

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)

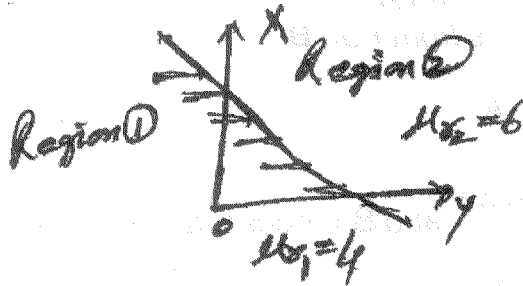
1. Show that vector fields $A = a_r \frac{\sin z\theta}{r^2} + 2a_\theta \frac{\sin\theta}{r^2}$ and $B = r \cos\theta \cdot a_r + r \cdot a_\theta$ are parallel to each other. 3
2. Define flux density. How is used to obtain field strengths at a point ? 2
3. Explain displacement current. 2
4. Derive 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 $\mu_{r1} = 4$ is on side of the plane $y + z = 1$ containing the origin.
 - 2) with $\mu_{r2} = 6$ 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 $E = 4 \sin (2\pi \times 10^7 t - 0.8x) a_z \text{ V/m}$. 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 $H = 10.e^{-\alpha t} \cos \left(\omega t - \frac{1}{2}x \right) . a_y . \text{ A/m}$.
17. a) Determine the self inductance of a coaxial cable.
- b) Deduce intrinsic impedance and propagation constant for a lossy dielectric medium.