भारतीय सूचना प्रौद्योगिकी संस्थान कोटा
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (ECE)
Mid Term Examination, Even Semester 2023-24

ECE Departmental Core – Electromagnetic Theory (ECT208) Close Book
Marks: 30 (Weightage – 30%) Time: 90 minutes Date: March 21, 2024

Note: Attempt all questions.

1. A long cylinder carries a charge density that is proportional to the distance from the axis: $\rho = ks$, for some constant k. Find the electric field inside this cylinder. [6]

2. Find out the expression of electric field $E(r,\theta)$ due the dipole arrangement shown in Fig. 1. [6]

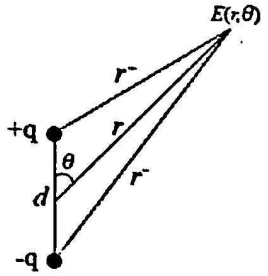

Fig. 1.

3. What will be the total force on a charge $+Q$ moving at a velocity v along the direction of a magnetic field B and electric field E? Write the continuity equation. Derive the expression of force between two current carrying conductors separated by a constant distance d carrying current I_1 and I_2 in the same direction. [1+2+3]

4. Write the expression of magnetic field at a distance r from a volume current source with density $J(r')$. Prove that divergence of the magnetic field is zero. [2+4]

5. If electric potential in some region can be given as $V = (10/r^2)\sin\theta\cos\varphi$ then determined at $(2, \pi/2, 0)$. Calculate the work done to move a 10μC charge from point A $(1, 30^0, 120^0)$ to point B $((4, 90^0, 60^0)$. [2+4]

*** *End* ***