



(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 : $4 \times 3.5 = 14$

- 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 ρ_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.
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