

Sub. Title : ELECTROMAGNETIC FIELDS
Sub. Code : EC6403
Duration : 3 Hours

Date : 09.04.2015
Branch : ECE
Max. Marks: 100

Part A - Answer all the Questions: (10 x 2 = 20)

1. What is electrostatic potential?
2. Define Gauss law.
3. What is Polarization?
4. Give the equation of continuity for current.
5. Give the Lorentz force equation.
6. What is the torque on a planar coil.
7. How will you identify the type of magnetic material?
8. Give relation between relative permeability and magnetic susceptibility.
9. State Faraday's law.
10. Define Poyntings theorem.

Part B - Answer as per the Choice: (5 x 16 = 80)

- 11.a.i Derive the expression for potential due to an electric dipole at any point P. Also find electric field intensity at the same point. [10]
ii. Two point charges 1.5 nC at (0,0,0.1) & -1.5nC at (0,0,-0.1) are in free space. Treat two charges as a dipole at the origin & find potential at p(0.3,0,0.4) [6]
(or)
- 11.b.i A circular disc of radius 'a' m is charged uniformly. Find the electric field intensity at a point 'h' m from the disc along its axis. [8]
ii. If $v = [2x^2y + 20z - 4/x^2 + y^2]$ volts. Find E & D at P(6,-2.5,3). [8]
- 12.a.i Derive Poisson's & Laplace's Equation. [8]
ii. A Parallel plate capacitor has an area of 0.8m^2 separation of 0.1mm, $E = 10^6\text{ v/m}$ & relative permittivity = 1000. Calculate C & V.
(or)
- 12.b.i State & explain the boundary conditions between two dielectrics with permittivity's 1 & 2 [8]
ii. Derive the expression for continuity equation of current in differential & Integral form. [8]
- 13.a.i Find the expression for H at any point due to a long straight conductor carrying I ampere. [8]
ii. State & prove Ampere circuital law. [8]
[or]
- 13.b.i Derive an expression for Magnetic vector potential. [8]
ii. The vector magnetic potential $A = (3y-3)a_x + 2xya_y$ wb/m in a certain region of free space.
a. Show that $\Delta \cdot A = 0$
b. Find Magnetic flux density B & magnetic field intensity H at P(2,-1,3). [8]
- 14.a.i Find the maximum torque on a 85 turns rectangular coil with dimension (0.2X0.3)m carrying a current of 5 A in a field $B = 6.5\text{T}$. [8]
ii. Derive an expression for the inductance of solenoid. [8]
[or]
- 14.b.i Derive the boundary condition at an interface between two magnetic medias. [8]
ii. A solenoid is 50 cm long, 2cm in diameter & contains 1500 turns. The cylindrical core has diameter of 2cm & relative permeability of 75. This coils is coaxial with a second solenoid of 50 cm long, 3cm diameter & 1200 turns. Calculate L for the inner solenoid & L for outer solenoid. [8]

15.a From the Maxwell's equation, Derive the electromagnetic wave equation in conducting medium for E & H fields.[16]
[or]

15.b.i Determine the expression for total power flow in coaxial cable.[8]
ii. Derive Maxwell's equation from Faraday's law.[8]