



MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

II B.Tech II Sem Supply End Examination, July 2022

Electromagnetic Fields and Waves

(ECE)

Time: 3 Hours.

Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part – A, answer all questions which carries 20 marks.

3. 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

(10*2 Marks = 20 Marks)

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|-------|--|----|-----|------|
| 1. a) | Define Coulumb's law for Electrostatic fields. | 2M | C01 | BL-1 |
| b) | Write the point form of continuity equation and explain its significance. | 2M | C01 | BL-2 |
| c) | Discuss Biot Savart's law. | 2M | C02 | BL-3 |
| d) | Derive the expression for Maxwell's equation, $\text{del} \cdot \mathbf{B} = 0$ | 2M | C02 | BL-5 |
| e) | Recall the Maxwell's equations in integral form for Time invariant fields. | 2M | C03 | BL-1 |
| f) | Summarize the boundary conditions at the interface between Dielectric-Conductor. | 2M | C03 | BL-2 |
| g) | Formulate the 2 wave equations for conducting medium. | 2M | C04 | BL-5 |
| h) | Explain Brewster's angle. | 2M | C04 | BL-2 |
| i) | Distinguish between TE and TM modes of wave propagation. | 2M | C05 | BL-4 |
| j) | Show how phase velocity and group velocity are related. | 2M | C05 | BL-1 |

PART- B

(10*5 Marks = 50 Marks)

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|------|--|----|-----|------|
| 2 a) | Derive the 2 Maxwell's equations for Electrostatic Fields. | 5M | C01 | BL-5 |
| b) | State Gauss's law. Using divergence theorem and Gauss's law, relate the displacement density D to the volume charge density ρ_v . | 5M | C01 | BL-2 |

OR

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|------|---|-----|-----|------|
| 3 | Evaluate the electric field due to an infinite line charge and infinite sheet charge. | 10M | C01 | BL-6 |
| 4 a) | Elaborate on the Forces due to Magnetic Fields. | 5M | C02 | BL-2 |
| b) | Explain the concept of Magnetic vector potential and its significance. | 5M | C02 | BL-2 |

OR

- 5 Discuss and Derive Ampere's circuital law. What is Magnetic Flux density? Show the relation between Magnetic Flux density and Magnetic field intensity. 10M C02 BL-3
- 6 a) State Faraday's law. How is it related to Lenz's law? 5M C03 BL-1
b) Derive the differential form of Maxwell's curl equations for time varying fields. 5M C03 BL-5
- OR**
- 7 What is the inconsistency associated with Ampere's law and Displacement current Density? Explain with equations. 10M C03 BL-3
- 8 a) Develop all the relations between E and H. 5M C04 BL-6
b) Explain wave propagation in dielectric medium. 5M C04 BL-2
- OR**
- 9 Classify the types of Polarization. Elaborate on the types of Polarization? Formulate the conditions for the occurrence of circular polarization? 10M C04 BL-4
- 10 a) Discuss the impossibility of TEM waves in rectangular waveguides. 5M C05 BL-3
b) What is effective dielectric constant in Microstrip lines? How does it affect the design parameters of a Microstrip line. 5M C05 BL-4
- OR**
- 11 Distinguish between Rectangular Waveguides and Microstrip lines. Derive the equation for power transmission in a rectangular waveguide. 10M C05 BL-4