



Attempt all questions:

50 marks

Q No 01

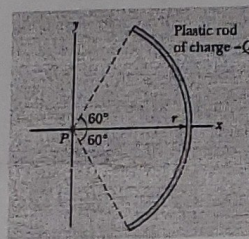
Short answers

1. Write the equation for magnetic field due to a current carrying wire. (1)
2. What is μ_0 and ϵ_0 ? Explain their significance in terms of Electric and Magnetic field. (2)
3. Why magnetic monopoles do not exist? (1)
4. Write four fundamental forces along with their magnitudes. (2)
5. What is resistance and resistivity? (2)
6. Explain the current density. (2)

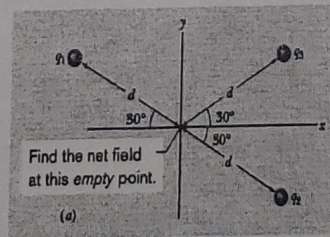
Q No 02

Extensive Part

1. (a) Figure shows a plastic rod with a uniform charge $-Q$. It is bent in a 120° circular arc of radius r and symmetrically placed across an x-axis with the origin at the centre of curvature P of the rod. In terms of Q and r , what is the electric field due to the rod at point P ? (5)



- (b) Figure shows three particles with charges $q_1 = 2Q$, $q_2 = -2Q$, and $q_3 = -4Q$, each a distance d from the origin. What net electric field is produced at the origin. (5)



2. (a) The current density in a cylindrical wire of radius $R=2.0$ mm is uniform across a cross section of the wire and is $J=2.0 \times 10^5$ A/m². What is the current through the outer portion of the wire between radial distances $R/2$ and R ? (5)
- (b) Suppose, instead, that the current density through a cross section varies with radial distance r as $J = ar^2$, in which $a = 3.0 \times 10^{11}$ A/m⁴ and r is in meters. What now is the current through the same outer portion of the wire? (5)
3. (a) When a uniform magnetic field B is applied to a conducting strip carrying current i , with the field perpendicular to the direction of the current, a Hall-effect potential difference V is set up across the strip. Explain this effect and moreover calculate the value of number density. (6)

- (b) The electric field in a region of space has the components $E_y = E_z = 0$ and $E_x = (4.00 \text{ N/C}) x$. Point A is on the y-axis at $y = 3.00 \text{ m}$, and point B is on the x-axis at $x = 4.00 \text{ m}$. What is the potential difference $V_B - V_A$? (4)
4. (a) Explain Faraday's Day law of electromagnetic induction with different experiments. (6)
(b) What is the significance of negative sign in this law. (4)
5. (a) Explain the law of Biot – Savart law. (4)
(b) Find the magnetic field of Solenoids and toroid's using Ampere's Law. (4+2)

GOOD LUCK