, कुल पाँच प्रश्नों के उत्तर दीजिए । प्रश्न संख्या **1** अनिवार्य है । सभी प्रश्नों के अंक समान हैं ।

Compulsory Question (अनिवार्य प्रश्न)

1. Answer any *four* of the following questions in brief :

(i) Sketch any *one* topology followed in Local Area Networks.

(ii) Name any *one* protocol of TCP/IP model.

(iii) What is a digital signal ?

(iv) Give one example of a wireless LAN standard.

(v) What is the need for error detection methods in data communication ?

(vi) What is the role of DNS in the Internet ?

(vii) How is data secured using encryption ?

निम्नलिखित में से किन्हीं चार प्रश्नों के उत्तर संक्षेप में दीजिए :

(i) लोकल एरिया नेटवर्क में अपनाई जाने वाली किसी एक टोपोलॉजी का स्केच बनाइए ।

(ii) TCP-IP मॉडल के किसी एक प्रोटोकॉल का नाम बताइए ।

(iii) डिजिटल सिग्नल क्या है ?

(iv) वायरलेस LAN मानक का एक उदाहरण दीजिए ।

(v) डाटा संचार में त्रुटि पहचान विधियों की क्या आवश्यकता है ?

(vi) इंटरनेट में DNS की क्या भूमिका है ?

(vii) एन्क्रिप्शन का उपयोग करके डाटा को कैसे सुरक्षित किया जाता है ?

Unit I (इकाई I)

2. List any *four* key network hardware components and briefly explain their functions.
किन्हीं चार प्रमुख नेटवर्क हार्डवेयर घटकों की सूची बनाइए और उनके कार्यों को संक्षेप में समझाइए ।

3. (a) Name any *two* network design issues and explain their purpose.
किन्हीं दो नेटवर्क डिजाइन मुद्दों का नाम बताइए और उनके उद्देश्य की व्याख्या कीजिए ।

(b) List the functions of the Network layer of OSI reference model.
OSI संदर्भ मॉडल की नेटवर्क परत के कार्यों की सूची बनाइए ।

Unit II (इकाई II)

4. (a) Define capacity in the context of communication systems. How does it relate to bandwidth and data rate ?
संचार प्रणालियों के संदर्भ में क्षमता को परिभाषित कीजिए । यह बैंडविड्थ और डाटा दर से कैसे संबंधित है ?

(b) Discuss switching techniques in communication systems.
संचार प्रणालियों में स्विचिंग तकनीकों पर चर्चा कीजिए ।

5. (a) What is a Modem ? Sketch any **two** modulation techniques used by modems.
मॉडेम क्या है ? मॉडेम द्वारा उपयोग की जाने वाली किन्हीं दो मॉड्यूलेशन तकनीकों का स्केच बनाइए ।

(b) Describe the role of wireless transmission and communication satellites in modern communication systems.
आधुनिक संचार प्रणालियों में वायरलेस ट्रांसमिशन और संचार उपग्रहों की भूमिका का वर्णन कीजिए ।

Unit III (इकाई III)

6. Explain the concept of Media Access Control (MAC) and describe one MAC protocol of your choice.
मीडिया एक्सेस कंट्रोल (MAC) की अवधारणा की व्याख्या कीजिए और अपनी पसंद के एक MAC प्रोटोकॉल का वर्णन कीजिए ।

5. Discuss the causes, symptoms and nutritional management in coronary heart disease. 8
कोरोनरी हार्ट डिजीज में कारण, लक्षण और पोषण प्रबंधन पर चर्चा करें।

UNIT–II (इकाई–II)

6. Discuss the diagnosis of cancer with its dietary management. 8
कैंसर का निदान और इसके पोषण प्रबंधन पर चर्चा करें।

7. Give causes, symptoms and dietary modification of acute renal failure. 8
एक्यूट रेनल फेल्योर (ARF) के कारण, लक्षण और आहार संशोधन पर चर्चा करें।

8. Write an elaborate note on nephritis. 8
नेफ्राइटिस पर विस्तृत नोट लिखें।

9. What are the causes and dietary management in kidney stones? 8
किडनी स्टोन्स के कारण और आहार प्रबंधन पर चर्चा करें।

Roll No. ..... Total Pages : 4

3624

GSQ/M-25

DIETETICS–II

Paper : 311

Time : Three Hours] [Maximum Marks : 40

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

नोट : प्रत्येक इकाई से **दो** प्रश्नों का चयन करते हुए, कुल **पाँच** प्रश्नों के उत्तर दीजिए। प्रश्न संख्या 1 अनिवार्य है। सभी प्रश्नों के अंक समान हैं।

Compulsory Question

(अनिवार्य प्रश्न)

1. Fill in the blanks :

   (i) A significant cause of NIDDM is _____ resistance, which is often related to _____ and an unhealthy lifestyle.

   (ii) Limiting _____ intake and increasing potassium-rich foods like _____ and bananas can help manage hypertension.

   (iii) Coronary Heart Disease (CHD) is primarily caused by the buildup of _____ in the arteries, reducing blood flow to the heart.

(iv) A diet rich in _____ and _____ helps in supporting cancer treatment.

(v) Chronic Renal Failure is often caused by long-term conditions such as _____ and hypertension.

(vi) Symptoms of ARF include decreased _____ output, swelling, and confusion.

(vii) A major dietary modification for nephritis is reducing _____ intake to manage swelling.

