1st year Re/ Lib.

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BT–2/J-25 **42031**

ELECTRICAL TECH. FUNDAMENTALS

Paper–EE–101N

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. Find Thevenin's equivalent of circuit shown as Fig.–1 (below), w.r.t. the load resistor of 10Ω. 15

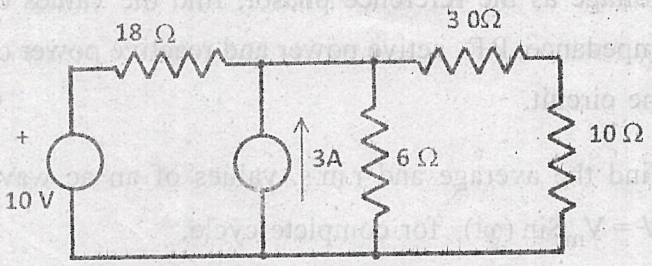

Fig-1

2. Find Norton's equivalent of circuit shown as Fig–2 (below), w.r.t. the load resistor of 40Ω. 15

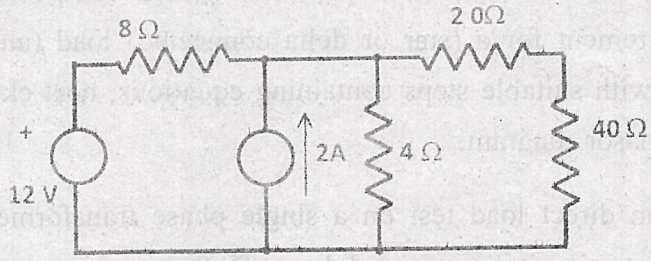

Fig-2

UNIT–II

3. Explain in detail the theory of Sinusoidal AC response of series RC ckt. Including showing its voltage, impedance and power triangles and neatly drawing instantaneous voltage, current and power waveforms on simultaneous (common) time axis. 15

4. (a) The Voltage applied to an AC circuit is $200\sqrt{2}\sin(100\pi t)$ volts and the Circuit draws a current of $20\sqrt{2}\sin\left(100\pi t-\frac{\pi}{3}\right)$ ampere. Taking voltage as the reference phasor, find the values of impedance, P.F., active power and reactive power of the circuit. 8

   (b) Find the average and r.m.s. values of an ac wave $V = V_m \text{Sin}(\omega t)$, for complete cycle. 7

UNIT–III

5. Explain in detail the two wattmeter method of power measurement for a (star or delta connected) load (any type) with suitable steps containing equations, neat ckt. and phasor diagram. 15

6. Explain direct load test on a single phase transformer with neat circuit diagram and draw efficiency curve w.r.t.

the load current. Also draw a labeled equivalent circuit of a single phase transformer. 15

UNIT–IV

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

8. Briefly compare and contrast amongst the following :

   (a) Squirrel cage type and Slip ring type Induction Motors w.r.t their construction. 5

   (b) Synchronous Generator and DC Generator w.r.t their working. 5

   (c) Fleming's RH and Fleming's LH Rules w.r.t their definitions and applications. 5

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BT-2/J-25 **42033**

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) What do you mean by Bravais lattices? Describe briefly the Seven Systems of Crystals. Mention and explain with examples the types of Lattices in Cubic systems. 7

   (b) Draw the neat diagrams of NaCl, CsCl, Diamond and Zinc Blend. 8

2. (a) Write a short note on Bonding in Solids. 7

   (b) Name the various kinds of defects in Crystals and find out the concentration of Schottky defects in a crystal. 8

UNIT–II

3. (a) What are de-broglie waves? Show that the de-Broglie wavelength of a particle of momentum p is h/p. 7

   (b) Prove that the group velocity is less than the phase velocity in a dispersive medium. 8

4. (a) Using Uncertainty principle, find the radius of Bohr's orbit. 7

(b) Derive the time independent Schrodinger wave equation and discuss its Physical significance. 8

UNIT–III

5. (a) Discuss the classical theory of free electrons. 7

(b) Obtain an expression for Fermi energy at T=0 K in a good conductor and hence find the average energy of an electron. 8

6. (a) Discuss the effective mass of an electron and explain its Physical significance. 7

(b) Distinguish between Metals, Semiconductors and Insulators on the basis of Band theory. 8

