



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 121501

Roll No.

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**B. Tech.**

(SEM. V) (ODD SEM.) THEORY  
EXAMINATION, 2014-15

**FUNDAMENTALS OF ELECTROMAGNETIC  
FIELD THEORY**

Time : 2 Hours]

[Total Marks : 50

- 1 Attempt any four parts : 4×3.5=14
- a. Explain physical significance of divergence and curl.
  - b. Write all four Maxwell's equations in point and integral form for time varying field.
  - c. State Stokes theorem and Divergence Theorem.
  - d. Express in  $A = r \sin \theta a_r$  in Cartesian coordinates system
  - e. Find gradient of  $V = 2 \rho^3 z \cos 2\phi$ .
  - f. Derive the boundary conditions between conductor-free space interfaces.

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[ Contd...

2 Attempt any two parts :

2×6=12

- a. Derive Poisson's and Laplace's equation hence write Laplace equation on cylindrical and spherical coordinates system.
- b. State Coulomb's law. Derive an expression for electric field intensity due to line charge density  $\rho_L$ .
- c. Define electric potential and derive an expression for spherical capacitor.

3 Attempt any two parts :

2×6=12

- a. State Biot Savart's law and derive an expression for magnetic field intensity due infinite straight line current carrying conductor.
- b. State and explain Maxwell's equations. Discuss its physical significance.
- c. A current filament of 2.5 A is placed along z-axis and current in the direction of  $a_z$ . Then calculate the magnetic flux crossing the portion of plane defined by  $\phi = \frac{\pi}{4}$ ,  $\phi = \frac{\pi}{4} 0.01 \leq r \leq 0.05$  and  $0 \leq z \leq 2m$ .

4 Attempt any two parts :

2×6=12

- a. Derive the expression of reflection and transmission coefficients. Derive the relation between two.
- b. Explain phenomenon of polarization and explain its types.
- c. A uniform plane wave propagating in medium has  $E = 2e^{-\alpha z} \sin(10^8 t - \beta z) a_y$  V/m. If a medium is characterized by  $\epsilon_r = 2$ ,  $\mu_r = 10$  and  $\sigma = 5$  S/m.

Find :

- i) Attenuation constant
- ii) Phase constant
- iii) Velocity of propagation
- iv) Propagation constant
- v) Intrinsic impedance.