(viii) Kidney stones are often caused by dehydration, high levels of _____, oxalates, or _____ acid in the urine. (8×1=8)

खाली स्थान भरें :

(i) NIDDM का एक महत्वपूर्ण कारण -------- प्रतिरोध है, जो अक्सर -------- और एक अस्वास्थ्यकर जीवनशैली से संबंधित होता है।

(ii) उच्च रक्तचाप (हाइपरटेंशन) को नियंत्रित करने में -------- का सेवन कम करना और -------- और केले जैसे पोटैशियम से भरपूर खाद्य पदार्थों का सेवन करना मददगार हो सकता है।

(iii) कोरोनरी हार्ट डिजीज (CHD) मुख्य रूप से -------- के धमनियों में जमाव के कारण होता है, जो दिल तक रक्त प्रवाह को कम कर देता है।

(iv) कैंसर उपचार में सहायता करने के लिए -------- और -------- से भरपूर आहार लाभकारी होता है।

(v) क्रोनिक रेनल फेल्योर (CRF) अक्सर लंबे समय तक चलने वाली स्थितियों जैसे -------- और उच्च रक्तचाप (हाइपरटेंशन) के कारण होता है।

(vi) ए.आर.एफ. (एक्यूट रेनल फेल्योर) के लक्षणों में -------- उत्पादन में कमी, सूजन, और भ्रम शामिल होते हैं।

(vii) नेफ्राइटिस के लिए एक प्रमुख आहार संशोधन है -------- का सेवन कम करना, ताकि सूजन को नियंत्रित किया जा सके।

(viii) किडनी स्टोन्स अक्सर निर्जलीकरण, ---------- और ऑक्सेलेट्स, या ---------- अम्ल की उच्च मात्रा के कारण होते हैं।

UNIT–I (इकाई–I)

2. What is IDDM stands for? Discuss the causes, symptoms and nutritional management in NIDDM. 8

IDDM का क्या मतलब है? NIDDM में कारण लक्षण और पोषण प्रबंधन पर चर्चा करें।

3. Describe the causes, symptoms and dietary modifications in hypertension. 8

हाइपरटेंशन के कारण, लक्षण और आहार संशोधन पर चर्चा करें।

4. Write a detailed note on nutritional management of heart diseases. 8

हृदय रोगों के पोषण प्रबंधन पर विस्तृत टिप्पणी लिखें।

Roll No. ..... Total Pages : 3

3625

GSQ/M-25

TRADITIONAL TEXTILES : EMBROIDERIES AND CONSUMERISM

Course–312

Time : Three Hours] [Maximum Marks : 40

Note : Canditate will attempt *five* questions in all. Question No. 1 is compulsory. Attempt remaining *four* questions by selecting *two* questions from each unit.

नोट : उम्मीदवार कुल **पाँच** प्रश्न हल करेंगे। प्रश्न संख्या 1 अनिवार्य है। प्रत्येक इकाई से **दो-दो** प्रश्न चुन कर, शेष **चार** प्रश्नों के उत्तर दें।

Compulsory Question

(अनिवार्य प्रश्न)

1. Explain the following in brief :

(a) Bagh.

(b) Himroo.

(c) Dhakai mulmul.

(d) Labelling. (2×4=8))

निम्नलिखित को संक्षेप में समझाइए :

(क) बागं

(ख) हिमरू।

(ग) ढकाई मलमल।

(घ) लेबलिंग।

UNIT–I (इकाई–I)

2. Explain the manufacturing and importance of carpets and shawls of Kashmir. 8
कश्मीर के कालीन एवं शॉल के निर्माण एवं महत्व को समझाइये।

3. What is the traditional importance of Kantha of Bengal, elaborate motifs, colors used and articles of kantha? 8
बंगाल के कांथा का पारंपरिक महत्व, विस्तृत रूपांकन, प्रयुक्त रंग और कांथा की वस्तुएं क्या हैं?

4. Elaborate the traditional embroidery of Himachal Pradesh. 8
हिमाचल प्रदेश की पारंपरिक कढ़ाई का विस्तार से वर्णन करें।

5. Explain the traditional textiles of Banaras with illustration. 8
बनारस के पारंपरिक वस्त्रों को उदाहरण सहित समझाइये।

UNIT–II (इकाई–II)

6. What do you mean by special finishes? How do they enhance the value of fabrics? 2,6
विशेष फिनिश से आपका क्या तात्पर्य है? वे कपड़ों का मूल्य कैसे बढ़ाते हैं?

7. Explain the process of dry cleaning for care of clothing. 8
कपड़ों की देखभाल के लिए ड्राई क्लीनिंग की प्रक्रिया समझाएं।

8. What influences the consumption of textiles in India? 8
भारत में वस्त्रों की खपत पर क्या प्रभाव पड़ता है?

9. What factors influence selection of fabrics for table linen and draperies? 8
टेबल लिनन और ड्रेपरियों के लिए कपड़ों के चयन को कौन से कारक प्रभावित करते हैं?

5. What is Mid-life Crisis? Explain Menopause in Women. 8
मध्य-जीवन संकट क्या है? महिलाओं में रजोनिवृत्ति की व्याख्या करें।

UNIT–II (इकाई–II)

6. Elaborate the skill and characteristics of effective counsellor. 8
प्रभावी परामर्शदाता के कौशल और विशेषताओं का विस्तार से वर्णन करें।

7. Discuss various methods and techniques in counselling of children & parents. 8
बच्चों और अभिभावकों की काउंसलिंग में विभिन्न तरीकों और तकनीकों की विवेचना कीजिए।

8. Explain the problems, strategies and approaches of individual and group guidance. 8
व्यक्तिगत और समूह मार्गदर्शन की समस्याओं, रणनीतियों और दृष्टिकोणों की व्याख्या कीजिए।

9. What do you mean by counselling? Discuss the need & principles of guidance and counseling. 8
परामर्श से आपका क्या अभिप्राय है? मार्गदर्शन और परामर्श की आवश्यकता और सिद्धांतों की विवेचना कीजिए।

Roll No. ..... Total Pages : 6

GSQ/M-25 **3626**

ADULTHOOD GUIDANCE AND COUNSELLING

Course–313

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *five* questions in all, selecting *two* questions from each unit as well as compulsory question.

