

[5669]-553

T.E. (Electronics Engg)

ELECTROMAGNETICS AND WAVE PROPAGATION

(2015 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates.

- 1) Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7, or Q.8, Q.9, or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of electronic packet calculator and smith chart is allowed.

Q1) a) State and explain Gauss's law. [4]

- b) Given $\vec{E} = 60\vec{a}_x + 20\vec{a}_y - 30\vec{a}_z$ V/m at a point on the interface between air and conducting surface. Find \vec{D} and ρ_s at that point. [6]

OR

Q2) a) Give the relationship between \vec{E} and V. [4]

- b) State and prove ampere's circuital law. [6]

Q3) a) Derive an expression for the capacitance of spherical capacitor with two concentric spherical conductors. [6]

- b) Planes $z = 0$ and $z = 4$ carry current $\vec{K} = -10\vec{a}_x$ A/m and $\vec{K} = 10\vec{a}_x$ A/m respectively determine \vec{H} at.

i) (1,1,1)

ii) (0,-3,10)

[4]

OR

Q4) a) Write a short note on polarization in dielectrics. [4]

- b) Derive the boundary condition at an interface between two magnetic medium. [6]

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Q5) a) State and explain the integral form of faraday's law of electromagnetic induction. [4]

b) Write a short note on displacement current and displacement current density. [4]

c) A conducting bar can slide freely over two conducting rails as shown in fig. 1 below. Calculate the induced voltage in the bar, [10]

i) If the bar is stationed at $y = 8 \text{ cm}$ and $\vec{B} = 4\cos 10^6 t \vec{a}_2 \text{ mwb/m}^2$

ii) If the bar slides at a velocity $\vec{a} = 20\vec{a}_y \text{ m/s}$ and $\vec{B} = 4\vec{a}_2 \text{ mwb/m}^2$

iii) If the bar slides at a velocity

$$\vec{u} = 20\vec{a}_y \text{ m/s} \text{ and } \vec{B} = 4\cos(10^6 t - y) \vec{a}_z \text{ mwb/m}^2$$

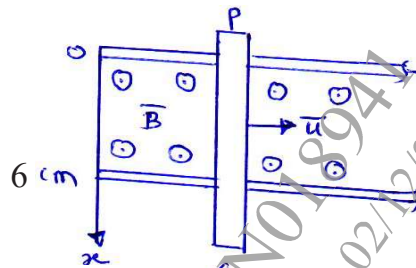


Fig-1

OR

Q6) a) Write the maxwell's equations for static and time varying fields in point form and integral form. [8]

b) In a charge free region, the magnetic field intensity is given by,

$\vec{H} = H_m \cos \beta z \cos \omega t \vec{a}_y$ by using maxwell's equation calculate electric field intensity. [10]

Q7) a) Explain and derive the plane wave equation in free space. [8]

b) What is polarization? Explain circular and elliptical polarization with mathematical expression. [8]

OR

Q8) a) State and prove Poynting theorem. Interpret each term. [8]

b) An electric field in free space is given by $\vec{E} = 50 \cos(10^8 t + \beta x) \vec{a}_y \text{ V/m}$. [8]

- i) Find the direction of wave propagation.
- ii) Calculate β and the time it takes to travel a distance of $\lambda/2$
- iii) Sketch the wave at $t = 0, T/4$, and $T/2$.

Q9) a) Explain characteristics of wireless channel: [8]

- i) Fading
- ii) Multipath delay spread
- iii) Coherence bandwidth.
- iv) Coherence Time.

b) Explain modes of propagation: Ground; sky and space wave propagation. [8]

OR

Q10) a) Explain the following: [8]

- i) Virtual Height.
- ii) MUF
- iii) Skip distance.
- iv) Multi-hop propagation.

b) Explain the fundamental equations for the free space propagation. [8]

