Unit-IV

8. (a) Show that electromagnetic wave is transverse in nature. 7

(b) Derive the equation of electromagnetic wave in a non-conducting medium. 8

9. (a) Show that pressure exerted by electromagnetic wave incident normally on the highly reflective surface is twice the ratio of intensity and speed of the wave i.e., P=2 I/C. 7

(b) If the monochromatic electromagnetic wave is incident normally on the surface of dielectric medium of refractive index (μ_2) from a dielectric medium of refractive index (μ_1) then show that reflection coefficient $(R)=\left(\frac{\mu_1-\mu_2}{\mu_1+\mu_2}\right)^2$ and transmission coefficient $(T)=\frac{4\mu_1\mu_2}{(\mu_1+\mu_2)^2}$. 8

B.Tech. (ECE) 2nd Semester (G-Scheme)

Examination, May-2023

INTRODUCTION OF ELECTROMAGNETIC THEORY

Paper - B.Sc.-PHY-101-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note : *Attempt **five** questions in all and each question carries equal marks. Select only **one** question from each unit. **Question no. 1 is compulsory.***

1. (a) How much torque and force act on the electric dipole in uniform electric field?

(b) State Stoke's theorem and discuss its physical significance.

(c) Define Eddy's current and explain its applications.

(d) Define magnetic flux and write its unit.

(e) Write down important properties of electromagnetic waves.

(f) Find out the value of divergence of a vector i.e., $\vec{E}=x^2\hat{i}+y\hat{j}+2z\hat{k}$ at a point (1, –1, 2).

6×2.5=15

Unit-I

2. (a) State Gauss law in electrostatics and derive the equation of electric field intensity inside and outside the uniformly solid charge sphere. 7

(b) Derive the expression of electric field intensity and electric potential at the equatorial line of a short electric dipole. 8

3. (a) Derive Poisson and Laplace's equation. 7

(b) What do you mean by electric polarization? Define electric field intensity ($\vec{E}$), electric polarization vector ($\vec{P}$) and electric displacement vector ($\vec{D}$) and derive their relation. 8

Unit - II

4. (a) Using Biot-Savarts Law, derive magnetic field intensity at the axial line of current-carrying circular wire. 7

(b) Write important properties of Día, Para and Ferromagnetic substances. 8

5. (a) Prove that $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$ and $\vec{\nabla} . \vec{B} = 0$. 7

(b) Define magnetic field intensity ($\vec{B}$), magnetizing force ($\vec{H}$), intensity of magnetization ($\vec{I}$), magnetic susceptibility (χ) and relative permeability (μ_r). Derive the relation between relative permeability and magnetic susceptibility. 8

Unit-III

6. (a) Define Faraday's first and second law in EMI and state Lenz's law. Derive e.m.f. induced in a conducting rod when the rod is rotating about its one end in the uniform magnetic field. 7

(b) Discuss the incompleteness of Ampere's law and explain its modification made by Maxwell. 8

7. (a) Write the integral and differential forms of Maxwell's equations in a vacuum and discuss their physical significance. 7

(b) State the Poynting theorem and show that Poynting vector $(\vec{S}) = \frac{1}{\mu_0}(\vec{E} \times \vec{B})$. 8