नोट : प्रत्येक इकाई से कम-से-कम **दो** प्रश्न और अनिवार्य प्रश्न के साथ कुल **पाँच** प्रश्न कीजिए।

Compulsory Question (अनिवार्य प्रश्न)

1. (i) The best way to help students do well in their studies is through :
   (a) Guidance & Counselling
   (b) Punishment
   (c) Rigid & Strict Discipline
   (d) None of the above.

   छात्रों को उनकी पढ़ाई में अच्छा करने में मदद करने का सबसे अच्छा तरीका है :
   (क) मार्गदर्शन और परामर्श
   (ख) सजा
   (ग) कठोर और सख्त अनुशासन
   (घ) उपरोक्त में से कोई नहीं।

14/05

(ii) During early adulthood, which of the following begin to decline?

(a) Metabolism
(b) Dexterity
(c) Physical fitness
(d) Cognitive functioning.

प्रारंभिक वयस्कता के दौरान, निम्नलिखित में से किसमें गिरावट शुरू होती है?

(क) चयापचय
(ख) निपुणता
(ग) शारीरिक फिटनेस
(घ) संज्ञानात्मक कार्य।

(iii) Which of the following is an objective of the guidance?

(a) It assists the students in developing a better attitude towards school attitude.
(b) It assists the children to adapt to the school transitions and regulations of the school.
(c) It enables the students to identify their problems.
(d) All of the above.

निम्नलिखित में से कौन-सा मार्गदर्शन का उद्देश्य है?

(क) यह छात्रों को स्कूल के दृष्टिकोण के प्रति बेहतर दृष्टिकोण विकसित करने में सहायता करता है।
(ख) यह बच्चों को स्कूल के बदलावों और नियमों के अनुकूल होने में सहायता करता है।
(ग) यह छात्रों को उनकी समस्याओं की पहचान करने में सक्षम बनाता है।
(घ) उपरोक्त सभी।

(iv) Which of the following is not an element of counselling?

(a) Interview
(b) Confidence
(c) Professional Growth
(d) Communication.

निम्नलिखित में से कौन-सा परामर्श का तत्व नहीं है?

(क) साक्षात्कार
(ख) आत्मविश्वास
(ग) व्यावसायिक विकास
(घ) संचार।

(v) What is not a characteristic of counselling?

(a) Effective building
(b) Opportunity for free expression
(c) Counsellor's Involvement
(d) Personal Interview.

परामर्श की विशेषता क्या नहीं है?

(क) प्रभावी बनाना
(ख) स्वतंत्र अभिव्यक्ति के लिए अवसर
(ग) परामर्शदाता की भागीदारी
(घ) व्यक्तिगत साक्षात्कार।

(vi) Which of the following statement is true?

(a) Guidance means to instruct students.
(b) Guidance can be given individually as well as in a group.
(c) Counselling can be given collectively only.
(d) Guidance is given to weak students.

निम्नलिखित में से कौन-सा कथन सत्य है?

(क) मार्गदर्शन का अर्थ छात्रों को निर्देश देना।

(ख) मार्गदर्शन व्यक्तिगत रूप से साथ ही साथ समूह में दिया जा सकता है।

(ग) परामर्श केवल सामूहिक रूप से दिया जा सकता है।

(घ) मार्गदर्शन कमजोर छात्रों को दिया जाता है।

(vii) Social and emotional well-being in young adulthood cab be affected by what?

(a) Establishing a career

(b) Establishing first serious relationships

(c) Increasing responsibilty and independence

(d) All of these.

युवा वयस्कता में सामाजिक और भावनात्मक कल्याण किससे प्रभावित हो सकता है?

(क) कैरियर की स्थापना से

(ख) पहले गंभीर संबंध स्थापित करने से

(ग) बढ़ती जिम्मेदारी और स्वतंत्रता से

(घ) ये सभी।

(viii) What are some of the 'crises' affecting social and emotional well-being in middle adulthood?

(a) Physical signs of ageing

(b) Children growing up and leaving home

(c) Boredom with a chosen career

(d) All of these. (8×1=8)

मध्य वयस्कता में सामाजिक और भावनात्मक कल्याण को प्रभावित करने वाले कुछ संकट क्या हैं?

(क) उम्र बढ़ने के शारीरिक संकेत

(ख) बच्चों का बड़ा होना और घर छोड़ना

(ग) चुने कैरियर से बोर होना

(घ) ये सभी।

UNIT–I (इकाई–I)

2. Discuss various health and disease associated with late adul hood. 8

वृद्धवस्था से जुड़ी विभिन्न स्वास्थ्य और बीमारी की विवेचना कीजिए।

3. Discuss : 8

(a) Developmental task of Middle adulthood.

(b) Problems and adjustment in old age.

चर्चा कीजिए :

(क) मध्य वयस्कता का विकासात्मक कार्य।

(ख) बुढ़ापे में समस्याएं और समायोजन।

4. Explain : 8

(a) Retirement.

(b) Grandparenthood.

