[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5971 **J**

Unique Paper Code : 2222511201

Name of the Paper : Electricity and Magnetism

Name of the Course : **B.Sc. Prog. – Physical Sciences with Electronics/ Chemistry_NEP: UGCF-2022**

Semester : II

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use of non-programmable scientific calculator is allowed.
3. **All** questions carry equal marks.
4. Question No. **1** is compulsory.
5. Attempt any **Four** questions in total.

1. Answer any five of the following : (3×5=15)

   (a) An infinitely long wire has charge 2 μC/m. Calculate the intensity of electric field at a point distant 10 cm normal to the length of the wire.

   (b) If the electric field is $\vec{E} = 6\hat{i} + 3\hat{j} + 4\hat{k}$, calculate the electric flux through a surface of area 20 units lying in the y-z plane.

   (c) State three properties of para magnetic materials.

   (d) Prove that $\nabla . B = 0$.

   (e) Explain the concept of displacement current.

   (f) State and explain the Superposition theorem.

P.T.O.

2. (a) Derive an expression for electric potential and field at any point at a distance r from the centre of a dipole. (10)

   (b) Obtain the relation between polarization vector $\vec{P}$ and surface charge density of polarization charges. (5)

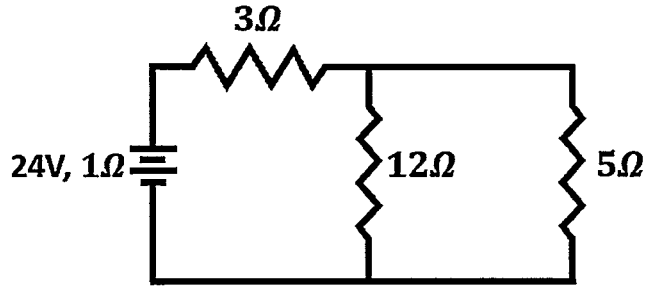
3. (a) Derive an expression for the magnetic field due to a current (I) carrying straight conductor of infinite length at a distance 'x'. (10)

   (b) A solenoid has a core of a material with relative permeability (μ_r) 400. The windings of the solenoid are insulated from the core and carry a current of 2 A. If it has 10 turns per cm, find the magnetic field (B) inside the solenoid. (5)

4. (a) Derive the four Maxwell's equations in differential form. (10)

   (b) Deduce the expression of self-inductance for an aircored solenoid of length '*l*' having N number of turns and area of cross-section A. (5)

5. (a) State Thevenin and Norton's theorem. Apply Thevenin's theorem to calculate the current flowing through 5Ω resistance (10)



   (b) Derive an expression for the capacitance of a parallel plate capacitor. (5)