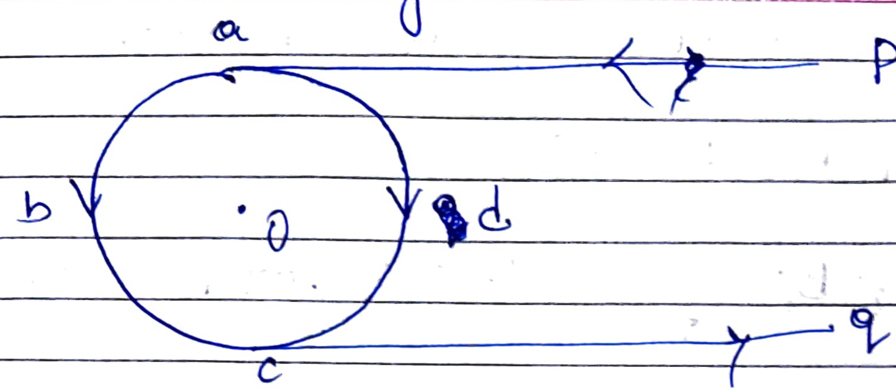
Name :- Pratik Kumar Muduli, seaction - DB
school.no :- 9703

Date
Page

Home Assignment

1)



Magnetic field at point O due to straight conductor PA is

$$B_1 = \frac{1}{2}\left[\frac{\mu_0 I}{2\pi r}\right]$$

$$= \frac{4\pi \times 10^{-7} \times 5}{4\pi \times 5 \times 10^{-2}} = 10^{-5} T$$

similarly, magnetic field at a point O due to straight conductor QC is

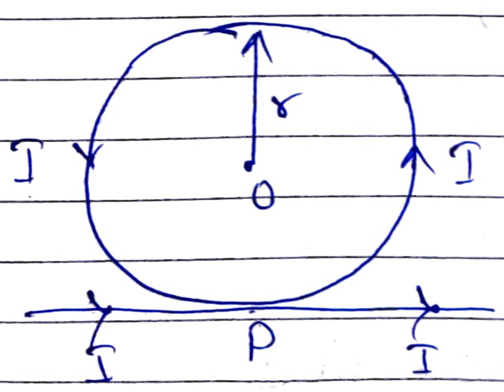
$$B_2 = \frac{\mu_0 I}{4\pi r} = 10^{-5} T$$

Both the magnetic field B_1 and B_2 are acting normally, so the total magnetic field $\vec{B}$ is

$$B = B_1 + B_2$$

$$= 10^{-5} + 10^{-5} = 2 \times 10^{-5} T$$

2)



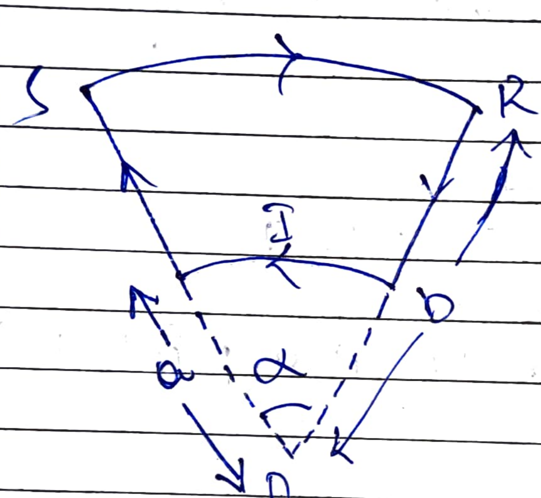
Magnitude of the magnetic field at O due to the straight part of the wire is $B_1 = \frac{\mu_0}{2\pi} \cdot \frac{I}{R}$

normally out of the plane of paper

Resultant field at O is

$$B = B_2 - B_1 = \frac{\mu_0 I}{2R}\left(1 - \frac{1}{\pi}\right)$$, normally into the plane of paper.

3)



Magnetic field due to slope line will be zero as they exist on same line

Due to circular arc.

$$B = \frac{\mu_0 I \theta}{4\pi r}$$

for $r = a$

$$\vec{B_1} = \frac{\mu_0 I \theta}{4\pi r} \text{ (outside)}$$

for $r = b$

$$\vec{B_2} = \frac{\mu_0 I b}{4\pi b} \text{ (inside)}$$

Net Magnetic field

$$B = B_1 - B_2 = \frac{\mu_0 I \theta}{4\pi}\left(\frac{1}{a} - \frac{1}{b}\right)$$

4) We know that $B = \frac{\mu_0 I}{2R}$

$$B_1 = \frac{\mu_0 I}{2R}$$

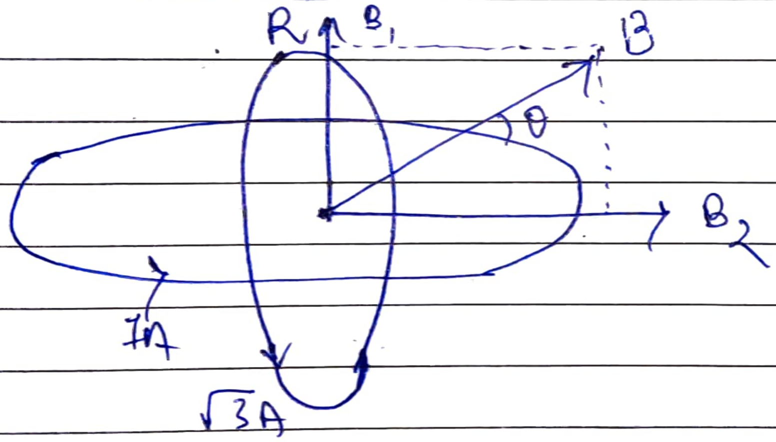
$$B_2 = \frac{\mu_0}{2R}\sqrt{3}$$

$$B = \sqrt{B_1^2 + B_2^2}$$

$$= \sqrt{\left(\frac{\mu_0}{2R}\right)^2 + \left(\frac{\mu_0}{2R}\cdot\sqrt{3}\right)^2}$$