UNIT–IV

7. (a) Discuss the Conduction Mechanism and Band model for Intrinsic Semiconductors. 7

(b) Derive an expression for charge carrier concentration in n-type semiconductors and also discuss the position of Fermi level in the same. 8

8. (a) Describe the I-V characteristics of a p-n junction diode. 7

(b) Explain the principle, construction and working of a semiconductor laser. 8

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BT-2/J-25 **42034**

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) Write basic postulates of Crystal Field Theory. Explain the splitting of d-orbitals for Tetrahedral complexes and Square planer complexes, citing an example for each geometry, on the basis of Crystal field theory. 9

   (b) Differentiate between Aromatic, Anti-aromatic and Non-aromatic compound with suitable examples. 6

2. (a) Explain the Linear Combination of Atomic Orbitals for the formation of molecular orbitals. Differentiate between Bonding and anti-bonding molecular orbitals. Also explain the pi- molecular orbitals for Buta-1,3-diene. 10

   (b) Describe Band theory for Solids. Explain classification of solids on the basis of Band theory Also write examples for each Category. 5

UNIT–II

3. (a) Define terms Chromophore and Auxochrome with example. 3

(b) Explain the following phenomenons and give their significance also-

(i) Magnetic Resonance Imaging.

(ii) Diffraction of light.

(iii) Fluorescence. 12

4. Write notes on the following :

(a) Explain the principle of NMR Spectroscopy. What information can be obtained about a molecule from NMR Spectrum and how? 7

(b) Explain the principle of IR Spectroscopy and also the possible Vibrational modes possible in a molecule. 8

UNIT–III

5. (a) Write basic postulates of VSEPR theory and explain the bond angle in ammonia and water. 7

(b) Define Polarization, Polarizing Power and Polarizability. Explain Fajan's rule for describing covalent character in Molecules. 8

6. (a) Derive Nernst equation and give its significance. 4

(b) Define Entropy. Write its significance. Also derive equation for calculating Entropy change for an ideal gas. 6

(c) While filling electrons in Atomic orbitals, 4s is filled first and then 3d. Also while removing, Electron from 4s atomic orbital is lost first. Explain why? 5

UNIT–IV

7. (a) Describe the mechanism of NUCLEOPHILIC substitution reaction with the help of suitable examples. 8

(b) Explain the Oxidation and Reduction processes in Organic Compounds. 7

8. (a) Define the term Isomerism. Explain different types of Optical Isomers with examples. 8

(b) Explain the process of assigning E/Z configuration in geometrical isomers with suitable examples. 3

(c) Explain various conformations of n-butane and their stability order. 4

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

BT-2/J-25 **42035**

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) What is Algorithm? Write an algorithm to print factorial of a number. 7

   (b) What is Primary Memory? Explain its different types. 8

2. (a) Convert the following: 10

   (i) $(65327.472)_8 = (?)_{10}$

   (ii) $(8FDA.2C)_{16} = (?)_8$

   (b) Discuss the role of Compiler, Interpreter, Linker, Loader, and Assembler in C. 5

UNIT–II

3. (a) Explain formatted and unformatted input/output functions in C. 7

(b) What are Storage Classes? How many types of storage classes are used in C? Explain them. 8

4. (a) Write a C Program to find roots of Quadratic equation. 8

(b) Write a C program to check whether character is vowel or not using switch statement. 7

UNIT–III

5. (a) Define Recursion. Write a C program to Print Fibonacci series using Recursion. 7

(b) Differentiate between Formal and Actual Parameters with example. 8

6. (a) Write a C Program that uses a function to reverse a string. 8

(b) What is Parameter Passing techniques? Explain with example. 7

UNIT–IV

7. (a) Explain file handling modes in C and their uses. 7

(b) Describe Pointers. Write a C program using pointers to read an array of integers. 8

8. (a) Differentiate between union and structure. Write a C Program to implement unions. 8

(b) Write a program that counts the number of characters and number of lines in a text file. 7

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BT-2/J-25 **42037**

PROBABILITY & STATISTICS

Paper–BS-134A

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) There are three bags: first containing 2 yellow, 2 red, 3 green balls; second 3 yellow, 3 red, 1 green balls and the third 4 yellow, 1 red, 2 green balls. Two balls are drawn from a bag chosen at random. These are found to be one yellow and one red. Find the probability that the balls so drawn came from the second bag. 8

   (b) Two cards are drawn in succession from a pack of 52 cards. Find the chance that the first is ace and the second is queen if first card is (i) replaced (ii) not replaced. 7

2. (a) A random variable Z has the following probability function:

Z	0	1	2	3	4	5	6	7	8
P(Z)	b	b	2b	4b	6b	b	2b	7b	8b

(i) Find the value of the b.

