

RA

Code No: 155ST

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 2023

ELECTROMAGNETIC FIELDS AND WAVES

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A**

**(25 Marks)**

- 1.a) Define Conduction Current. [2]
- b) What is Electric Flux density and give its units? [3]
- c) Compare vector and Scalar magnetic potential. [2]
- d) What is magnetic flux density and give its units? [3]
- e) Define displacement current density. [2]
- f) Explain Faraday's Law. [3]
- g) Define uniform plane wave. [2]
- h) What is Brewster angle and give its significance. [3]
- i) Illustrate electromagnetic spectrum. [2]
- j) Analyze wave equations in rectangular co-ordinates. [3]

**PART – B**

**(50 Marks)**

- 2.a) State and Explain Coulomb's Law.
- b) Three point charges  $Q_1=1\text{mC}$ ,  $Q_2=2\text{mC}$ , and  $Q_3=-3\text{mC}$  are respectively located at (0,0,4), (-2,6,1) and (3,-4,-8). Find the the force on  $Q_1$ . [5+5]

**OR**

- 3.a) Derive an expression for Electric Field Intensity due to line charge of distribution.
- b) In free space,  $V=6xy^2z+8$ . At point P(1,2,-5), Find Electric Field Intensity. [6+4]

- 4.a) Using Biot- Savart's Law, Find  $\vec{H}$  on axis of a current loop.
- b) State and explain Maxwell's equations for magnetostatic fields. [5+5]

**OR**

- 5.a) Show that  $\text{curl } \vec{H} = \vec{j}$ .
- b) In a certain conducting region,  $\vec{H} = yz(x^2 + y^2)\vec{a}_x - y^2xz\vec{a}_y + 4x^2y^2\vec{a}_z$  A/m. Solve for  $\vec{j}$ . [5+5]

6.a) Obtain the boundary conditions of the tangential and normal components of electric field at the interface of two mediums with different dielectrics.

b) What is transformer e.m.f? Explain in brief. [6+4]

**OR**

7.a) Tabulate Maxwell's equations for time varying fields in different forms.

b) Demonstrate about inconsistency of Ampere's law. [5+5]

8.a) Derive the expression which describes propagation of uniform plane wave in good conductor.

b) Explain i) Critical angle and ii) total internal reflection. [6+4]

**OR**

9.a) Prove point form and integral form of Poynting's theorem.

b) What is polarization? Explain in brief. [6+4]

10.a) Discuss about TE/TM mode Analysis.

b) What are microstrip lines? Explain in brief. [6+4]

**OR**

11.a) Derive Equation for power transmission.

b) Discuss the impossibility of TEM mode. [6+4]

---ooOoo---

papers 2023