(b) Discuss failure of Ampere's law and explain its modification made by Maxwell. 7

7. (a) Drive the equation of magnetic energy stored i.e.

$$W = \frac{1}{2\mu_0} \int B^2 \, dV .$$ 8

(b) When two coils are placed very close to each other then find out equation of mutual induction. 7

SECTION – D

8. (a) Derive equation of speed of electromagnetic wave in vacuum using Maxwell equations and explain its transverse. 10

(b) When electro- magnetic wave (monochromatic) is incident normally on dielectric surface then show that sum of reflection and transmission co-efficient is unity i.e. T+ R=1. 5

9. (a) Derive equation of speed of electromagnetic wave in non-conducting medium and explain polarization. 10

(b) When electromagnetic wave of intensity I falls on the surface which completely absorb the E. M . waves then show that pressure (P) exerted on the surface is P= I/c where c is speed of wave. 5

Roll No. .....

3001

B. Tech. 1st Sem. (ECE)

Examination – December, 2018

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 Section. Question No. **1** is ***compulsory***. All questions carry equal marks.

1. (a) What do you mean by electric dipole and explain polar and non- polar dielectrics. 2.5

(b) Write down any five properties of electromagnetic waves. 2.5

(c) Define refractive index (n) of a medium and write its relation in term of relative permittivity ε_r and permeability (μ_r). 2.5

(d) Derive the differential form of faraday law in electromagnetic induction . 2.5

(e) Define stokes theorem and Gauss divergence theorem. 2.5

(f) Find out the value of $\vec{\nabla}\left(\frac{1}{r}\right)$, where $\vec{r}$ is position vector. 2.5

SECTION – A

2. (a) Define gauss law in electrostatics and derive its differential form. 5

(b) Derive Poisson and Laplace's equation . 5

(c) Drive the equation of electric energy stored in term of electric field intensity i. e. $W = \frac{\varepsilon_0}{2}\int E^2 dV$ .5

3. (a) Write and explain boundary conditions in terms of electric field intensity and electric potential. 5

(b) Derive the relation between electric displacement vector, electric field intensity and electric polarization vector i. e. $\vec{D} = \varepsilon_0 \vec{E} + \vec{P}$. 5

(c) Derive the electric energy stored in di-electrics i.e.

$$W = \frac{1}{2}\int \vec{E}.\vec{D}\, dV .$$ 5

SECTION – B

4. (a) Show that $\mu_r = 1 + \chi_m$, where μ_r is relative permeability and χ_m is magnetic susceptibility. 5

(b) Define Ampere's law and derive its differential form. 5

(c) Write properties of diamagnetic, paramagnetic and ferromagnetic materials. 5

5. (a) Find out vector potential of an infinite solenoid with turns per unit length n, radius R, and electric current I. 5

(b) Find out magnetic field due to bar magnet at arbitrary point. 5

(c) Show that change in magnetic dipole moment of an electron which is revolving around a nucleus due to application of magnetic field

$$\Delta m = -\frac{e^2 R^2}{4m_e} B.$$ 5

SECTION – C

6. (a) State and prove Poynting's theorem and define Poynting vector $(\vec{S})$. 8