



# MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

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

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

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

## Electro Magnetic Fields

(EEE)

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)

- |       |   |    |     |     |
|-------|---|----|-----|-----|
| 1. a) | Derive the expression for energy density in a static electric field.            | 2M | C01 | BL3 |
| b)    | State Coulomb's law   | 2M | C01 | BL1 |
| c)    | Derive the conditions of a boundary between conductor and dielectric interface. | 2M | C02 | BL3 |
| d)    | What are the applications of Laplace's and Poisson's equations?                 | 2M | C02 | BL1 |
| e)    | Evaluate the Relation between magnetic flux, magnetic flux density.             | 2M | C03 | BL5 |
| f)    | List the properties of vector magnetic potential.                               | 2M | C03 | BL2 |
| g)    | State Faraday's laws of electromagnetic induction                               | 2M | C04 | BL1 |
| h)    | List Maxwell's equations for time varying fields.                               | 2M | C04 | BL2 |
| i)    | What do you mean by lossy dielectric?   | 2M | C05 | BL5 |
| j)    | Derive the wave equation of electromagnetic wave?                               | 2M | C05 | BL3 |

### PART- B

(10\*5 Marks = 50 Marks)

- |       |  |    |     |     |
|-------|--|----|-----|-----|
| 2. a) | Derive an expression for electric field intensity due to an electric dipole. | 5M | C01 | BL3 |
| b)    | Two 6nC point charges are located at (1,0,0) and (-1,0,0) in free space.     | 5M | C01 | BL3 |
| i)    | Find V at P(0,0,z)   |    |     |     |
| ii)   | Find Vmax  |    |     |     |
| iii)  | calculate dv/dz on z axis  |    |     |     |

OR

- |       |  |     |     |     |
|-------|--|-----|-----|-----|
| 3.    | State and prove Gauss's law and write limitations of Gauss law.                  | 10M | C01 | BL4 |
| 4. a) | Derive the ohms law in point form.   | 5M  | C02 | BL3 |
| b)    | State and explain continuity equation of current in integral form and point form | 5M  | C02 | BL2 |

OR

- |           |  |     |     |     |
|-----------|--|-----|-----|-----|
| 5         | Derive the expressions for the capacitance of a parallel plate capacitor and the energy stored in it   | 10M | C02 | BL3 |
| 6         | a) Define and explain terms self inductance and mutual inductance with neat sketch.  | 5M  | C03 | BL2 |
|           | b) Derive the expression for magnetic field due to an infinitely long straight filament carrying a direct current 'I' by using Biot – Savart's law.  | 5M  | C03 | BL3 |
| <b>OR</b> |  |     |     |     |
| 7         | Analyze and Explain force between two parallel current carrying conductors and also Determine the force per meter length between two long parallel wires A & B separated by 6 cm in air carrying currents of 42 Amps. (i) In same direction. (ii) In the opposite direction. | 10M | C03 | BL4 |
| 8         | a) What is displacement current? Explain briefly   | 5M  | C04 | BL2 |
|           | b) Explain about induced emf and derive the expressions for statically and dynamically.  | 5M  | C04 | BL2 |
| <b>OR</b> |  |     |     |     |
| 9         | Write and explain differential and integral form's of Maxwell's equations for fields varying harmonally with time  | 10M | C04 | BL5 |
| 10        | a) Derive the expressions for wave equations in electric field in free space.  | 5M  | C05 | BL3 |
|           | b) Develop equations of uniform plane waves in phasor form.  | 5M  | C05 | BL6 |
| <b>OR</b> |  |     |     |     |
| 11        | Define poynting vector and derive the expression for poynting theorem.   | 10M | C05 | BL1 |

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