

BT-4/M-21

44100

ELECTROMAGNETIC THEORY

Paper–ECE-206 N

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions by selecting at least *one* question from each Unit.

UNIT-I

1. (a) Discuss the nature of the fields given below using divergence and curl :
- (i) $A = 30 I + 3xyj + 4xz^2k$
- (ii) $B = (1/r^2)a_r + 10 a_\phi$ 8
- (b) Transform the following vector into Cartesian coordinate system : $A = r_z \sin \phi a_r + 3r \cos \phi a_\phi + r \cos \phi \sin \phi a_z$. 7
2. (a) The planar interface between two dielectrics having relative permittivities $\epsilon_{r1} = 3$ and $\epsilon_{r2} = 8$ is defined as $x - y + 2z = 5$. Origin side is considered as medium 1. If $E_1 = 40a_x + 20a_y + 5a_z$ V/m, then find E_2 ? 8
- (b) Define and explain the concept of Continuity of current? 7

UNIT-II

3. (a) Explain Magnetic Vector Potential in detail. 7.
(b) Two conductors of length 'L' separated by a fixed distance 'd' are placed in XZ plane in uniform magnetic field. Calculate the torque about Z-axis. 8
4. (a) Explain about Magnetic Circuit using necessary expressions. 8
(b) Write down the Maxwell's equations in point and integral form for Lossy dielectrics. 7

UNIT-III

5. (a) Derive the wave equations for conducting medium. 7
(b) A 0.3 GHz plane EM wave is propagating in free space. The wave is incident normally on an infinite copper slab. For the transmitted wave inside the slab calculate : α , β , skin depth and phase velocity. 8
6. (a) Explain the reflection of uniform plane waves by perfect conductors under Oblique incidence for TE polarization. 7
(b) State and prove the Poynting's theorem. 8

UNIT-IV

7. (a) A lossless transmission line having a characteristic impedance of 75 ohms is terminated in an unknown impedance Z_L . The VSWR measured is 3. The nearest minimum from the load is found to be at 20 cm. Calculate Z_L if the frequency is 150 MHz. 8

- (b) Derive the expression for evaluation of voltage and current at any point on a transmission line. 7
- 8.** (a) A rectangular waveguide has a broad wall dimensions of 2.29 cm and is 10 GHz carrier from a coaxial cable to generate TE_{10} mode. Find its wavelength, phase and group velocities. 9
- (b) Write a short note on circular waveguide. 6
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