(ii) Evaluate P (Z < 7), P (Z ≥ 7). 8

(b) Find the mean, variance, and standard deviation of the number of heads in three tossed of a coin. 7

UNIT–II

3. (a) If $f(x) = \begin{cases} \frac{1}{2}(x+1) & , \quad -1 < x < 1 \\ 0 & , \quad \text{otherwise} \end{cases}$

Represents the density of a random variable X.

Find E(X) and Var(X). 8

(b) Find the moment generating function of the exponential distribution

$F(x) = \frac{1}{c} e^{-x/c}$ $0 \le x \le \infty, c > 0$. Hence find its mean and standard deviation. 7

4. (a) A pair of dice is thrown 7 times. If getting a total of 7 is considered a success, find the probability of getting (i) no success (ii) 6 successes. 8

(b) Fit a Poisson distribution to the set of observations: 7

x :	0	1	2	3	4
f :	180	92	24	3	1

UNIT–III

5. (a) Calculate Mean and Median of the following data relating to weight of 120 articles: 8

Weight (in gm)	0–10	10–20	20–30	30–40	40–50	50–60
No. of Articles	14	17	22	26	23	18

(b) Find the value of Standard-Deviation from the following table: 7

Size of Item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

6. (a) Calculate the Rank Correlation coefficient from the following data showing ranks of 10 students in two subjects: 8

Maths	3	8	9	2	7	10	4	6	1	5
Physics	5	9	10	1	8	7	3	4	2	6

(b) Find two lines of regression and coefficient of correlation for the data given below: 7

$$n = 18, \sum x = 12, \sum y = 18, \sum x^2 = 60,$$

$$\sum y^2 = 96, \sum xy = 48.$$

UNIT–IV

7. (a) By the method of least square, find the Straight line that best fits the following data: 8

x	1	2	3	4	5
y	14	27	40	55	68

(b) Fit a Second-degree Parabola to the following data: 7

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

8. (a) Eleven students were given a test in Statistics. After one month extra coaching a second test of equal difficulty was held. Do the marks given below give evidence that the students have benefitted by extra coaching? 8

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

(b) A set of five similar coins is tossed 320 times and the result is

No. of Heads	0	1	2	3	4	5
Frequency	6	27	72	112	71	32

Test the hypothesis that the data follow a binomial distribution. 7

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BT–2/J–25 **42038**

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. Coir is unwound from a drum of 50 mm diameter. Draw the locus of the free end of the coir for unwinding through an angle of 360°. Also, draw normal and tangent at any point on the curve. 15

2. On a building plan, a line of 20 cm long represents a distance of 10 m. Devise a diagonal scale for the plan to read up to 12m, showing meter, decimeter and centimeter. Represent on the scale, the lengths, 6.48 mm and 11.14 mm. 15

UNIT–II

3. A line AB, 90 mm long, is inclined at 45° to the H.P. and its top view makes an angle of 60° with the V.P. The end

A is in the H.P. and 12 mm in front of V.P. Draw its front view and finds its true inclination with the V.P. 15

4. A regular pentagon of 30 mm sides is resting on HP, on one of its sides with its surface 45° inclined to HP. Draw its projections when the side in HP makes 30° with VP. 15

