B Tech Ist year/ Lib.
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BT–1/D-25 **41037**

CHEMISTRY

Paper–BS–101A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) What are Co-ordination Compounds ? Write one example each of the tetrahedral, octahedral and square planer complexes. Explain the splitting pattern of d-orbitals and magnetic behaviour for $\left[Co(NH_3)_6\right]^{3+}$ on the basis of Crystal Field theory. 9

   (b) Explain the Linear Combination of Atomic Orbitals. Differentiate between Bonding molecular orbitals and anti-bonding molecular orbitals. 6

2. (a) Write different structures of Butadiene. Which butadiene is more stable ? Explain pi-molecular orbitals of more stable butadiene structure. 7

(b) Explain Aromatic and Anti-aromatic compounds with examples. 5

(c) Describe Band theory of solids. 3

UNIT–II

3. (a) State Hook's Law. Explain Shielding and de-shielding of protons with example wherever possible. 5

(b) Explain the Fluorescence of light and write its applications. 5

(c) Explain the principle of NMR spectroscopy. 5

4. Write notes on the following :

(a) Diffraction and Scattering. 7

(b) Principle of UV-visible spectroscopy and important electronic transitions occurring in this spectroscopy. 8

UNIT–III

5. (a) Define the term Entropy. State First and Second law of Thermodynamics. 6

(b) Write key features of VSEPR theory. Write examples corresponding to Linear, Trigonal Planar, Tetrahedral and Octahedral shapes. Explain shapes of NH_3 and PCl_5 on the basis of VSEPR theory. 9

6. Describe the following periodic properties in detail :

(a) Ionization Energy. 7

(b) Electronegativity. 8

UNIT–IV

7. (a) Describe the different mechanisms of Nucleophilic substitution reaction with the help of suitable examples. 8

(b) Explain the properties, method and mechanism of preparation of Paracetamol. 7

8. (a) What is Optical activity ? Name different symmetry elements. Explain different types of Optical Isomer with examples. 10

(b) Explain Oxidation and Reduction reactions for Organic compounds with examples. 5

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BT–1/D-25 **41038**

PROGRAMMING FOR PROBLEM SOLVING

Paper–ES–105A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Solve the following : 9

   (i) $(59AF.DA)_{16} = (?)_8$

   (ii) $(5735.46)_8 = (?)_{10}$.

   (iii) $(FD)_{16} - (9CD)_{16}$ using 16's complement and write the proper steps.

   (b) What do you understand by Flowchart? Draw flowchart to find factorial of an integer number. 6

2. (a) Solve the following : 9

   (i) $(9748.59)_{10} = (?)_{16}$.

(ii) $(AFCD.79)_{16} + (9AFA.F9)_{16}$.

(iii) $(346)_8 - (747)_8$.

(b) Write a note on Secondary memories with neat and clean diagrams. 6

UNIT–II

3. (a) Write a program in C to add digits of an integer number. 9

(b) Explain conditional operator with suitable examples. 6

4. (a) Write a program to check whether an integer number is a perfect or not. 7

(b) Write a C program to calculate the following series without pow () function : 8

$$1 - x + \frac{x^3}{3!} - \frac{x^5}{5!} + \frac{x^7}{7!} - \ldots\ldots\ldots \frac{x^n}{n!}.$$

UNIT–III

5. (a) Write a program in C to multiply two matrix. 8

(b) Write a program in C to check whether a string is palindrome or not. 7

6. (a) Write a program in C to find factorial of a number using function. 8

(b) How an array can be returned from function. Explain with suitable example. 7

UNIT–IV

7. (a) Write a C program to store the record of Library. 6

(b) Write a program in C by reading an array from file and then find maximum number from it. 9

8. (a) Write a program to sort the array using call by reference. 9

(b) Write a program in C to copy data from one file to another file. 6

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BT-1/D-25 **41040**

MULTI-VARIABLE CALCULUS & LINEAR ALGEBRA

Paper–BS–135A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Express the Integral $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ in terms of Gamma function.

   (b) Find the volume of the Reel-shaped solid formed by the revolution about the y-axis, of the part of the parabola $y^2 = 4ax$ cut off by the Latus-rectum.

