Total No. of Questions : 12]

SEAT No. :

P6107

[Total No. of Pages : 3

[5559]-5

S.E. (Electronics/E&TC)

ELECTROMAGNETICS

(2008 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate answer books.*
2) *Answer three questions from each section.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right side indicate full marks.*
5) *Use of calculator is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Develop an expression for $\overline{E}$ at point P due to infinite sheet of charge in XY plane with uniform charge density ρ_s. **[9]**

b) Three infinite uniform sheets of charges are located in free space as follows : 3 nC/m^2 at z = -4, 6 nC/m^2 at z = 1, -8 nC/m^2 at z = 4, Find $\overline{E}$ at the points. **[9]**

i) A(4,2,-3) ii) B(-1,-5,2) iii) C(-2,4,5)

OR

Q2) a) State and explain Divergence Theorem. Prove that volume charge density is divergence of $\overline{D}$. **[9]**

b) A uniform infinite line charge with density 20nC/m lies along the z–axis. Find the $\overline{E}$ at (6,8,3)m. **[9]**

Q3) a) Derive the expression for electric field due to electric dipole with centre at origin. **[8]**

b) A scalar potential is given by V = 5x+4y^2+2z^3 Volts. Find $\overline{E}$ at (2,3,4). **[8]**

P.T.O.

OR

Q4) a) Derive an expression for capacitance of two co-axial cylindrical conductors separated by dielectric medium with permittivity €. Assume V = Vo at ρ = a and V = 0 ρ = b; b>a. **[8]**

b) Derive the expression for the energy stored per unit volume in an electric field in terms of $\overline{D}$ and $\overline{E}$. **[8]**

Q5) a) In free space magnetic flux density is $\overline{B} = y^2\overline{a}_x + z^2\overline{a}_y + x^2\overline{a}_z$ wb/m^2. **[8]**

i) Show that $\nabla . \overline{B} = 0$

ii) Find magnetic flux through X=1,0 < Y < 1, 1 < Z < 4

b) State and explain **[8]**

i) Biot Savart's law

ii) Ampere circuit law

OR

Q6) a) Derive relationship between magnetic flux density $\overline{B}$ and vector magnetic potential $\overline{A}$. **[8]**

b) An infinite long straight conductor carrying current 3 Amp is placed on z axis. Find magnetic field strengh at (1,2,1) **[8]**

<u>SECTION - II</u>

Q7) a) Derive the boundary condition for magnetic field at an interface between two magnetic medium having permeability μ_1 and μ_2. **[9]**

b) A boundary exist at Z = 0 between two dielectrics ε_{r1} = 2.5 in region Z < 0 and ε_{r2} = 4 in region Z > 0. The field in the region ε_{r1} is $\overline{E}_1 = -30\widehat{a_x} + 50\widehat{a_y} + 70\widehat{a_z}$ V/m. Find i) Normal component of $\overline{E}_1$ ii) Tangential component of $\overline{E}_1$ ii) $\overline{D}_2$ **[9]**

OR

Q8) a) Derive the boundary condition for electric field at an interface between free space and dielectric. **[9]**

b) $\overline{H}_1 = -2\overline{a}_{x+} + 6\overline{a}_y + 4\overline{a}_z$ A/m in region z ≤ 0 where $\mu_1 = 5\mu_0$, Calculate i) $\overline{B}_1$ ii) $\overline{H}_2$ and $\overline{B}_2$ in region z ≥ 0 where $\mu_z = 2\mu_0$ **[9]**

Q9) a) State and explain Maxwell's equations for static electric and magnetic fields in both integral and point form. **[8]**

b) In free space $\bar{E} = 20\cos(\omega t - 50x)\widehat{a_y}$ V/m. Calculate i) Direction of wave propagation ii) β and ω iii) $\bar{H}$ **[8]**

OR

Q10) a) State and prove pointing theorem. State significance of Poynting vector. **[8]**

b) In a free space $\bar{E}(z,t) = 50\cos(\omega t - \beta z)\widehat{a_x}$ V/m. Find the power flowing in the circular area of radius 2.5 m in the plane z = constant. **[8]**

Q11) a) Explain with example Finite Difference Method. **[8]**

b) Explain the method of moments used to find solution of integral equation with suitable example. **[8]**

OR

Q12) a) Explain method of images in detail. **[8]**

b) Explain the different steps in graphical representation of electric field lines and equipotential lines. **[8]**