

**2024  
(Session : 2022-26)**

*Time : 3 hours*

*Full Marks : 60*

*Candidates are required to give their answers in  
their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Answer from both the Groups as directed.*

**Group – A**

1. Answer the following questions : 1×5 = 5
- (a) The \_\_\_\_\_ product of two vectors results in a scalar quantity.
- (b) The law that states the magnetic field around a conductor carrying current is directly proportional to the current and inversely proportional to the distance from the conductor is called \_\_\_\_\_ law.

- (c) The electric potential inside a uniformly charged spherical shell is the same as on the surface of the shell. (True / False)
- (d) The displacement current is necessary to make Ampere's law consistent with the continuity equation for current. (True / False)
- (e) Write the expression for the Faraday's law of electromagnetic induction.
2. Given the vector field  $F = x^2i + y^2j + z^2k$ , find the divergence of F. 5
3. An electric dipole consists of two equal and opposite charges of magnitude  $2 \times 10^{-9}C$  separated by a distance of 0.05 m. Calculate the electric dipole moment of the dipole. 5

OR

Explain Lenz's law and its significance in electromagnetic induction.

**Group - B**

Answer any **three** questions of the following :

15×3 = 45

4. Calculate the electric potential due to a uniformly charged spherical shell. Discuss the potential both inside and outside the shell.

KW - 36/1

(2)

Contd.

5. Derive the expression for electrostatic potential due to uniformly charged spherical shell. Discuss the potential both inside and outside the shell.
6. Derive the expression for the capacitance of a parallel plate capacitor. Explain the effect of inserting a dielectric material completely filling the space between the plates.
7. Write short notes on diamagnetic, paramagnetic and ferromagnetic materials.
8. State Maxwell's four equations in both integral and differential forms. Explain how these equations unify the concepts of electricity and magnetism.



KW - 36/1 (900)

(3) FYU-ESUE(III) — Phy  
(MN - 1B)