

UNIT - IV

8. (a) Derive speed of electromagnetic wave in vacuum. 7
- (b) Write properties of electromagnetic waves and show that electromagnetic wave is transverse in nature. 8
9. (a) Show that ratio of electric field intensity to magnetic field intensity is equivalent to speed of electromagnetic wave i.e., $E/B = C$. 7
- (b) Prove that pressure exerted by EM wave incident perpendicularly on the highly absorbing surface is ratio of intensity of wave to speed of the wave i.e., $P = I/C$. 8
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3001-1250-P-4/(C-9)/22 (4)

Roll No.

3001

**B. Tech. (ECE) 1st Semester
Examination - February, 2022**

INTRODUCTION TO ELECTROMAGNETIC THEORY

Paper : BSC-PHY-101-C

Time : Three Hours] [Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all and each question carry equal marks. Select only *one* question from each unit but 1st question is *compulsory*.

1. Attempt any six questions :
- (a) Define electric polarization and dielectric constant.
 - (b) State Biot-Savart's law.
 - (c) If charge particles of equal value 'q' are placed at each corner of a square of side 'a' in vacuum then find out total electric energy of system.

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- (d) Define Eddy current and explain its application as electromagnetic braking.
- (e) What do you mean by displacement current and write its expression?
- (f) State Stokes theorem and explain its physical significance.
- (g) Define electric dipole and electric dipole moment.
- (h) Find out the value of divergence of a position vector ($\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$) i.e. $\nabla \cdot \vec{r}$. (2.5 = 6 = 15)

UNIT - I

- 2. (a) Derive equation of electric energy density in term of electric field intensity. 7
- (b) Find out electric field intensity and electric potential at axial line of short electric dipole. 8
- 3. (a) Derive Poisson and Laplace's equations. 7
- (b) Define Gauss law and find out electric field intensity at distance 'r' from straight uniform charge wire of infinity length and linear charge density λ . 8

3001-1250-(P-4)(O-9)/(22) (2)

- 4. (a) Derive the equation of magnetic vector potential. 7
- (b) Show that $\nabla \times \vec{B} = \mu_0 \vec{J}$ and $\nabla \cdot \vec{B} = 0$. 8
- 5. (a) Derive magnetic field at axial and equatorial line of a bar magnet. 7
- (b) Define magnetic flux density (\vec{B}), magnetizing field intensity (H), intensity of magnetization (\vec{J}), magnetic susceptibility (χ_m) and relative permeability (μ_r). Derive the relation between relative permeability (μ_r) and magnetic susceptibility (χ_m). 8

UNIT - III

- 6. (a) Derive the equation of magnetic energy stored in a magnetic field i.e. $U_m = \frac{1}{2\mu_0} \int B^2 dV$. 7
- (b) State Poynting theorem and derive equation of Poynting vector (S). 8
- 7. (a) Derive equation of continuity and show that modified Ampere's law satisfy the equation of continuity. 7
- (b) State Faraday laws in EMJ and derive its differential equation. Find out induced emf in a circular conducting wire of area (A) which is rotating about its diameter with uniform angular speed (ω) in uniform magnetic field (B). 8

3001-1250-(P-4)(O-9)/(22) (3) P. T. O.