व्याख्या कीजिए :

(क) सेवानिवृत्ति।

(ख) दादा-दादी।

Roll No. ..... Total Pages : 02

BSIT/M-25 26488

PROGRAMMING IN C++ – II

BSIT 602

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) Differentiate Public and Protected specifications.
   (b) What is use of Throw block ?
   (c) Define Inheritance, Binding.
   (d) Discuss role of fstream.

Unit I

2. Explain concept of Operator overloading in C++ by writing a Program.

3. (a) What is a Friend function and differentiate with Member function ?
   (b) Write a Program in C++ to explain friend function.

Unit II

4. What is Inheritance, discuss its types. Write a progam to explain Multi-level Inheritance.

5. (a) What is scope of Public, Private and Protected visibility modes ?

   (b) Write a program to show three modes of visibility and their importance.

Unit III

6. Explain concept of Virtual base class using a program in C++.

7. (a) What is Virtual function and how is it different from normal member function ?

   (b) Make a program in C++ to show concept of Virtual Function.

Unit IV

8. What is role of Try and catch. Exception handling by a program ?

9. Write notes on the following :

   (a) File output using Text or BinaryFile

   (b) Stream Classes.

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Roll No. ..... Total Pages : 02

BSIT/M-25 26489

WEBSITE DESIGN IMPLEMENTING BASIC DESIGN TOOLS-II

BSIT-603

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 difference between frame and frameset ?
   (b) Define Multimedia.
   (c) What is the syntax of CSS ?
   (d) What is XML DOM ? 4×2=8

Unit I

2. What do you understand by frameset and how would you combine various framesets ? 8

3. What is form and how is a form created ? 8

Unit II

4. (a) What is Image link and Image Map ? 4
   (b) What is the attribute of Image elements ? 4

5. (a) How would you add sound to your Multimedia projects ? 4

(b) What are the various broadcasting standards of Video ? 4

Unit III

6. What is CSS ? How would you put style sheets to the documents ? 8

7. What is embedded CSS styles and what is a limitation of using embedded CSS styles ? 8

Unit IV

8. (a) What is XML and what are various features of XML ? 4

(b) What do you understand by flow objects ? 4

9. How would you change the various aspects of the text using XML ? 8

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26490**

INTERNET CONCEPTS AND APPLICATION-II

BSIT-604

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) Define Encryption. 2

   (b) What is the difference between internet, intranet and extranet ? 2

   (c) List two advantages of e-Commerce over Traditional Commerce. 2

   (d) What is the difference between hypertext and hypermedia ? 2

Unit I

2. (a) Define network security. Discuss about the principles of network security. 4

   (b) Differentiate between active and passive attacks. 4

3. What are the main computer viruses ? How to protect a computer from viruses ? 8

Unit II

4. What do you mean by multimedia ? Explain the various steps and considerations in multimedia design. 8

5. Explain the various online chatting and video conferencing applications. 8

Unit III

6. What do you mean by e-Commerce ? Discuss about various types of e-Commerce models with examples. 8

7. What do you mean by EDI ? Explain its components with the help of a diagram. 8

Unit IV

8. Define intranet and its components. Explain the various applications of intranet. 8

9. (a) Explain the various web publishing techniques. 4

   (b) What do you mean by e-Mail ? Discuss its significance. 4

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Roll No. ..... Total Pages : 03

BSIT/M-25 **26491**

EMBEDDED SYSTEMS AND 8051 MICROCONTROLLER-II

BSIT-605

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 is watchdog timer in embedded system ? **2**

(b) Which type of architecture is preferred in embedded system and why ? **2**

(c) Which pin of port3 is used for serial transmission and reception ? **2**

(d) How the timers of 8051 work as timer and counter ? **2**

Unit I

2. Discuss different types of components embedded in system on chip. **8**

3. Discuss the following units of embedded system hardware :

(a) Clock oscillator circuit and clock units 3

(b) System timers and real time clock 3

(c) Interrupt handler. 2

Unit II

4. Discuss read and write process in all ports using internal circuit. 8

5. Discuss how the special function registers are used for controlling the function of timers and counters. 8

Unit III

6. What is serial communication ? Discuss the serial communication indifferent modes using special function registers. 8

7. How jump and call instructions are used in 8051 ? Discuss immediate and register addressing modes using examples. 8

Unit IV

8. (a) What are the specification used while designing the microcontroller ? 4

(b) Why testing is required after microcontroller design ? 4

9. (a) Discuss the steps to test microcontroller design. 4

(b) What is look up table and how is it implemented in microcontroller design ? 4

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10. (a) Prove that, A Cauchy sequence in a metric space is convergent, iff it has a convergent subsequence. 5

(b) Show that the function $f:[0,1]\to R$ such that $f(x)=x^2$ is uniformly continuous. 4

Roll No. ..... Total Pages : 4

BAQ/M-25 **35102**

ANALYSIS

Paper–BM–301

Time Allowed : 3 Hours] [Maximum Marks : 45

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) If $f(x)\frac{1}{x^2}$ on [1,4] and $P=\{1,2,3,4\}$ be the partition of [1,4], then compute $L(f,p)$ and $U(f,p)$. Also find $W(f,p)$. 5

(b) Prove that $\frac{1}{2}\le\int_0^1\frac{dx}{\sqrt{4-x^2+x^3}}\le\frac{\pi}{6}$. 4

2. (a) Find the values of m and n for which the integral $\int_0^1 x^n e^{-mx}dx$ converges. 4

