

[5058] - 355

T.E. (Electronics Engg.)

ELECTROMAGNETIC AND WAVE PROPAGATION (304204)

(2012 Pattern) (End Semester) (Semester - I)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of calculator is allowed.

- Q1)** a) Derive the equation for Electric Field E due to infinite sheet of charge. [6]
- b) Two extensive homogeneous isotropic dielectrics meet on plane $z = 0$. For $z > 0$, $\epsilon_{r1} = 3$ and for $z < 0$, $\epsilon_{r2} = 2$. A uniform electric field $E_1 = 5a_x - 2a_y + 3a_z$ KV/m exists for $z \geq 0$. Find E_2 for $z \leq 0$. [8]
- c) Using concept of curl, obtain point form of ampere's circuit law $\nabla \times \vec{H} = \vec{J}$. [6]

OR

- Q2)** a) Three infinite uniform sheets of charge are located in free space follows 3nC/m^2 at $z = -4$, 6 nC/m^2 at $z = 1$ and -8 nC/m^2 at $z = 4$. Find E at the point. [8]
- i) A (2,5,-5)
 - ii) B (4,2,-3)
- b) State and explain Electric potential and potential difference. [6]
- c) State and prove Divergence Theorem. [6]

P.T.O.

Q3) a) In non magnetic medium $E = 4 \sin (2\pi 10^7 t - 0.8x) \mathbf{a}_z$ V/m. Find the following things. [9]

i) ϵ_r, η

ii) The time -average power carried by the wave.

iii) The total power crossing 100cm^2 of plane $2x + y = 5$

b) Explain and derive the expression for displacement current. [9]

OR

Q4) a) A parallel plat capacitor with plate area 5cm^2 and plate separation of 3mm has a voltage $50 \sin (10^3 t)$ V. applied to its plates calculate the displacement current when $\epsilon = 2\epsilon_0$ [9]

b) What is pointing vector? What is its significance? Derive the expression for average pointing vector. [9]

Q5) a) Explain and derive the plane wave equation in good conductor. [8]

b) An EM wave travels in free space with the electrical field component $E_s = 100e^{j(0.866y + 0.5z)} \mathbf{a}_x$ V/m. [8]

Determine

i) ω and λ

ii) Magnetic field component

iii) The time average power in the wave

OR

Q6) a) Explain and Derive the expression for and Helmholtz equation. [8]

b) Explain and derive the plane wave equation in good conductor. [8]

Q7) a) Derive the Fundamental equations for free space propagation. [8]

b) Explain the following terms: [8]

i) MUF

ii) Skip Distance

iii) D & E Layer

iv) Virtual height

OR

Q8) a) Explain the following terms: **[8]**

- i) Fading
- ii) Multipath delay spread,
- iii) Coherence Bandwidth
- iv) Coherence Time

b) Write a short note on following. **[8]**

- i) Multi hop propagation
- ii) Ionospheric abnormalities