UNIT–III

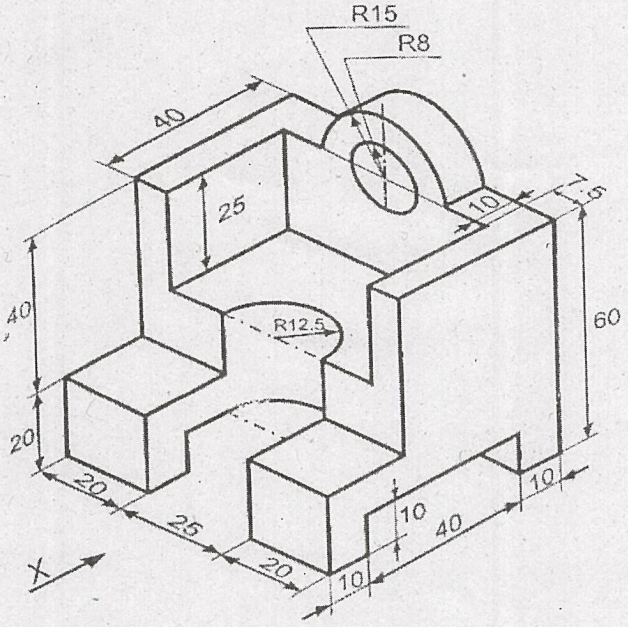
5. A cone of 50 mm diameter and axis 70 mm long. Its base is on HP. It is cut by a sectional plane perpendicular to VP and inclined at 45° to HP and a distance of 32 mm from apex. Draw the projections of Front View, Sectional Top View and True shape. 15

6. A cone of base 50 mm diameter and height 65 mm rests with its base on HP. A section plane perpendicular to VP and inclined at 30 degree to HP bisects the axis of the cone. Draw the development of the lateral surface of the truncated cone. 15

UNIT–IV

7. Draw the isometric projection of a pentagonal prism of base side 35 mm and axis 60 mm. The prism rests on its base on the HP with an edge of the base parallel to the VP. 15

8. Draw the front, top and right-hand side view of the figure given below : 15



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BT–2/J-25 **42039**

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. (a) Discuss the principles of engineering graphics and their significance. 8

   (b) Explain the uses of different drawing instruments. 7

2. A point *P* is 30 mm and 50 mm respectively from two straight lines which are at right angles to each other. Draw a rectangular hyperbola from *P* within 10 mm distance from each line. 15

UNIT–II

3. A line AB, 50 mm long, has its end A in both the H.P. and the V.P. It is inclined at 30° to the H.P. and at 45° to the V.P. Draw its projections and locate its traces. 15

4. A pentagonal prism is resting on one of the corners of its base on the H.P. The longer edge containing that corner is inclined at 45° to the H.P. The axis of the prism makes

an angle of 30° to the V.P. Draw the projections of the solid. 15

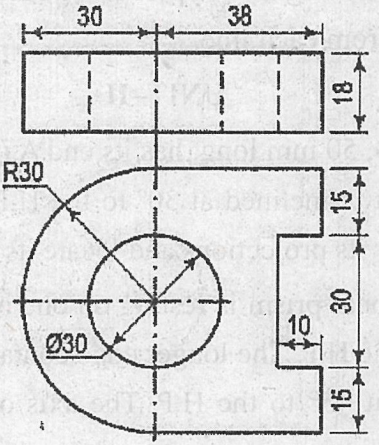
UNIT–III

5. A pentagonal pyramid, base 30 mm side and axis 60 mm long, is lying on one of its triangular faces on the H.P. with the axis parallel to the V.P. A vertical section plane, whose H. T. bisects the top view of the axis and makes an angle of 30° with the reference line, cuts the pyramid, removing its top part. Draw the top view, sectional front view, true shape of the section. 15

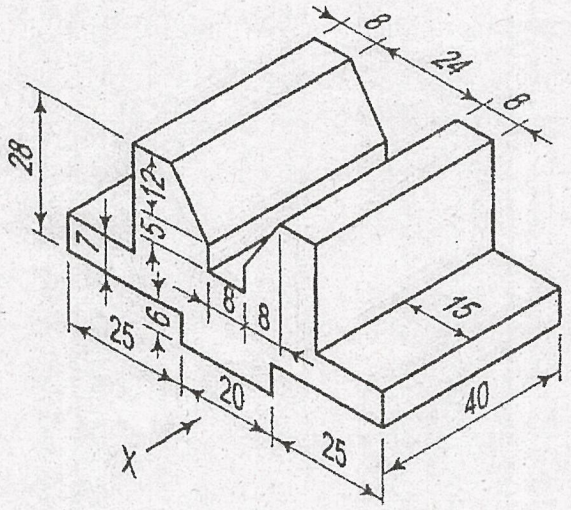
6. Draw the development of the lateral surface of the pentagonal pyramid side 30 mm and length 60 mm which is cut by a plane inclined at 45° to the HP and bisect the axis of the pyramid. 15

UNIT–IV

7. The orthographic projections of the object is shown in fig. Draw the isometric view of the object. 15



8. Draw the front view and top view of the given image: 15



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BT–2/J-25 **42040**

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. What are various characteristic features of living organisms? Describe the ultra structure of a typical prokaryotic cell indicating all the cell organelles with the help of Well labelled diagram. 15

2. Write short notes on the following : 15

   (a) Ammonotellic, Uricotellic and Ureotelic organisms.