(b) Discuss the convergence of Gamma function. 5

3. (a) Examine the convergence of $\int_0^\infty \sin x^2 dx$. 5

(b) Show that $\int_0^1 \frac{x^\alpha - 1}{\log x} dx = \log(1+\alpha)$. 4

UNIT–II

4. (a) Show that the sequence $< a_n >$ where $a_n = x^n$ converges to zero if $|x| < 1$. 5

(b) Discuss the convergence of the sequence $< a_n >$ where

$$a_n = 1 + \frac{1}{3} + \frac{1}{3^2} + \ldots\ldots\ldots + \frac{1}{3^n}.$$ 4

5. (a) Find the Fourier expansion of $f(x) = x$ in $[-\pi, \pi]$. 5

(b) If $x = r\cos\theta$ and $y = r\sin\theta$, prove that : 4

$$\frac{\partial^2 r}{\partial x^2} \cdot \frac{\partial^2 r}{\partial y^2} = \left(\frac{\partial^2 r}{\partial x \partial y} \right)^2.$$

UNIT–III

6. (a) Show that the function $f(z) = |z|^2$ is continuous everywhere but nowhere differentiable except at the origin. 5

(b) For what values of z, the function $z = \sinh u \cos v + i \cosh u \sin v$ ceases to be analytic. 4

7. (a) Show that the function $u(x, y) = e^x \cos y$ is harmonic. Determine the Harmonic conjugate $v(x, y)$ and the analytic function $f(z) = u + iv$. 5

(b) Find the Fixed points, normal form and nature of the following Mobius transformation $w = \frac{3iz+1}{z+i}$. 4

UNIT–IV

8. (a) Let X be the set of all real valued bounded functions defined on $[a,b]$ and let 'd' be a function such that : 5

$$d = (f,g) = \sup_{x \in [a,b]} |f(x) - g(x)| \text{ for all } f, g \in X.$$

Show that (X,d) is a metric space.

(b) Any metric space (X,d), bounded or not, can be converted into a bounded metric space (X,d^*), where

$$d^*(x,y) = \frac{d(x,y)}{1 + d(x,y)}.$$ 4

9. (a) In a metric space (X,d), a subset of X is closed iff its complement is open. 5

(b) Let (X,d) be a metric space and let A, B be subsets of X, Then prove that $\overline{A \cup B} = \overline{A} \cup \overline{B}$. 4

10. (a) Let f be a homomorphism of an R-module M into an R-module N then $\frac{M}{Ker(f)} \cong f(M)$. 5

(b) Let V be finite dimensional vector space and let W be subspace of V. Then
dimA(W) + dim(W) = dimV. 4

Roll No. ..... Total Pages : 4

BAQ/M-25 **35103**

ABSTRACT ALGEBRA

Paper–BM–302

Time Allowed : 3 Hours] [Maximum Marks : 45

Note : Attempt **five** questions in all, selecting at least **two** questions from each Unit. All questions carry equal marks.

UNIT–I

1. (a) State and prove the class equation of a group G. 5

(b) Find o(Z(G)) for a non-abelian group G of order p^3 (where p is prime). 4

2. (a) Let G be a group and the Homomorphism $f: G \to G$ commutes with every inner automorphism of the group G then prove that $K = \{x \in G : f^2(x) = f(x)\}$ is normal subgroup of G. 4

(b) For a finite cyclic group G of order n, prove that $o(Aut(G)) = \varphi(n)$. 5

3. (a) Any two Sylow p-subgroups of a finite group G are conjugate. 4

(b) Let P be a Sylow p-subgroups of G. Then the number of Sylow p-subgroups of G is equal to $\frac{o(G)}{o(N(P))}$. 5

UNIT–II

4. (a) Let R be a commutative ring with unity whose only ideals are {0} and R itself. Then R is a field. 4

(b) Let R be a commutative ring with unity and let M be an ideal of R. Then R/M is a field if and only if M maximal ideal. 5

5. (a) Any two non-zero elements x and y in a Euclidean domain R have a g.c.d. d(say) and d can be written as $d = \lambda x + \mu y$ for some λ and μ in R. 5

(b) An integral domain R with unity is a field iff $R[x]$ is PID. 4

UNIT–III

6. (a) Prove that union of two subspaces of a vector space is a subspace if and only if one is contained in the other. 4

(b) Prove that every linearly independent subset of a finitely generated vector space V, can be extended to form a basis of V. 5

7. (a) Two fininte dimensional vector spaces over the same field are Isomorphic if and only if they have the same dimension. 5

(b) Find a linear transformation, which maps (1, 1, 1), (1, 1, 0), (1, 0, 0) of R^3 to (2, 1), (2, 1) and (2, 1) of R^2. 4

8. (a) If V is a finite dimensional vector space and W be a subspace of V, then prove that $A(A(W)) = W$. 5

(b) Show that the matrix $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ is not diagonalizable over the field C. 4

UNIT–IV

9. (a) Obtain an orthonormal basis with respect to standard inner product for the subspace of R^3 generated by (1, 0, 1), (1, 0, –1) and (0, 3, 4). 4

(b) State and prove Bessel's inequality. 5

Roll No. ..... Total Pages : 3

BAQ/M-25 **35104**

PROGRAMMING IN C & NUMERICAL ANALYSIS

Paper–BM-303, (i)

Time Allowed : 3 Hours] [Maximum Marks : 27

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) What is a Flow Chart ? Define its advantages and limitations.

   (b) What do you mean by Looping ? Explain different types of loops available in C language.

2. (a) What is Recursion ? How recursion is implemented using C language ? Explain through a suitable example.

   (b) What are Operators ? What are the various operators available in C language ?

3. (a) What are Arrays ? Explain different types of array in C language.

