

SECTION – IV

8. Obtain wave equations for electromagnetic waves in vacuum. 15
9. (a) Derive expression for momentum of electromagnetic waves. 5
- (b) Prove that electromagnetic waves are transverse in nature. 10

Roll No.

3001

B. Tech. 2nd Semester (ECE)
Examination – July, 2021

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. Question No. 1 is *compulsory*. Attempt *one* question from each Section. All questions carry equal marks.

1. (a) Give $\vec{A} = x^2y\hat{i} + (x-y)\hat{k}$. Find curl and divergence of \vec{A} at point (2, 3, 0). 2.5
- (b) Write characteristics of e. m. waves. 2.5
- (c) State Gauss's law in electrostatics. Express it in integral form. 2.5

- (d) Define electric susceptibility and find its relation with dielectric constant. 2.5
- (e) Using differential form of Gauss law, calculate net charge in the region where electric field is uniform at all points. 2.5
- (f) Discuss the behavior of polar and non-polar dielectrics in applied electric field. 2.5

SECTION – I

2. (a) Discuss boundary conditions of electric field and electrostatic potential. 10
- (b) Calculate energy stored in continuous charge distribution. 5
3. (a) Calculate torque experienced by electric dipole when placed in field. 9
- (b) Derive expression for Gauss law in the presence of dielectrics. 6

SECTION – II

4. (a) Define Magnetic susceptibility and permeability. Write short note on ferromagnetism. 7

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- (b) Show that magnetic field due to steady currents satisfies : 8

(i) $\nabla \cdot \vec{B} = 0$

(ii) $\nabla \times \vec{B} = \mu_0 \vec{J}$

5. (a) Define magnetic vector potential. Show that current carrying loop magnetic is equivalent to magnetic dipole. 10
- (b) Discuss boundary conditions of B. 5

SECTION – III

6. (a) Derive expression for energy stored in magnetic fields. 5
- (b) Define displacement current. Discuss how Maxwell modified Ampere's Law ? 5
- (c) Define Poynting vector. Discuss its significance. 5
7. (a) Derive Maxwell equations for non-conducting medium. 10
- (b) Derive expression for equation of continuity. 5

3001- (P-4)(Q-9)(21) (3)

P. T. O.