2. (a) Evaluate $\lim_{x\to 0} \frac{1+\sin x - \cos x + \log(1-x)}{x\tan^2 x}$.

   (b) Evaluate $\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x}\, dx$.

UNIT–II

3. (a) Discuss the convergence of the sequence

$$a_n = \left(1+\frac{1}{n}\right)^n.$$

(b) Discuss the convergence of the series

$$\sum_{n=1}^{\infty} \frac{1}{3^n + x}, \; x > 0.$$

4. (a) Find the Fourier series of the Periodic function

$$f(x) = \begin{cases} \sin x, & \text{if } 0 \le x \le \pi \\ 0, & \text{if } \pi \le x \le 2\pi \end{cases}$$

and $f(x+2\pi) = f(x)$.

(b) Obtain the half-range sine series of the function $f(x) = x\cos x$ in the interval $0 < x < \pi$.

UNIT–III

5. (a) Expand $\tan^{-1}\frac{y}{x}$ about (1, 1) upto the second degree terms by Taylor's series.

(b) Find the maximum and minimum values of $\sin x \sin y \sin(x+y)$, $x > 0$, $y < \pi$.

6. (a) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$,

then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$.

(b) Find the shortest and longest distance from the point (1, 2, –1) to the sphere $x^2 + y^2 + z^2 = 24$, by using Lagrange's method of undertermined multipliers.

UNIT–IV

7. (a) If $A = \begin{bmatrix} 1 & -1 & -1 \\ 1 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$, determine two non-singular matrices P and Q such that PAQ is in normal form.

(b) Determine the values of a and b such that the system $x + y + z = 3$, $x + 2y + 2z = 6$, $x + ay + 3z = b$ have (i) no solution (ii) a unique solution, (iii) infinite number of solutions.

8. (a) Find the Eigen values and Eigen vectors of the matrix

$$A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}.$$

(b) Find the characteristic equation of the matrix

$$\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$$

and hence find its inverse by using Cayley-Hamilton theorem.

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BT–1/D-25 **41041**

ENGINEERING GRAPHICS & DESIGN

Paper–ES–109A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. Draw an involute of a Circle of 50 mm diameter. Also, draw a tangent and normal at any point on the curve. 15

2. Construct a plain scale to show meters when 1 cm represents 4 meters and long enough to measure up to 50 metres. Find the R.F. and mark on it a distance of 36 meters. 15

UNIT–II

3. Draw the projections of a line AB when its end A is 20 mm above H.P. and 10 mm in front of the V.P., its end B is 55 mm above the H.P. and 60 mm in front of the V.P. and distance between end projectors of line AB is 45 mm. Determine its true length and inclination of line with the H.P. and V.P. 15

4. A Cylinder of diameter 30 mm and axis length 50 mm is resting on the HP on a point so that its axis is inclined at 45° to the HP and parallel to the VP. Draw its top and front views. 15

UNIT–III

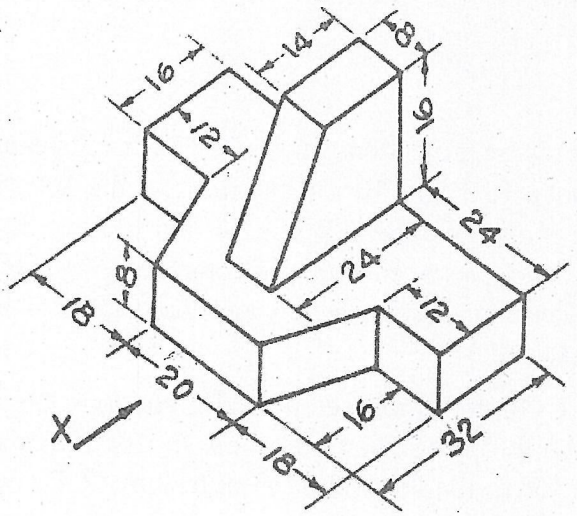
5. A cube of side 40 mm is placed and cut by a plane in such a way that the true shape of the section is a regular hexagon. Draw the front and top views of the cube and determine the inclination of the plane with the HP. 15

6. Draw the development of the lateral surface of the lower portion of a Cylinder of diameter 50 mm and axis 70 mm when sectioned by a plane inclined at 40° to HP and perpendicular to VP and bisecting axis. 15