(b) Distinguish between Structures and Array.

UNIT–II

4. Find real root of following equation by Newton-Raphson method, correct to three places of decimal :

$$x^3 + x^2 - 1 = 0.$$

UNIT–III

5. (a) Apply Lagrange's formula to find the value of y_4 if $y_3 = 16$, $y_5 = 36$, $y_7 = 64$, $y_8 = 81$, $y_9 = 100$.

   (b) Solve the following equations by Gauss elimination method :

   $x + y + z = 10$, $2x + y + 2z = 17$, $3x + 2y + z = 17$.

6. (a) Using Jacobi's method. find all the eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}.$$

   (b) Find $y'(0)$ and $y''(0)$ from the following table :

x	0	1	2	3	4
f(x)	4	8	15	7	6

UNIT–IV

7. Using Runge-Kutta method of order 4, find y for $x = 0.1, 0.2, 0.3$; given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$. Continue the solution at $x = 0.4$ using Milne-Simpson's method.

8. (a) Solve the differential equation $\frac{dy}{dx} = xy$ with $y(1) = 5$ for $x = 1.1$, given that $h = 0.1$.

   (b) Obtain the least square Polynomial approximation of degree one and two for $f(x) = x^{1/2}$ on [0, 1].

9. Show how to generate a random variable whose distribution function is $f(x) = \frac{1}{2}(x + x^2)$; $0 \le x \le 1$.

   Use

   (a) The Inverse transform method.

   (b) The acceptance-rejection method.

   Which method do you think is best for this function ? Briefly explain your answer.

   Approximate the following integrals using Monte Carlo method :

$$\int_1^{\pi} e^x \, dx.$$

(ii) Ca.

(iii) Mg.

(b) What is N_2 fixation? Discuss briefly biological nitrogen fixation. 3

10. (a) What is the cooperativity effect in hemoglobin? 2

(b) Sodium pump is Electrogenic in nature. Justify. 2

(c) What is meant by Island model of bonding in $(NPCl_2)_3$? 2

Roll No. ..... Total Pages : 4

BAQ/M-25 35110

INORGANIC CHEMISTRY (THEORY)

Paper–I

Time Allowed : 3 Hours] [Maximum Marks : 30

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Explain the Splitting of d-orbitals in Octahedral complexes with the help of a neat and clean diagram. 3

(b) Calculate CFSE for the following : 3

(i) $\left[Cr(CN)_6\right]^{4-}$

(ii) $\left[Fe(H_2O)_6\right]^{3+}$

2. (a) Discuss the factors affecting the Magnitude of Crystal field splitting. 4

(b) $CuSO_4.5H_2O$ on heating becomes colorless, why? 2

UNIT–II

3. (a) Define the Magnetic susceptibility. Discuss briefly the Gouy's method for measurement of Magnetic susceptibility. 3

   (b) Cu(I) is diamagnetic whereas Cu(II) is paramagnetic. Why? 2

   (c) Calculate spin only magnetic moment for the complex $K_4\left[Mn(NCS)_6\right]$. 1

4. (a) What is the basic difference between thermodynamic stability and kinetic stability of the complexes? Give one example for each. 3

   (b) What is trans effect? Explain the theories for it. 3

UNIT–III

5. (a) What are the characteristics of Hard acids and Soft acids? Explain HSAB principle. 3

   (b) Discuss the feasibility of the following reactions : 3

$$LiF + CsI \rightarrow$$
$$HgF_2 + BeI_2 \rightarrow$$
$$CaO + H_2S \rightarrow$$

6. (a) Draw combined Orgel energy level diagram for d^1 and d^9 tetrahedral complexes. 2

   (b) Why does the complex ion $\left[Ti(H_2O_6)\right]^{3+}$ appear violet? 2

   (c) Explain Laporte forbidden transitions. 2

UNIT–IV

7. (a) What are the structural consequences of back bonding into olefin π^* orbitals? 3

   (b) What is Heptacity? Give two examples. 2

   (c) Give an example of Homogenous hydrogenation catalyst. 1

8. (a) How will you increase the stability of Metal-alkyl compounds? 3

   (b) Draw structure of Zeise's salt. 2

   (c) Give an example of π-acid ligand. 1

UNIT–V

9. (a) Discuss the role of following elements in Biological systems : 3

   (i) Fe.

UNIT–V

9. (a) Briefly explain refraction method for determining dipole moment of a substance? 4

   (b) What do you understand by the terms 'Diamagnetism' and 'Paramagnetism'? 2

   (c) Define the term colligative properties. 1

10. (a) Define Osmotic pressure. How is it determined by Berkeley and Hartley' method ? 4

    (b) 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. 3

Roll No. ..... Total Pages : 4

BAQ/M-25 **35111**

PHYSICAL CHEMISTRY (THEORY)

Paper–II

Time Allowed : 3 Hours] [Maximum Marks : 35

Note : Attempt **five** questions in all, selecting **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Briefly describe the spectral distribution of black body radiations. How do Stefan Boltzmann' Law and Wien's displacement law follow from it? 4

   (b) What are the postulates of Quantum mechanics? 3

2. (a) What is Compton effect? Write expression for Compton shift. 2

   (b) Write Schrodinger wave equation. Convert it to the form in terms of Hamiltonian operator. 2

   (c) What is the ground state energy for an electron which is confined to a potential well having a width of 0.2 nm ? 3

UNIT–II

3. (a) What is Statistical Mechanics? Why there was a need for the branch of Statistical Mechanics? 2

   (b) Write the expressions for translational, rotational and vibrational partition functions. What do the different symbols signify? 3

