

Code No.: EC504PC

R20

H.T.No.

8

R

**CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS**

**III-B.TECH-I-Semester End Examinations (Supply) - June- 2024
ELECTROMAGNETIC FIELDS AND WAVES
(ECE)**

[Time: 3 Hours]

[Max. Marks: 70]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks.

PART-A

(20 Marks)

1. a) Write the Poisson's and Laplace equations. [2M]
- b) List out the boundary conditions between dielectric to dielectric and dielectric to conductor? [2M]
- c) Mention the major laws that govern magneto static fields. [2M]
- d) Define the term magnetic flux density. [2M]
- e) Define the term displacement current density. [2M]
- f) State Faraday's law. [2M]
- g) Define the term Surface impedance. [2M]
- h) Explain about critical angle. [2M]
- i) Write the electromagnetic spectrum bands at GHz frequency. [2M]
- j) Draw and Name different types of Waveguides. [2M]

PART-B

(50 Marks)

2. Using Gauss law, derive the expression for electric field intensity due to an infinite length of line charge. [10M]
- OR**
- 3.a) Differentiate static electric and magnetic fields. [5M]
 - b) Derive Equation of continuity. What is its significance? [5M]
4. Using Biot Savart's Law, find H due to an infinite line current. [10M]
- OR**
- 5.a) State and prove Ampere's circuit law. [4M]
 - b) Using Ampere's circuit Law, find H due to an infinite sheet of current. [6M]
6. Derive the Maxwell's equations in integral form for time varying fields and based on this obtain the corresponding differential form by applying stroke's theorem. [10M]
- OR**
- 7.a) Derive the boundary conditions for a dielectric - dielectric interface. [6M]
 - b) A dielectric sphere of $\epsilon_r = 5.7$ and of radius 10 cm has a point charge $2\mu\text{c}$ placed at its centre. Calculate the surface density of polarization charge on the surface of the sphere. [4M]
8. Derive the relation between E and H in conducting medium. [10M]
- OR**
- 9.a) What is Polarization? Explain in detail different types of polarization. [5M]
 - b) What is Skin depth and how does it vary in good conductors at high frequencies. [5M]

10.a) When the dominant mode is propagated in an air filled rectangular wave guide, the guided wave length for a frequency of 9000MHz is 4cm. Calculate the Breadth of the guide. [5M]

b) Write a short notes on Microstrip lines [5M]

OR

11 Write a short notes on [10M]

- i. Cut off frequency(f_c)
- ii. Group Velocity
- iii. Phase Velocity
- iv. Wave guide Impedance
- v. Guided Wavelength.
