Total No. of Questions : 12]

SEAT No. :

**P4216**

[Total No. of Pages : 3

# [5459]-4
# S.E. (Electronics / E & TC)
# ELECTROMAGNETICS
## (2008 Course) (Semester - II) (204189)

*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 indicates full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume suitable data, if necessary.***



## SECTION - I

***Q1)*** a) Develop an expression for Electric field intensity at any point P due to infinite line charge of uniform charge density $\rho_L$ along z axis. **[9]**

b) A point charge of 30nC is located at origin, while plane y=3 carries charge 10nC/m$^2$. Find $\bar{D}$ at (0,4,3) **[9]**

OR

***Q2)*** a) State and prove Gauss law. State significance of Gaussian surface. **[9]**

b) Point charges 5nC and -2nC are located at (2,0,4) and (-3,0,5) respectively. **[9]**

i) Determine the force on a 1 nC point charge located at (1,-3,7)

ii) Find electric field $\bar{E}$ at (1,-3,7)

***Q3)*** a) An electric dipole of $100\hat{a}_z$ pCm is located at the origin. Find V and $\bar{E}$ at point (0,0,10). **[8]**

b) Prove that the electric field intensity is the gradient of V. **[8]**

OR

***P.T.O.***

***Q4)*** a) Derive the expression for capacitance of parallel plate capacitor. **[8]**

b) The point charges - 1nC, 4nC and 3nC are located at (0,0,0),(0,0,1) and (1,0,0) respectively. Find energy in the system. **[8]**

***Q5)*** a) A current distribution gives rise to the vector magnetic potential $\bar{A} = x^2 y\bar{a}_x + y^2 x\bar{a}_y - 4xyz\bar{a}_z$ wb/m$^2$. **[8]**

Calculate:

i) $\bar{B}$ at (-1,2,5)

ii) The flux through the surface defined by z=1, $0 \le x \le 1, -1 \le y \le 4$.

b) State and explain Biot Savart's Law. Derive an expression for magnetic field intensity $\bar{H}$ at any point P due to straight filamentary conductor along z axis of infinite length. **[8]**

OR

***Q6)*** a) State Maxwell's equations for static electric and magnetic fields in both point and integral forms. **[8]**

b) A circular loop located on $x^2+y^2=9, z=0$ carries a direct current of 10A along $\hat{a_\varphi}$. Determine $\bar{H}$ at (0,0,4) and (0,0,-4) **[8]**

## SECTION - II

***Q7)*** a) Derive the boundary condition for magnetic field at an interface between two magnetic medium having permeability $\mu_1$ and $\mu_2$. **[9]**

b) Two extensive homogeneous isotropic dielectrics meet on the plane z = 0, for z >0, $\varepsilon r_1$=4 and for z<0, $\varepsilon r_2$ = 3. A uniform electric field $\overline{E_1} = 50\bar{a}_x - 20\bar{a}_y + 30\bar{a}_z$ V/m exist for z>0 find $\overline{E_2}$ for z < 0. **[9]**

OR

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

b) $H_1 = -2\bar{a}_{x+} + 6\bar{a}_y + 4\bar{a}_z$ A/m in region $x \le 0$ Where $\mu_1 = 5\mu_0$,

Calculate:

i) $\bar{B}_1$

ii) $\overline{H_2}$ and $\overline{B_2}$ in region $x \ge 0$ where $\mu_2 = 2\mu_0$. **[9]**

***Q9)*** a) Explain concept of uniform plane waves. Explain transverse nature of uniform plane waves. **[8]**

b) In free space $\bar{H} = 0.2\cos(\omega t - \beta x)\hat{a}_z$ A/m. Find the total power passing through a circular disc of radius 5 cm on plane x=1. **[8]**

OR

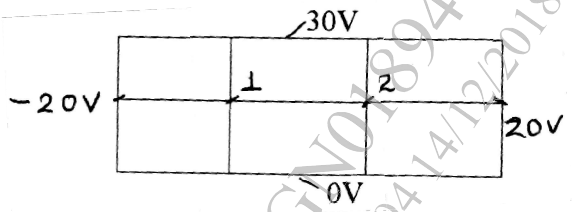
***Q10)***a) State and prove pointing theorem. State significance of Poynting vector. **[8]**

b) In the charge free region, the magnetic field intensity is given by $\bar{H} = H_m \cos\beta z \cos\omega t\, \bar{a}_y$ A/m. **[8]**

Calculate $\bar{E}, \bar{D}, \bar{B}$

***Q11)***a) Explain the Finite Difference Method to solve electromagnetic problem in the form of a partial differential equation. **[8]**

b) Use finite difference method to calculate potentials at free nodes 1 and 2 after 4 iterations. **[8]**




OR

***Q12)***a) What is finite element method? Explain four steps of realization. **[8]**

b) Explain Method of Images in detail. **[8]**

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