PVP 12

Code: EC4T4

II B.Tech - II Semester – Regular Examinations - JUNE 2015

ELECTROMAGNETIC FIELD THEORY
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) i) Convert the point A(x=2, y=3, z=1) to cylindrical & spherical coordinates.

ii) Convert the point A(ρ =5, Φ=45^0, z=2) to Rectangular & Spherical co-ordinates. 7 M

b) Develop the expression for divergence in cylindrical coordinates. 7 M

2. a) Derive an expression for electric field intensity at any point due to a line charge with uniform charge density ρ_L C/m on the infinitely long Z-axis. 7 M

b) Consider a uniformly charged sphere of radius 'a' with a uniform charge density of ρ_v c/m^3. Use Gauss's Law to determine $\vec{D}$ everywhere. 7 M

3. a) Explain the concept of polarization in Dielectrics. 7 M

b) Solve the Laplace's equation for the potential field in a homogenous region between two concentric conducting spheres with radius 'a' and 'b' where b>a, V=0 at r=b and V=Vo at r=a. Find the capacitance between two concentric spheres. 7 M

4. a) A circular loop of a wire of radius 'a ', lying in the xy plane with its centre at the origin carries a current I in the +Φ direction . Using Biot Savarts law find $\vec{H}(0,0,Z)$ and H(0,0,0). 7 M

b) State Ampere's circuital law and derive the expression for $\nabla \times \vec{H} = \vec{J}$. 7 M

5. a) Derive an expression for force between two current carrying conductors. 7 M

b) A conductor located at x=0.4m, y=0 and 0<z<2.0m carries a current of 5.0A in the a_z direction. Along the length of the conductor $\vec{B}=2.5\ \vec{a}_z$T. Find the torque about the z axis. 7 M

6. a) Explain the inconsistency of Ampere's law. 7 M

b) State and derive the boundary conditions to be satisfied by the field vectors $\overline{E}$, $\overline{H}$, $\overline{D}$ and $\overline{B}$ at the boundary surface between any two media using Maxwell's equations. 7 M

7. a) A plane wave propagating through a medium with $\varepsilon_r = 8$, $\mu_r = 2$ has $\vec{E}$=0.5 sin (10^8t-z) $\vec{a}_z$ v/m. 7 M

Determine

i) β ii) The loss tangent iii) wave impedance

iv) wave velocity v) magnetic field.

b) Describe how the uniform plane wave propagation take place? What is its practical importance with emphasis on attenuation and wave impedance. 7 M

8. a) State and explain poynting theorem in complex form. 7 M

b) Derive an expression for Brewster's angle. 7 M