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BT-4/M-21 **44160**

ELECTROMAGNETIC FIELD THEORY

Paper–EC-214A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions, selecting at least *one* question from each unit.

UNIT–I

1. (a) Transform the vector $\vec{A} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ into Cylindrical Co-ordinate system. (6)

(b) Convert point P(1, 3, 5), T (0, –4, 3) and S (–3, –4, –10) from Cartesian to Cylindrical and Spherical Co-ordinate system. (9)

2. State and derive Gauss's Law in Electrostatic. Explain the various application of Gauss's Law with necessary expression. (15)

UNIT–II

3. (a) Discuss the boundary condition for electric field at the interface of dielectric-dielectric medium. (8)

(b) Derive the Maxwell's equation from Faraday's Law of electromagnetic induction. (7)

4. Write short note on the following :

(a) Biot - Savert's Law.

(b) Ampere's Circuital Law.

(c) Laplace and Poisson's Equation. (3×5)

UNIT–III

5. (a) Define Poynting Vector Theorem. Derive the relation for power flow associated with an electromagnetic wave. (10)

(b) What is skin effect? Find the expression for skin depth. (5)

6. (a) What do you understand by Polarization of a uniform plane wave? Describe the conditions for Circular and Elliptical Polarization. (8)

(b) Derive the wave equation from Maxwell's Equation for free space. (7)

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UNIT–IV

7. (a) Define Reflection and Reflection coefficient. Derive the relation between reflection coefficient and load impedance (Z_L). (8)

(b) How input impedance of a transmission line which is terminated with any load impedance can be evaluated? Derive necessary expressions. (7)

8. (a) A lossless T_x line with $Z_o = 50\ \Omega$ is 30 m long and operates at 2 MHz. The line is terminated with a load $Z_L = 60 + j\ 40\ \Omega$. Find

(i) Reflection coefficient with angle.

(ii) VSWR.

(iii) Input Impedance. (9)

(b) Why TEM wave cannot propagate in a rectangular waveguide? (6)

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