

II B. TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MARCH - 2022
ELECTROMAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time : 3 Hours

Max. Marks : 60

Note : Answer ONE question from each unit (5 × 12 = 60 Marks)

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UNIT-I

1. a) State and prove the Gauss law. [6M]
- b) A line charge  $\rho_L = 400\text{pC/m}$  lies along the X-axis. The surface of zero potential passes through the point P (0, 5, 12) m. Find the potential at point (2, 3, -4) m. [6M]

(OR)

2. a) Define potential function and properties of potential function. [6M]
- b) Point charges 1mC and -2mC are located at (3, 2, -1) and (-1, -1, 4), respectively. Calculate the electric force on a 10nC charge located at (0,3,1) and the electric field intensity at that point. [6M]

UNIT-II

3. a) Show that the displacement current in a capacitor is equal to the conduction current. [6M]
- b) Find the force per unit length on two long, straight, parallel conductors carrying a current of 10 A each in the same direction, if the distance between them is 20 cm. [6M]

(OR)

4. a) Define Capacitance and Expression for energy stored in a capacitor. [6M]
- b) Show that the capacitance of an isolated sphere of radius, R is given by  $4\pi\epsilon_0 R$ . [6M]

UNIT-III

5. a) Define BIOT-Savart law? How it will useful to derive H? Explain? [6M]
- b) A thin ring of radius 5 cm is placed on plane Z=1cm, so that its center is at (0,0,1) cm. If the ring carries 50mA along  $a_\phi$ . Find H at (i) (0, 0, -1) cm (ii) (0,0,10) cm. [6M]

(OR)

6. a) State and prove Ampere's circuit law. [6M]
- b) Consider a wire carrying a current 1 A bent into square of side 10m. Find the magnetic field intensity at the center of the square. [6M]

## UNIT-IV

7. a) Derive the expression for the force on a current element in a magnetic field. [6M]  
b) The force between two long parallel conductors placed 10cm from each other is 1.5kg/m. If conductor carries twice the current as the Other, calculate the current in each conductor. [6M]

(OR)

8. a) Derive Lorentz force equation. [6M]  
b) What is the maximum torque on a square loop of 100 turns in a field of uniform flux density 1wb/m<sup>2</sup>? The loop has a 10 cm side and carries a current of 3 A. [6M]

## UNIT-V

9. a) Derive Maxwells fourth equation. [6M]  
b) An air core solenoid of length 50cm long has an inductance of 10mH. [6M]  
The radius of solenoid is 2cm.Find the number of turns.

(OR)

10. a) Explain the terms motional emf and static emf. [6M]  
b) State and prove Poynting theorem. [6M]

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