UNIT–IV

7. Draw the isometric projection of a Hexagonal prism of base side 30 mm and axis 70mm. The prism rests on its base on the HP with an edge of the base parallel to the VP. 15

8. Draw three views of the blocks pictorially in the figure as shown below according to first angle projection : 15



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BT–1/D-25 **41042**

ENGINEERING GRAPHICS & DESIGN

Paper–ES–109A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. On a map, the distance between two points is 14 cm. The real distance between them is 20 km. Draw a diagonal scale of this map to read kilometres and hectametres and to measure up to 25 km. Show a distance of 17.6 km on this scale. 15

2. Two straight line OA and OB make an angle of 75° between them. P is a point 40 mm from OA and 50 mm from OB. Draw a hyperbola through P, with OA and OB as asymptotes, marking at least ten points. 15

UNIT–II

3. Draw the projection of following points on the same reference line by taking the gap of 20 mm in adjacent projectors : 15

   (a) point A, 35 mm in front V.P. and 40 mm above HP.

(b) point B, 28 mm behind V.P. and 38 mm above HP.

(c) point C, 25 mm behind V.P. and 35 mm below HP.

(d) point D, 50 mm in front of V.P. and 55 mm below H.P.

4. The top view of a 75 mm long line CD measures 50 mm in front of the V.P. and 15 mm below the H.P. D is 15 mm in front of the V.P. and is above the H.P. Draw the front view of CO and find its inclinations with the H.P. and the V.P. Show also its traces. 15

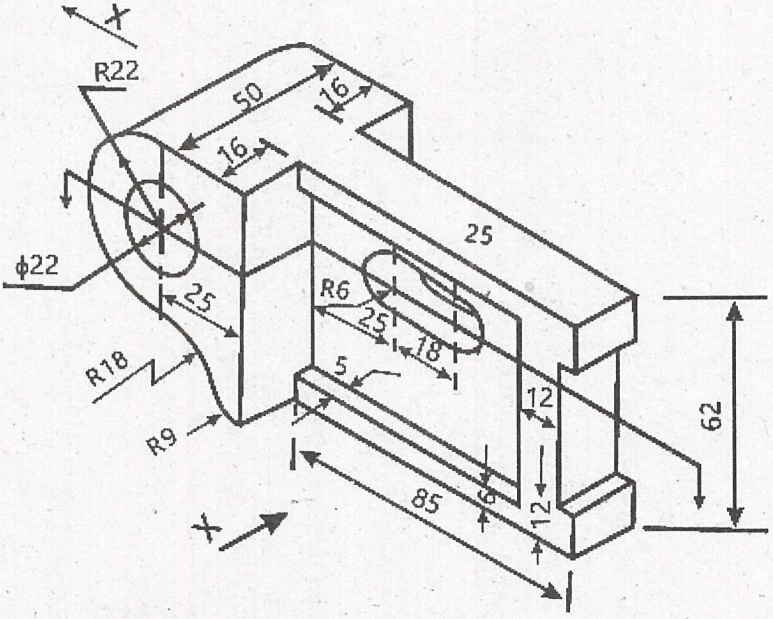
UNIT–III

5. A pentagonal pyramid, side of base 30 mm and axis 65 mm long, has its base lying on horizontal plane and an edge of the base parallel to the VP. A horizontal section plane cuts it at a distance of 25 mm above the base. Draw its front view and sectional top view. 15

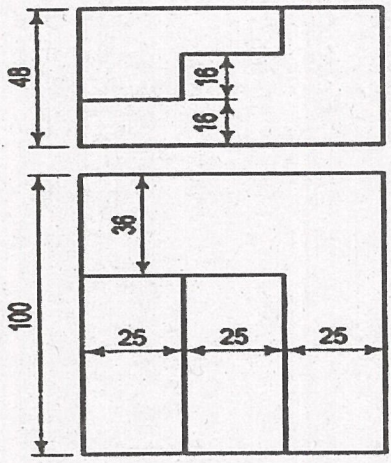
6. A hexagonal prism of base side 30 mm and axis length 65 mm is resting on HP on its base with two of its vertical faces perpendicular to VP. It is cut by a plane inclined at 50° to HP and perpendicular to VP and meets the axis of prism at a distance 10 mm from the top end. Draw the development of lateral surface of the Prism. 15

