Printed Pages : 3

EEC-508

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

PAPER ID : 121501

Roll No.

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.

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 $\phi = \frac{\pi}{4}$, $\phi = \frac{\pi}{4} 0.01 \le r \le 0.05$ and $0 \le z \le 2m$.

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 $E = 2e^{-\alpha z} \sin\left(10^8 t - \beta z\right) a_y$ V/m If a medium is characterized by $\varepsilon_r = 2$, $\mu_r = 10$ and $\sigma = 5\ S/m$. Find :

i) Attenuation constant

ii) Phase constant

iii) Velocity of propagation

iv) Propagation constant

v) Intrinsic impedance.