Ch—04 Moving Charges and Magnetism

Daily Practice Problem 03

Q1. A wire of radius 0.5 cm carries a current of 100 A, which is uniformly distributed over its cross-section. Find the magnetic field

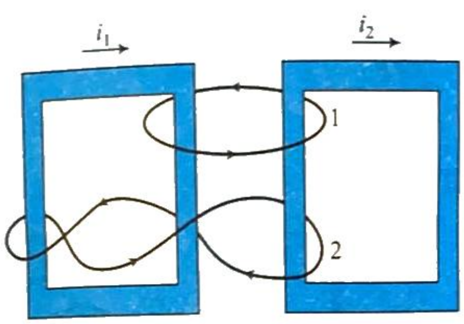
(i) at 0.1 cm from the axis of the wire,

(ii) at the surface of the wire and

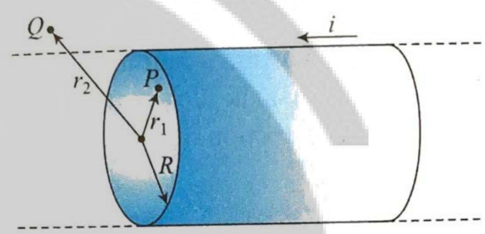
(iii) at a point outside. the wire 0.2 cm from the surface of the wire.

Q2. A long straight solid conductor of radius 4 cm carries a current of 2 A, which is uniformly distributed over its circular cross-section. Find the magnetic field at a distance of 3 cm from the axis of the conductor.

Q3. In the figure shown, two closed paths wrapped around two conducting loops carrying currents $i_1 = 8.0\ A\ and\ i_2 = 5.0\ A$. What is the value of the integral $\oint \vec{B}.d\vec{l}$ for **(i)** path 1 and **(ii)** path 2?



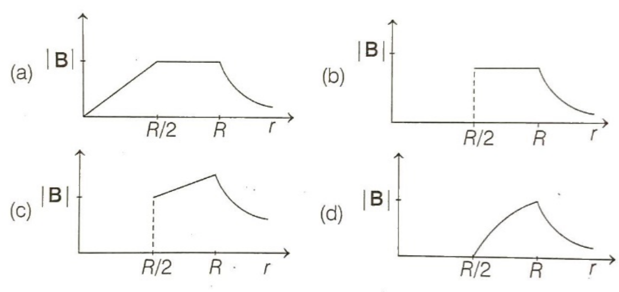
Q4. A long cylindrical conductor of radius R carries a current I as shown in figure. The current density J is a function of radius according to, $J = br$, where b is a constant. Find an expression for the magnetic field B.



a. at a distance $r_1 < R$ and

b. at a distance $r_2 > R$ measured from the axis.

Q5. An infinitely long hollow conducting cylinder with inner radius R/2 and outer radius R carries a uniform current density along its length. The magnitude of the magnetic field, $|B|$ as a function of the radial distance r from the axis is best represented by



ANSWERS

1. (i) $B_{inside} = 8.0 \times 10^{-4}\ T$

(ii) $B_{surface} = 4.0 \times 10^{-3}\ T$

(iii) $B_{outside} = 2.86 \times 10^{-5}\ T$

2. $7.5 \times 10^{-6}\ T$

3.(i) $-1.2\pi \times 10^{-6}\ T.m$

(ii) $-8.4\pi \times 10^{-6} T.m$

4. (a) $\frac{\boldsymbol{\mu_0 b r_1^2}}{\mathbf{3}}$

(b) $\frac{\mu_0 b R^3}{3r_2}$

5. d