   (c) Write the important features of Maxwell-Boltzmann Statistics. 2

4. (a) What are the factors that affect the width of a spectral line? 3

   (b) Discuss Born-Oppenheimer Approximation. 2

   (c) What do you understand by Resolving power of a spectrometer? Write formula for Resolving power of a prism. 2

UNIT–III

5. (a) The far- infra red spectrum of HI consists of series of equally spaced lines separated by 12.8 cm^{-1}. Calculate moment of inertia of HI molecule. 3

   (b) What is Raman effect? Name the different types of lines obtained in Raman spectrum and explain the reasons for observing these lines. 4

6. (a) Giving reasons, arrange the following groups in order of their absorption frequencies:

   (i) CF, CCl, CBr, CH

   (ii) C – C, C = C, C ≡ C. 3

   (b) Explain the relative intensities of the Spectral lines obtained in a pure rotational spectrum. 4

UNIT–IV

7. (a) Differentiate between the following:

   (i) Fluorescence and Phosphorescence

   (ii) Internal Conversion and Intersystem Crossing. 4

   (b) The Photodecomposition of HI vapours was carried out with radiation of wavelength 2070 Å. Absorption of each calorie gave 1.44 x 10^{-5} g of H_2. Calculate the quantum yield. 3

8. (a) What are selection rules for Electronic transitions in molecules? 2

   (b) Discuss the Potential energy curve for bonding and anti-bonding Molecular orbitals. 3

   (c) State and explain First law of photochemistry. 2

10. (a) Give the structure of Indigo. In the structure of Indigo, encircle the chromophore portion responsible for its deep blue colour. 2

(b) Discuss the different classification of dyes. 3

(c) Draw the structure of phenolphthalein responsible for colour in basic medium. 1

Roll No. ..... Total Pages : 4

BAQ/M-25 **35112**

ORGANIC CHEMISTRY (THEORY)

Paper–III

Time allowed : 3 Hours] [Maximum Marks : 35

Note : Attempt **five** questions in all, selecting at least **one** question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Explain the following terms used in NMR spectroscopy:

(i) Resonance

(ii) Coupling constant

(iii) Chemical shift. 3

(b) What are the factors affecting chemical shift? 2

(c) Explain chemical equivalent and chemical non equivalent protons by suitable examples? 2

2. (a) How PMR spectroscopy can be used to distinguish between the following pair of compounds:

(i) n–Propyl bromide and Isopropyl bromide

(ii) But–2–ene and But–2–yne

(iii) Acetone and methyl acetate. 3

(b) What do you understand by:

(i) anisotropic effect

(ii) shielding and deshielding of protons? 4

UNIT–II

3. (a) Draw the structures of maltose and sucrose. 2

(b) Glucose, mannose and fructose on reaction with excess of phenyl hydrazine result in the formation of same osazone. Explain. 4

(c) What are polysaccharides? Give examples. 1

4. (a) How Grignard reagent is useful in synthesising primary, secondary and tertiary alcohol from carbonyl compounds? Explain. 3

(b) Explain mutarotation and Ruff degradation of glucose. 4

UNIT–III

5. (a) How desulphonation of arene sulphonic acid is achieved? Give mechanism of the reaction involved. 3

(b) Write a short note on synthetic detergent? 2

(c) Compare the basicity of pyrrole and pyridine by giving suitable explanation. 2

6. (a) Briefly discuss Chichibabin reaction. 2

(b) Discuss the electrophilic substitution reactions of pyrrole. 3

(c) How Ethyl aceto acetate can be used to prepare pyrrole? 2

UNIT–IV

7. (a) What are enolates? Give two examples along with their structures. 2

(b) What is Claisen Condensation? Give mechanism. 2

(c) How ethylacetoacetate can be used to prepare: 3

(i) 2–Hexanone

(ii) y–diketone.

8. (a) Discuss the structure and nomenclature of peptides? 3

(b) Explain the synthesis of peptide using protection of amino group. 3

(c) What are ribonucleosides? 1

UNIT–V

9. (a) Give one example with synthesis and uses of the polymers belonging to the category of polyester and polyamide. 4

(b) Write a short on Ziegler–Natta polymerisation and free radical vinyl polymerisation. 3

9. (a) What are the advantages and limitations of using integrated circuit regulators like the LM317 and LM337 in voltage regulation circuits ? 5

(b) What is a Band-Reject Filter and how does it differ from a Band-Pass Filter in terms of frequency response and applications ? 5

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Roll No. ..... Total Pages : 04

NBST/M-25 26508

TRANSISTOR AND LINEAR INTEGRATED CIRCUITS

Time : Three Hours] [Maximum Marks : 50

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

1. (a) How does a Class B amplifier differ from a Class A amplifier in terms of efficiency and performance ? 2.5

(b) Write the characteristics of an ideal operational amplifier. 2.5

(c) What is a Zero-Crossing Detector ? 2.5

(d) In active filters, what are the key parameters that affect the filter's performance ? 2.5

Unit I

2. (a) Describe the operation of a Transformer-Coupled Class A amplifier. What are the advantages of using a transformer in this configuration ? 5

(b) In a Class B amplifier circuit, what is the role of the biasing and how does it ensure proper operation of the amplifier ? 5

3. (a) What is the difference between a Class C amplifier and a Class D amplifier in terms of efficiency, linearity and typical applications ? 5

(b) What are the main causes of distortion in power amplifiers and how does each class of amplifier handle distortion differently ? 5

Unit II

4. (a) What is the function of a differential amplifier and how does it differ from other types of amplifiers ? 4

