

Code No.: EC504PC

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CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS

III-B.TECH-I-Semester End Examinations (Supply) - May- 2023
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) State and prove the Gauss law. [2M]
- b) Derive the relationship between potential (V) and electric field intensity (E). [2M]
- c) State Ampere's circuit law. [2M]
- d) Write Maxwell's equations in a free space? [2M]
- e) What is meant by boundary condition? State them. [2M]
- f) Derive Maxwell's equation derived from Ampere's law. [2M]
- g) What is Polarization? [2M]
- h) Define critical angle. [2M]
- i) What is dominant mode? [2M]
- j) Why TEM mode is not possible in wave guides? [2M]

PART-B

(50 Marks)

- 2.a) State and explain Coulomb's law. [5M]
 - b) Two point charges $Q_1 = 5.0$ C and $Q_2 = 1.0$ C are located at $(-1, 1, -3)$ m and $(3, 1, 0)$ m respectively. Determine the electric field at Q_1 and Q_2 . [5M]
- OR**
- 3.a) Using Gauss law, derive the expression for electric field intensity due to an infinite length of line charge. [6M]
 - b) Differentiate static electric and magnetic fields. [4M]
- 4.a) State and prove Ampere's Force law. [4M]
 - b) Using Ampere's circuit Law, Find H due to an infinite sheet of current. [6M]
- OR**
- 5.a) Explain the concept of Magnetic vector potential. [4M]
 - b) Write Maxwell's equations in differential form and in word Statement form. [6M]
6. Derive the Maxwell's equations in integral form for time varying fields. [10M]
- OR**
7. Derive the boundary conditions for a dielectric – conductor interface. [10M]
- 8.a) Define uniform plane wave. Prove that uniform plane wave does not have field component in the direction of propagation. [5M]
 - b) Describe the concept of Reflection of an EM wave by a perfect dielectric at oblique incidence. [5M]
- OR**
- 9.a) Define Brewster angle and derive an expression for Brewster angle when a wave is parallelly polarized. [5M]
 - b) For good dielectrics, derive the expressions for α , β , γ and η . [5M]

10. Derive the wave equation for a TE wave and obtain all the field components in a rectangular wave guide. [10M]

OR

11.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 wave guide. [5M]

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