

Code No. : 5421/N

FACULTY OF ENGINEERING

**B.E. 2/4 (EE/Inst.) II Semester (New) (Main) Examination, May/June 2012
ELECTROMAGNETIC THEORY**

Time : 3 Hours]

[Max. Marks : 75

Note : Answer *all* questions from Part A.
Answer *any five* questions from Part B.

PART – A

(25 Marks)

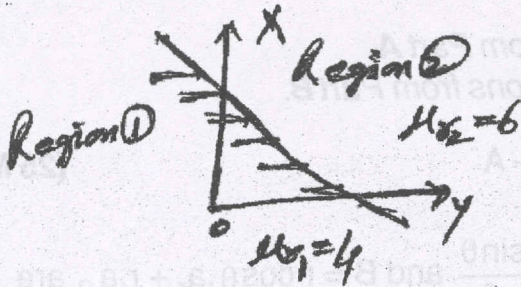
1. Show that vector fields $A = a_r \frac{\sin z \theta}{r^2} + 2a_\theta \frac{\sin \theta}{r^2}$ and $B = r \cos \theta \cdot a_r + r \cdot a_\theta$ are parallel to each other. 3
2. Define flux density. How is used to obtain field strengths at a point ? 2
3. Explain displacement current. 2
4. Derive the relation between B, H and I. 3
5. What are equipotential surfaces ? Comment on their significance. 2
6. Comment on applicability of Colomb's law and Gauss law of electrostatics. 2
7. What is induction ? Briefly explain self and mutual induction. 3
8. Comment on various sources of electromagnetic interference. 2
9. Compare the storage capacity of a parallel plate capacitor with and without dielectric. 3
10. Derive Colomb's law from Gauss law. 3

PART – B

(50 Marks)

11. a) Obtain the relation between E and V.
b) A point charge of 10 nc is located at the origin. If electric potential at (0, 6, -8) is 4V, obtain the potential at the point (-3, 2, 6).

12. a) What is the significance of boundary conditions ?
- b) Region :
- 1) with $\mu r_1 = 4$ is on side of the plane $y + z = 1$ containing the origin.
 - 2) with $\mu r_2 = 6$ is on the other side. If $B_1 = 2.a_x + a_y$. Find B_2 and H_2 .



13. a) State and explain Biot-Savart's law.
- b) Find the magnetic field strength (H) at the center of a square current loop of side length 'L'.
14. a) Explain the Poisson equation.
- b) Find the electric field intensity for the region between two concentric circular cylinders, where $V = 0$ at $r = 1$ mm and $V = 150$ V at $r = 20$ mm.
15. a) What is the significance of Poynting theorem ?
- b) In a non magnetic medium if $E = 4 \sin (2\pi \times 10^7 t - 0.8x) a_z$ V/m. Find the time average power carried by the wave.
16. a) What is skin depth ?
- b) Determine the skin depth for a plane wave propagating through a medium of intrinsic impedance of $200 \angle 30^\circ \Omega$, If $H = 10.e^{-\alpha t} \cos \left(\omega t - \frac{1}{2}x \right). ay. \mu_m$.
17. a) Determine the self inductance of a coaxial cable.
- b) Deduce intrinsic impedance and propagation constant for a lossy dielectric medium.