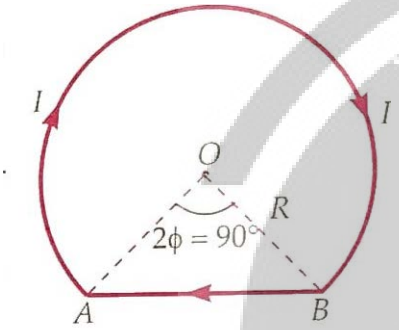
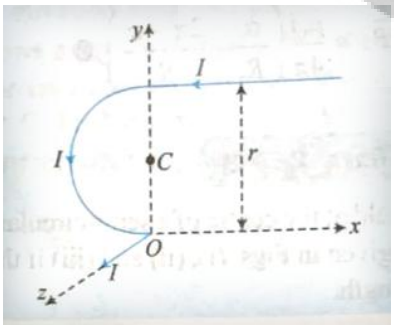
Ch—04 Moving Charges and Magnetism

Daily Practice Problem 02

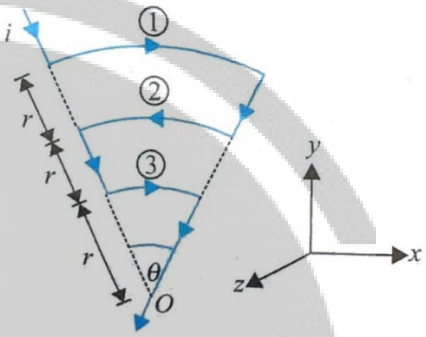
Q1. A current I = 5.0 A flows along a thin wire shaped as shown in Fig. The radius of the curved part of the wire is equal to R = 120 mm the angle $2\phi = 90°$. Find the magnetic induction of the field at the point O.



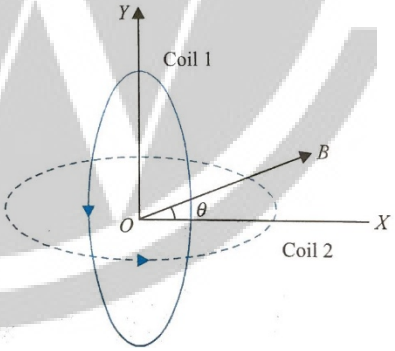
Q2. An infinitely long conductor as shown in figure carrying a current I with a semicircular loop on X- Y plane and two straight parts, one parallel to x-axis and another coinciding with semi-circular with Z-axis. What is the magnetic field at the centre C of the semicircular loop?



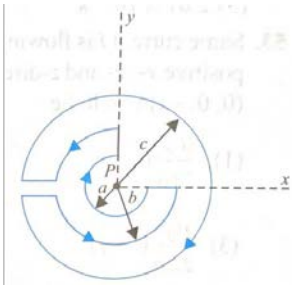
Q3. Shown in figure is a conductor carrying current I. Find the magnetic field intensity at point 0.



Q4. For the arrangement shown in figure, determine the magnetic field at center 0.



Q5. For $c = 2a$ if, the magnetic field at point P will be zero when



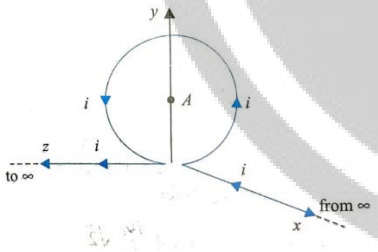
a. $a = b$

b. $a = \frac{3}{5}b$

c. $a = \frac{5}{3}b$

d. $a = \frac{1}{3}b$

Q6. Find the magnitude of the magnetic induction B of a magnetic field generated by a system of thin conductors along which a current i is flowing at a point $A\,(0, R, 0)$, that is the centre of a circular conductor of radius R. The ring is in yz plane.



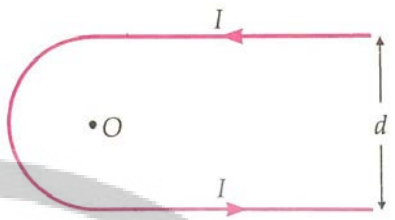
a. $B = \frac{\mu_0 i}{4\pi R}\sqrt{2\pi^2 - 2\pi + 1}$

b. $B = \frac{\mu_0 i}{4\pi R}\sqrt{2(2\pi^2 - 2\pi + 1)}$

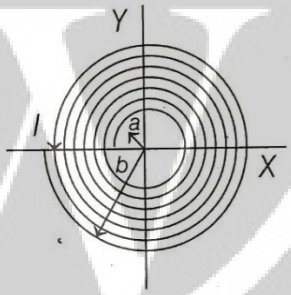
c. $B = \frac{\mu_0 i}{2\pi R}\sqrt{2\pi^2 - 2\pi + 1}$

d. None of these

Q7. In Fig. the curved portion is a semi-circle and the straight wires are long. Find the magnetic field at the point O.



Q8. A long insulated copper wire is closely wound as a spiral of N turns. The spiral has inner radius a and outer radius b. The spiral lies in the X-Y plane and a steady current I flows through the wire. The Z-component of the magnetic field at the centre of the spiral is



a. $\frac{\mu_0 NI}{2(b-a)}\ln\left(\frac{b}{a}\right)$

b. $\frac{\mu_0 NI}{2(b-a)}\ln\left(\frac{b+a}{b-a}\right)$

c. $\frac{\mu_0 NI}{2b}\ln\left(\frac{b}{a}\right)$

d. $\frac{\mu_0 NI}{2b}\ln\left(\frac{(b+a)}{b-a}\right)$

ANSWERS

1. $B = 2.8 \times 10^{-5}$

2. $\vec{B} = \frac{\boldsymbol{\mu_0 I}}{\boldsymbol{2\pi r}}[(1+\pi)\hat{k} - \hat{\imath}]$

3. $B = \frac{5\mu_0 I\theta}{24\pi R}\ \hat{k}$

4. $B = \frac{\mu_0}{2R}\sqrt{i_1^2 + i_2^2}$

5. C

6. b

7. $\frac{\mu_0}{2}\frac{I}{d}\ (1 + \frac{2}{\pi})$

8. a