Roll No. .....

3001

B. Tech 1st Semester (ECE) Examination – December, 2019

INTRODUCTION TO ELECTROMAGNETIC THEORY

Paper : BSC-PHY-101-G

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, selecting ***one*** question from each Unit. Question Number **1** is ***compulsory***. All questions carry equal marks.

1. Attempt any ***six*** parts : 2.5 × 6

(a) What is the main difference between curl and divergence of a vector field ?

(b) A surfaces encloses an electric dipole, what about the electric flux.

(c) Why the electric field is always perpendicular to the equipotential surface ?

(d) Define magnetic susceptibility and give its unit.

(e) Why energy is lost in hysteresis loop ?

(f) Light is incident from air on a glass of refractive Index 1.5. Calculate Brewster's angle.

(g) What is Brewster's angle ?

UNIT – I

2. (a) State and prove Poisson's equation in electrostatics. What form does it take when the charge density is zero ? Illustrate the application of this equation to find electric field and potential in two suitable cases of symmetric charge distribution. 10

(b) What are the importances of Poisson's and Laplace's equations in electrostatics ? 5

3. (a) What is an electric dipole ? Calculate the electric field in free space due to a dipole. 7

(b) Determine the potential energy of a dipole in an external electric field. 5

(c) Calculate the torque on the dipole in a uniform electric field. 3

UNIT – II

4. (a) Find the vector potential of the field due to any system of currents and hence derive Biot-Savart's Law. 8

(b) A uniformly charged sphere is rotating with a constant angular velocity w show that at the centre of the sphere, the magnetic flux density is $B = \frac{1}{3}\mu_0 \rho\, wa^2$ where a = radius of sphere, ρ = charge density. Also find the vector potential inside and outside the sphere. 7

5. (a) Differentiate between three types of magnetic materials on the basis of atomic origin of magnetism. 9

(b) Define : 6

(i) Magnetic permeability

(ii) Relative permeability

(iii) Susceptibility and derive relation between them

UNIT – III

6. (a) Discuss on the topic equivalence of Faraday's Law and motional EMF. 9

   (b) State and explain Lenz's Law. 6

7. (a) What is electromagnetic breaking and its application ? 8

   (b) Obtain the equation of continuity and explain its significance. 7

UNIT – IV

8. A plane polarized electromagnetic waves is incident on an interface of two dielectric media find the relations between the angles of incidence, reflection and refraction. Write a note on waveguides. 15

9. (a) Explain the transverse nature of e/m waves and calculate the relation between electric and magnetic fields. 9

   (b) Derive energy carried by an electromagnetic wave. 6