(b) Briefly define the following Op-Amp parameters :

(i) Output Impedance

(ii) Input Bias Current

(iii) Slew Rate. 6

5. (a) Explain the difference between Open Loop Op-Amp configurations and Closed Loop Op-Amp configurations and provide examples of each. 5

(b) Explain the working of a Dual Input Balanced Output Differential Amplifier. How does it maintain balance and what advantages does it provide in signal processing ? 5

Unit III

6. Explain the operation of a Schmitt Trigger. How does it differ from a basic comparator and what advantages does it offer in noisy signal environments ? 10

7. (a) What is a Voltage Series Feedback Amplifier and how does the feedback configuration affect its performance ? 5

(b) With the help of circuit diagram explain the working of op-amp as summing amplifier. 5

Unit IV

8. (a) What is a Butterworth First-order Low Pass Filter (LPF) ? How does it behave in terms of frequency response and attenuation ? 5

(b) How does a second-order Low Pass Filter (LPF) differ from a first-order LPF in terms of frequency response and filter characteristics ? 5

Roll No. ..... Total Pages : 02

NBST/M-25 26509

FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

Time : Three Hours] [Maximum Marks : 50

Note : Attempt *Five* questions in all, selecting *one* question from each Unit including compulsory question. All questions carry equal marks.

(Compulsory Question)

1. Short-answer type questions : 5×2=10

   (a) Define a database system and state its purpose.

   (b) What is a weak entity set ?

   (c) Explain the difference between Domain and Tuple relational calculus.

   (d) Explain aggregate functions.

   (e) What is data abstraction ?

Unit I

2. Explain the basic building blocks of data models. Why are business rules important in data modeling ? 10

3. Describe the architecture of a database system and explain the concept of transaction management. 10

Unit II

4. Draw an ER diagram for a university database with entities: Student. Course, Instructor and Department. Show relationships, constraints and convert it to relational schema. **10**

5. What are the features of a good relational database design ? Explain atomic domains and Normalization with examples up to BCNF. **10**

Unit III

6. Define relational algebra. Explain selection, projection and joins with appropriate examples. **10**

7. Discuss Tuple Relational Calculus and Domain Relational Calculus. How are they different in terms of syntax and capabilities ? **10**

Unit IV

8. What are constraints in a database ? Explain various types of integrity constraints with suitable examples. **10**

9. What are views in SQL ? Discuss how views provide data independence and security. Also explain updating a view with example. **10**

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Roll No. ..... Total Pages : 03

NBST/M-25 **26510**

ELECTRONIC COMMUNICATION

Time : Three Hours] [Maximum Marks : 50

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 role does the transmitter play in a communication system ? 2

   (b) Define DSB- SC and SSB- TC 2

   (c) Give the comparison between AM and FM. 2

   (d) What is the modulation index of an FM signal having a carrier swing of 100 kHz when the modulating signal has a frequency of 8 kHz ? 2

   (e) Define Sampling theorem. 2

Unit I

2. What is the propagation of electromagnetic waves ? Discuss its different modes. 10

3. (a) Explain the following : 8

   (i) Bandwidth of signal

   (ii) Bandwidth of transmission medium

(b) What are the main components of communication system ? 2

Unit II

4. (a) What are the limitations of amplitude modulation ? 4

(b) What is the need of modulation ? 4

(c) The antenna current of an AM transmitter is 8 A when only carrier is sent but increases to 8.96 A when the carrier is modulated. Find the percentage of modulation. 2

5. (a) Derive the expression for Amplitude Modulated wave. Draw its waveform. 4

(b) What do you mean by modulation index ? Derive an expression for the same. 3

(c) A broadcast transmitter radiates 4.72 kW when the modulation percentage is 60. Calculate the total power when the modulation index has been reduced to 40 percent. 3

Unit III

6. (a) Draw and discuss the circuit of Demodulator for Amplitude Modulation. 5

(b) An FM wave is represented by the voltage equation : 5

$e(t) = 12 \sin(6\times10^{8}t + 5\sin1250t)$

Find the following :

(i) Carrier frequency

(ii) Modulating frequency

(iii) Modulation index

(iv) Maximum Deviation

(v) Power dissipation in a 10 ohm resistor.

7. Define frequency modulation and derive the mathematical expression for FM wave. Also draw its waveforms. 10

Unit IV

8. Discuss the modulation and demodulation of PAM. 10

9. Explain the following processes :

(a) Quantization 5

(b) Companding 5

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NBST/M-25 **26511**

OBJECT ORIENTED PROGRAMMING WITH C++

Time : Three Hours] [Maximum Marks : 50

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

1. Write short notes on the following :

(a) Implicit Conversions

(b) Inline Functions

(c) Dynamic Constructors

(d) This pointer.

Unit I

2. What do you mean by Object Oriented Programming Paradigm ? How C++ use this paradigm ? Explain using suitable examples.

3. What are different operators in C++ language ? Explain the arithmetic, relational and logical operators with suitable examples.

Unit II

4. Explain the following with suitable examples :

   (a) Function parameters

   (b) Call by reference.

5. What do you mean by member functions in a class ? Write a Program to add and subtract two matrices using class.

Unit III

6. (a) What are the objectives of constructors in C++ ?

   (b) Write a Program to calculate the area of a wall using constructors.

7. Write a program in C++ to highlight the difference between overloaded assignment operator and copy constructor.

Unit IV

8. What do you mean by a pointer ? How do they work with inheritance in programs ? Explain.

9. What are File streams ? How do we use them to perform operations on files ? Explain with help of suitable programs in C++.

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