UNIT–IV

7. Draw the front view, top view and right side view of the following object : 15



8. Draw the isometric view of the given orthographic projection of the object. 15



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BT–1/D-25 **41043**

BIOLOGY

Paper–BS–141A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Classify organism on the basis of Cellularity and Habitat. 5

   (b) Draw a well labelled structure of Chloroplast. 5

   (c) Differentiate between Plant cell and Animal cell. 5

2. Why classification of Living organism s is important? Classify living organism based upon mode of Energy and Carbon utilization. Also write down a short note on Molecular taxonomy. 15

UNIT–II

3. Draw the structures of two purine and two pyrimidine nucleotides. Also classify proteins based on their Biological roles. 15

4. (a) Briefly discuss about different Enzyme mechanisms. 7

(b) Discuss in brief about different parameters that affect Enzyme activity. 8

UNIT–III

5. Differentiate between stages of Mitosis and Meiosis. Also enlist significance of both theses process in Cell physiology. 15

6. (a) Discuss in detail role of Health and Disease management. 10

(b) Write down a short note on evidence of Nucleic acid as Genetic materials. 5

UNIT–IV

7. (a) Why down a short note on Light and Dark reactions? 5

(b) Write down the last five reactions of Glycolysis along with names of Enzymes which catalyse these reactions. 10

8. (a) Discuss in detail roles of Biology in Agriculture, medicine and Forensic science. 10

(b) Write down a short note on Bio-MEMS.. 5

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BT–1/D-25 **41044**

BASIC ELECTRICAL ENGINEERING

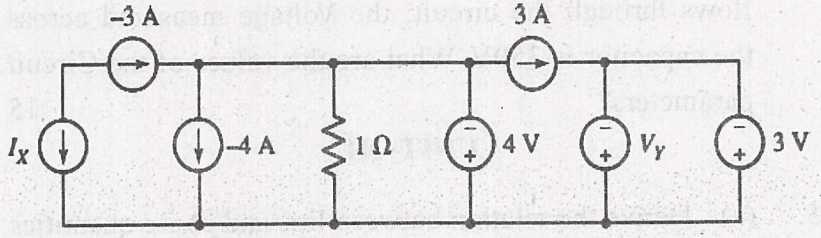
Paper–ES–101A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

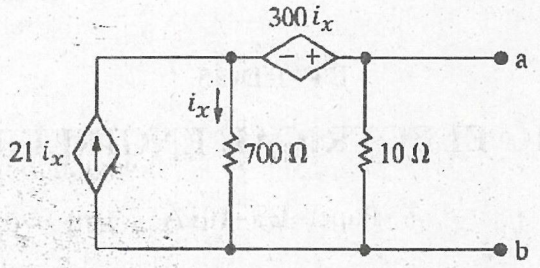
UNIT–I

1. (a) State KCL and KVL. Determine the values of I_X and V_Y in the circuit shown in figure. 10



(b) Explain about different types of sources. 5

2. (a) Find the Norton equivalent circuit of the following given circuit shown in fig. with respect to the terminals 'a-b'. 8



(b) Explain Delta to Star transformation is case of Resistors (R) with diagram. 7

UNIT–II

3. Derive the expression for average and r.m.s. value of a Periodic sine wave for full cycle. 15

4. In an R-L-C series circuit a maximum current of 0.5A is obtained by varying the value of inductance L. The supply voltage is fixed at 230V, 50Hz. When maximum current flows through the circuit; the Voltage measured across the capacitor is 350V. What are the values of the Circuit parameters? 15

UNIT–III

5. (a) Derive the relation between line and phase quantities of Voltage and Current for a Delta system. 8

(b) Determine the line currents when a Star connected balanced load with an impedance of (15 + j10) ohms in connected to 200V, three phase balanced supply in positive sequence. 7

6. (a) Draw and explain the phasor diagram of single phase transformer on lagging load. 10

