

[06 - 2110]

II/IV B.E. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

ELECTRO MAGNETICS

(Common with M.S. (E.E.E))

(w.e.f. admitted batch of 2006-07)

Time : Three hours

Maximum : 70 marks

Answer question No.1 and any other FOUR questions.

All questions carry equal marks.

1. (a) State Ampere's law.
- (b) State Lenz's law.
- (c) What is displacement current density?
- (d) How are the unit vectors defined in cylindrical coordinate systems?
- (e) Find the velocity of a plane wave in a lossless medium having a relative permittivity of 5 and a relative permeability of unity.
- (f) Define polarization.
- (g) Give the relation between attenuation constant, phase constant and propagation constant.

2. (a) Determine the curl of these vector fields. (10)

(i) $P = x^2 yz \bar{a}_x + xz \bar{a}_z$.

(ii) $Q = \rho \sin \phi \bar{a}_\rho + \rho^2 z \bar{a}_\phi + Z \cos \phi \bar{a}_z$.

(iii) $T = \frac{1}{r^2} \cos \theta \bar{a}_r + r \sin \theta \cos \phi \bar{a}_\theta + \cos \theta \bar{a}_\phi$.

(b) Find the gradient of the following scalar fields: (4)

(i) $V = e^{-z} \sin 2x \cosh y$.

(ii) $U = p^2 z \cos 2\phi$.

3. (a) Derive Poisson's and Laplace's equations from fundamentals.

(b) Given the potential field $V = 5x^2 yz + ky^3 z$.

(i) Determine K so that Laplace's equation is satisfied.

(ii) For this value of K, specify the direction of E at (2, -1, 1) by a unit vector.

4. Derive the boundary conditions at the charge interface of two dielectric media.

5. Derive an expression for the magnetic field intensity at a point "P" in a medium of permeability " μ " due to an infinitely long current carrying conductor at a distance "r" meters from the point.
6. State and explain Faraday's Law of electro magnetic induction. Also, derive expressions for statically and dynamically induce emf's.
7. Derive Maxwell's equation in point form and integral using Ampere's law and Gauss's Law.
8. (a) Discuss the significance and applications of Poynting theorem.
(b) Explain the utility of poynting vector? If the peak poynting vector in free space is 10 w/m^2 find the amplitudes of electric and magnetic fields.