

**GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN**

(Autonomous)

(Affiliated to Andhra University, Visakhapatnam)

II B.Tech. - II Semester Regular Examinations, April – 2026**EMF THEORY**

[Electrical and Electronics Engineering]

1. All questions carry equal marks
2. Must answer all parts of the question at one place

Time: 3Hrs.**Max Marks: 70****UNIT-I**

1. a. State Gauss's Law. Derive its differential form from integral form. [7M]
b. Derive the expression for electric field intensity due to an infinite line charge using Gauss law. [7M]

OR

2. a. Explain electric potential and derive the relation $E = -\nabla V$. [7M]
b. Three equal point charges of $2 \mu\text{C}$ are located at $(0,0,0)$, $(2,0,0)$, and $(0,2,0)$. [7M]

A charge of $5 \mu\text{C}$ is placed at $(2,2,0)$.

- i) Find electric field intensity at $(2,2,0)$
- ii) Determine force on the charge
- iii) Find magnitude and direction of resultant force

UNIT-II

3. a. Explain behavior of conductors in electrostatic field. [7M]
b. Derive boundary conditions for dielectric–dielectric interface. [7M]

OR

4. a. Derive the expression for capacitance of parallel plate capacitor with dielectric. [7M]
b. A parallel plate capacitor has plate area 200 cm^2 and separation 3 mm . The dielectric constant is 3.5 and applied voltage is 500 V . [7M]
 - i) Calculate capacitance
 - ii) Determine charge stored
 - iii) Find electric flux density
 - iv) Compute energy stored

UNIT-III

5. a. State and explain Ampere's Circuital Law in integral and differential forms. [7M]
b. Derive the expression for magnetic field intensity due to an infinite straight conductor using Biot-Savart law. [7M]

OR

6. a. Obtain the expression for force between two parallel current carrying conductors. [7M]
b. Two parallel conductors carry currents of 10 A each and are separated by 2 cm . Calculate force per unit length, nature of force and total force over 1 m length. [7M]

UNIT-IV

7. a. Differentiate between self and Mutual inductance and obtain the expression for self-inductance of a solenoid. [7M]
b. Derive expression for energy stored in magnetic field and energy density. [7M]

OR

8. a. Derive the expression for self-inductance of a toroid. [7M]
b. A solenoid has 2000 turns, length 0.5 m and diameter 4 cm. Compute inductance, energy stored for 2 A current and energy density. [7M]

UNIT-V

9. a. State and explain Faraday's laws, also derive Maxwell's fourth equation. [7M]
b. Describe displacement current and modification of Ampere's law. [7M]

OR

10. a. Distinguish between statically and dynamically induced EMF. [7M]
b. A circular loop of radius 20 cm lies in $z = 0$ plane. Magnetic field: $B = 10 \cos(377t) \text{ az mWb/m}^2$. [7M]
i) Find induced EMF
ii) Determine maximum EMF
iii) Comment on frequency effect