(b) Derive the condition for maximum efficiency in a single phase transformer. 5

UNIT–IV

7. Explain the construction and working principal of a 3-phase Induction motor with torque-slip characteristic. 15

8. Explain in detail the construction of a DC motor and working of Commutator using neat sketches. 15

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BT–1/D-25 **41045**

SEMICONDUCTOR PHYSICS

Paper–BS-115A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Describe the three dimensional Crystal systems and their Bravais lattices. 7

   (b) Explain the Crystal structures of Sodium Chloride, Cesium Chloride and Diamond. 8

2. (a) How various Physical characteristics of Solids are depending upon the nature of bonding ? 7

   (b) What are Point defects in Solids ? Derive the relation to show that the Frankel defects in Ionic crystal depend on the temperature. 8

UNIT–II

3. (a) Discuss the wave particle duality with reference to the de Broglie hypothesis and experimental verification. 7

(b) Explain the Group Velocity and Phase Velocity. Derive the expression for group Velocity with which a wave group travels. 8

4. (a) What is Heisenberg's uncertainty principle ? Why there is a finite width of spectral line ? 7

(b) Derive the expression for Time-independent Schrodinger wave equation and discuss Physical significance of Wave function. 8

UNIT–III

5. (a) What is Free electron theory of Metals ? Derive an expression for conductivity of Metals on the basis of Drude-Lorentz theory. 7

(b) Derive an expression for density of States in three dimensions. 8

6. (a) Explain the E-K diagrams and also draw the Brillouin zones in two dimensions. 7

(b) Distinguish between conductors, semiconductors and insulators on the basis of Band theory. 8

UNIT–IV

7. (a) Explain the conduction mechanism in intrinsic semiconductors with suitable energy band diagram. 7

(b) Derive an expression for carrier concentration of an Intrinsic semiconductor. 8

8. (a) Explain the construction and working of a p-n Junction. Discuss the forward and reverse biasing along with its V-I characteristics. 7

(b) Discuss the construction, working and applications of a Bipolar Junction Transistor (BJT). 8

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BT–1/D-25 **41046**

CALCULUS & LINEAR ALGEBRA

Paper–BS–133A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Evaluate $\int_{-\infty}^{\infty} x\, e^{-x^2}\, dx$ if it exists.

   (b) Express $\int_0^1 x^7 (1-x^4)^9\, dx$ in terms of Gamma function and evaluate.

2. (a) Find the surface area of the right circular cone of height h and base radius r.

   (b) Evaluate $\lim_{x\to\infty} \frac{x^n}{e^x}$.

UNIT–II

3. (a) Find the values of x, y, z and a which satisfy the matrix equation :

$$\begin{bmatrix} x+3 & 2y+x \\ z-1 & 4z-6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2a \end{bmatrix}.$$

(b) Determine the rank of the matrix $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 1 & -1 & -1 \end{bmatrix}$.

4. (a) Using the Gauss-Jordan method, find the inverse of the matrix $A = \begin{bmatrix} 2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & 2 & 2 \end{bmatrix}$.

(b) Solve the system of equations $2x+y+2z=10$, $2x+2y+z=9$, $x+2y+2z=11$ using Cramers's rule.

UNIT–III

5. (a) Determine whether the set of vectors $(1,-2,1)$, $(2,1,-1)$ and $(7,-4,1)$ are linearly dependent or linearly independent over $\mathbb{R}$.

(b) Show that the map $T:\mathbb{R}^2 \to \mathbb{R}^3$ defined by $T(x,y)=(x-y,2y-x,-x)$ is a linear transformation.

6. If $T:\mathbb{R}^4 \to \mathbb{R}^3$ is a linear transformation defined by :

$T(e_1)=(1,1,1), T(e_2)=(1,-1,1), T(e_3)=(1,0,0), T(e_4)=(1,0,1)$

then verify that $\rho(T)+\mu(T)=\dim \mathbb{R}^4 = 4$.

UNIT–IV

7. Find the Eigenvalues and Eigenvectors of the matrix

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

8. (a) Express the matrix A as the sum of a Symmetric and a skew-symmetric matrix where $A = \begin{bmatrix} 2 & 2 & -3 \\ 1 & 3 & -2 \\ 3 & 0 & -7 \end{bmatrix}$.

(b) Find a 2×2 matrix B such that :

$$B\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}.$$