$$B = \frac{\mu_0}{2R}\sqrt{1+3} = \frac{\mu_0}{2R}\cdot\sqrt{4}$$

$$B = \frac{\mu_0}{R}$$



$$\tan\theta = \frac{B_1}{B_2} = \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

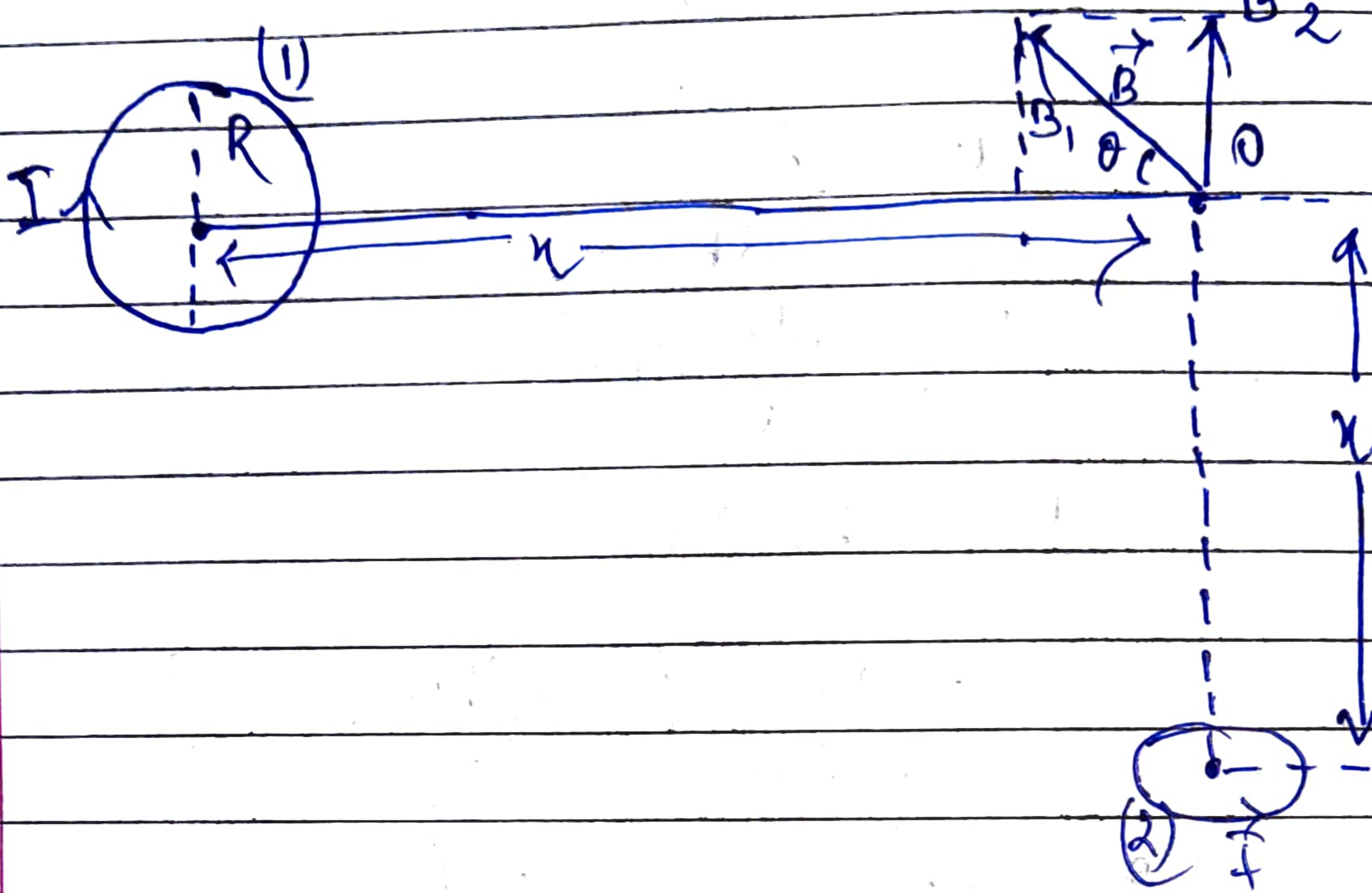
5) Magnetic field at point O due to circular loop (1) $B = \frac{\mu_0 I a^2}{2(a^2+x^2)^{3/2}}$, along the axis and twards the loop (1)

where a is the radius of the circular loop

Magnetic field at point O due to circular loop (2)

$B_2 = \frac{\mu_0 I a^2}{2(a^2+x^2)^{3/2}}$, along the axis and away from the loop (2)

Net Magnetic field at point O



(1)
R
I
x
B2
B
B1
θ
O
x
(2)
I