



Electromagnetic Engineering (1020)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Assume suitable data if necessary.
6. Figure to right indicate full marks.
7. Neat diagrams must be drawn wherever necessary.

UNIT – I

1. a) A line charge density of 24 nc/m is located at $y=1, z=2$ in free space. Find \vec{E} at $P(6, -1, 3)$ and find point charge Q_A is located at point $(-3, 4, 1)$ so that E_y is equal to zero at point $P(6, -1, 3)$. 10
b) Starting from Guass's law derive an expression for divergence of \vec{D} . 10
c) If $\vec{E} = -8xy \cdot \vec{a}_x - 4x^2 \vec{a}_y + \vec{a}_z$ v/m if a point charge of 6 C is moved from $B(1, 8, 5)$ to $A(2, 18, 6)$. Find work done if path is $y = 3x^2 + z, z = x + 4$. 10

UNIT – II

2. a) In spherical co-ordinates if $V=0$ volt for $r = 0.1$ m & $V=100$ volt for $r = 2$ meter. Assume free space between spherical shell's find \vec{E} and \vec{D} . 10
b) Derive Boundary condition between two different dielectric materials. 10
c) A parallel plate capacitor having three dielectric layers. 10
 $E_{R_1} = 1 \quad d_1 = 0.2\text{mm}$
 $E_{R_2} = 2 \quad d_2 = 0.3\text{mm}$
 $E_{R_3} = 3 \quad d_3 = 0.4\text{mm}$
 $S = 20 \text{ cm}^2$
Calculate capacitance, & % of total energy stored in each layer.

UNIT – III

3. a) State Biot Savart law. Derive an expression for \vec{H} due to in finite conductor on any axis. **10**
- b) i) Evaluate line integral of \vec{H} from $P_1(5, 4, 1)$ to $P_2(5, 6, 1)$ to $P_3(0, 6, 1)$ to $P_4(0, 4, 1)$ to P_1 if $\vec{H} = 0.1y^3 \cdot \vec{a}_x + 0.4x \cdot \vec{a}_2$ A/m. **10**
- ii) Calculate $(\vec{\nabla} \times \vec{H})_2$
- iii) Calculate $(\vec{\nabla} \times \vec{H})_2$ at the center of area.
- c) 1 Amp current flows through co-axial cable of radins $a = 10$ cm $b = 20$ cm $C = 25$ cm. Find \vec{H} at 6 cm, 11 cm, 24 cm and 26 cm. **10**

UNIT – IV

4. a) Derive maxwell's Ist and IInd equation in point & Integral form for time varying fields. **10**
- b) Write short notes on : **10**
- i) Skin Effect ii) Uniform plane wave
- c) Determine normalised impedance and locate on Smith chart if **10**
- $Z_0 = 100\Omega$, $Z_{L1} = 100 + j150\Omega$, $Z_{L2} = 100 - j150\Omega$, $Z_{L3} = 200\Omega$
- $Z_{L4} = \text{Open circuit}$ $Z_{L5} = \text{short circuit}$.

UNIT – V

5. a) Explain broad side and end fire array in detail. **10**
- b) An isotropic Antenna has power of 100 kwatt delivered to it find power density at (1) 1 cm (2) 100 m (3) 1 km (iv) 100 km **10**
- c) A Dipole of length 3 cm is operated at 14 H₂. The efficiency factor 0.6. Calculate radiation resistance, antenna gain & effective aperture. **10**