   (b) Molecular taxonomy.

UNIT–II

3. Discuss the various levels of Protein structure with the help of well-labelled diagrams. 15

4. Write short notes on the following : 15

   (a) Nucleic acids and their functions.

(b) Effect of substrate concentration on Enzyme activity.

UNIT–III

5. Discuss the concept of recessiveness and dominance with respect to Mendel's Laws of Inheritance by giving suitable examples. 15

6. Write short notes on the following : 15

   (a) Genetic disorders.

   (b) Variation and Speciation.

UNIT–IV

7. Discuss the mechanism of Glycolysis with well-labelled flow diagram and highlight its importance. 15

8. Write short notes on the following : 15

   (a) Role of Biology in Agriculture.

   (b) Exothermic and Endothermic reactions in living organisms.

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BT–8/J-25 **42041**

BASIC ELECTRICAL ENGINEERING

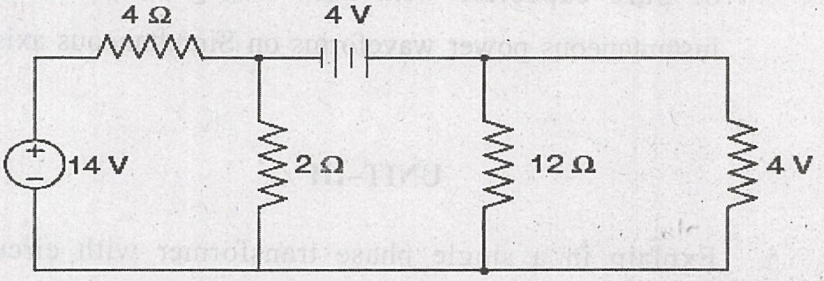
Paper–ES–101A

Time Allowed : 3 Hours] [Maximum Marks : 75

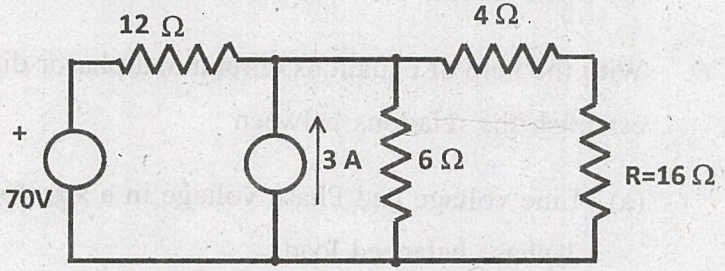
Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. Apply Superposition theorem to find the current in the load resistance of 12 Ω. 15



2. For the ckt. shown, deduce the Thevenin's equivalent ckt and find the current in load resistance R. 15



UNIT–II

3. (a) Given an ac wave $v = V_m \, Sin\theta$, (where $\theta = \omega t$.). Find out its average value for complete and half cycle. 8

   (b) Draw neatly the Voltage waveforms (all in volts) w.r.t. the Simultaneous time axis : 7

   $$V_1 = V_m \, Sin\, \omega t, V_2 = V_m Sin\,(\omega t - 120°), \; \& \; V_3 = V_m Sin\,(\omega t - 240°).$$

4. Explain in detail the theory of Sinusoidal AC input response of pure capacitor with neat voltage, current and instantaneous power waveforms on Simultaneous axis. 15

UNIT–III

5. Explain in a single phase transformer with circuit diagrams :

   (a) Open Circuit Test. (b) Short Circuit Test. 15

6. With the help of equations, circuit and phasor diagrams, establish the relations between :

   (a) Line voltage and Phase voltage in a star connected 3-phase balanced load. 8

(b) Line current and phase current in a Delta connected 3-phase balanced load. 7

UNIT–IV

7. Explain in detail the basic construction and working of a Synchronous motor with suitable sketches. 15

8. Explain in detail the construction and working of a DC Motor with suitable sketches. 15

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BT-2/J-25 **42042**

INTRODUCTION TO ELECTROMAGNETIC THEORY

Paper–BS-119A

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. Use Gauss's theorem to find the expression for Electric field:

