KATWA COLLEGE

DEPARTMENT OF PHYSICS

INTERNAL ASSESSMENT EXAMINATION -2023

B.Sc. (H), SEMESTER: - II, PAPER: - CC - III (Electricity & Magnetism)

F.M: 10   TIME: 1 HOUR

❖ **Answer any five from the following questions: -**   **5 x 2 = 10**

1. A point charge q is situated at the position $\vec{r}_1$. What is the corresponding volume charge density? Justify your answer.

2. The electric field in a certain region is given by $\vec{E} = A\, r^3 \hat{r}$, A is constant. Prove that the corresponding volume density of charge is given by $\rho(r) = 5\epsilon_o A r^2$.

3. Show that the electrostatic field of a point charge is irrotational.

4. The electric potential at a point (x, y, z) is $\varphi(x, y, z) = \frac{A}{\sqrt{x^2+y^2+z^2}}$, A is constant. Find the electric field at (x, y, z).

5. Can the vector $\vec{E} = \left(4y\hat{\imath} - 2x\hat{\jmath} - \hat{k}\right)$ represent an electric field?

6. A charge q is projected with a speed $\vec{v} = 2\,\hat{\imath}$ in a region of space having magnetic field $\vec{B} = -4\hat{\jmath} + 9\hat{k}$. Find the force on the particle.

7. What are the dimensions of magnetic flux density $\vec{B}$? What is the physical meaning of the equation $\nabla.\vec{B} = 0$.

8. Write down the statement of Ampere's circuital law and verify it for a long straight current carrying conductor.