EC / EE 221 (R-20)

Total No. of Questions : 10] [Total No.of Pages : 02

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

Second Semester

EC / EE

ELECTROMAGNETIC FIELD THEORY

Time : **Three Hours** Maximum : **70** Marks

Answer ONE question from each Unit. 5x14=70 M

All Questions carry equal marks.

UNIT - I

1. a) Three equal positive charges of $4x10^{-9}$ coulomb each are located at three corners of a square, side 20cm. Determine the electric field intensity at the vacant corner point of the square.

   b) Using Gauss law, derive the expression for electric field intensity due to an infinite length of line charge.

(OR)

2. a) Define electric field in terms of point charge and also in terms of potential, mention salient features of electric field intensity.

   b) A circular disc of radius 'a' m is charged uniformly with a charge density of σ c/m^2. Find the electric field at a point 'h' m from the disc along its axis.

UNIT - II

3. a) Derive the boundary conditions for a dielectric - dielectric interface.

   b) Derive the expressions for the capacitance of a parallel plate capacitor and the energy stored in it.

(OR)

4. a) Explain about Poisson's equation and Laplace equation.

   b) Explain the behavior of Conductors and Insulators in an Electric Field.

UNIT - III

5. a) Derive the magnetic field intensity due to an infinite length current carrying conductor by using Biot Savart's law.

   b) Find H at the centre of an equilateral triangle loop of side 4m carrying 5 A of current lying in x=0 plane and the centroid lies along z axis.

P.T.O.

(OR)

6. a) Two infinitely long parallel conductors are separated by a distance 'd'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are I_1 and I_2.

   b) Find the magnetic field intensity at the centre of square loop of side 5m carrying 10A of current.

UNIT - IV

7. a) State and explain Faraday's laws of electromagnetic induction with some examples.

   b) Write Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields.

(OR)

8. a) Derive point form of Ampere circuital law and explain displacement current density from this derivation.

   b) A 30 cm x 40 cm loop rotates at 130 rad/s in a magnetic field 0.06 Wb/m^2 normal to the axis of rotation. If the loop has 50 turns, determine the induced voltage in the loop.

UNIT - V

9. a) Derive the relation between E and H in uniform plane wave propagation.

   b) Derive an expression for reflection when a wave is incident on a dielectric obliquely with parallel polarization.

(OR)

10. a) Define reflection coefficient ? Derive the equations when wave is propagating between two dielectric mediums with normal incidence ?

    b) State and prove Poynting theorem.