   (a) For inside, on the surface and outside a hollow dielectric sphere of radius 'R' having a charge 'Q' at the Center. 7

   (b) For inside, on the surface and outside a solid dielectric sphere of radius 'R' having a uniformly distributed positive charge 'Q'. 8

2. (a) Prove that Energy density (Energy/Volume) in a in a region of a uniform Electric field of flux intensity 'E' is given by $\Gamma = \frac{\in E^2}{2}$. 5

(b) Write short notes on the following :

(i) Poisson's Equation

(ii) Laplace's Equation. 10

UNIT–II

3. Define Polarization. Explain how a dielectric acquires Polarization. Give its types and uses ? 15

4. Write short notes on the following :

(a) Bound charges and its Physical interpretation. 5

(b) Field inside a Dielectric. 5

(c) Forces in Dielectrics. 5

UNIT–III

5. (a) Explain the Lorentz's force law. 5

(b) Explain Biot Savart's Law. 5

(c) Explain Ampere's law in Magnetised material. 5

6. Explain the following:

(a) Divergence of Magnetic field. 5

(b) Curl of Magnetic field. 5

(c) Magnetic susceptibility. 5

UNIT–IV

7. Write down the Maxwell's equations in integral and differential forms for time varying fields and discuss the point wise physical significance/circuit relation/field theory concept possessed by each equation. Explain how Maxwell fixed Ampere's law ? 15

8. (a) Explain the propagation of Plane Electromagnetic waves in matter. 9

   (b) Draw a neat and labelled diagram of a propagating Plane Electromagnetic Wave. 6

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BT–2/J-25 **42043**

CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS

Paper–BS–136A

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 : $\frac{dy}{dx}+\frac{1}{x}y=x^3-3.$

   (b) Solve : $(e^y+1)\cos x\,dx+e^y\sin x\,dy=0.$

2. (a) Solve : $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=x+e^x\cos x.$

   (b) Solve : $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=\log x\sin(\log x).$

UNIT–II

3. (a) Evaluate $\iint_A xy(x+y)dxdy$, where A is the domain bounded by the line $y=x$ and the curve $x^2=y.$

(b) Evaluate $\int_0^1 \int_{e^x}^{e} \frac{1}{\log y} dy\, dx$ by changing the order of integration.

4. (a) Find the area bounded by the lines $y = 2 + x$, $y = 2 - x$ and $x = 5$.

(b) Find the valume of the sphere $x^2 + y^2 + z^2 = a^2$ by using triple integral.

UNIT–III

5. (a) Find the directional derivative of the function $\Phi = (x^2 - y^2 + 2z^2)$ at the point $P(1,2,3)$ in the direction of the line PQ, where Q is the point $(5,0,4)$.

(b) State and prove the physical meaning of divergence.

6. (a) Compute $\int_c \vec{F} . \vec{dr}$, where $\vec{F} = \sin y\, \hat{i} + x(1 + \cos y)\hat{j}$ and C is the circular path given by $x^2 + y^2 = a^2, z = 0$.

(b) Apply Green's theorem to evaluate $\oint_c [(y - \sin x)dx + \cos x\, dy]$, where C is the plane triangle enclosed by the lines $y = 0, x = \pi/2$ and $y = \frac{2}{\pi}x$.

UNIT–IV

7. (a) Find an analytic function $f(z)$ whose real part is $y + e^x \cos y$.

   (b) Find the Laurent's series which represent the function $f(z) = \dfrac{1}{(z-1)(z-2)}$, when

   (i) $|z| < 1$. (ii) $1 < |z| < 2$.

   (iii) $|z| > 2$.

8. (a) Evaluate, using Cauchy integral formula $\oint_c \dfrac{\cos \pi z}{(z^2 - 1)} dz$, where C is the rectangle with vertices $2 \pm i, -2 \pm i$.

   (b) Find the sum of the residues of the function $f(z) = \dfrac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2 (z-2)}$ at its poles within the circle $|z| = 3$.