NORTH SOUTH UNIVERSITY

Department of Mathematics & Physics

Assignment – 10

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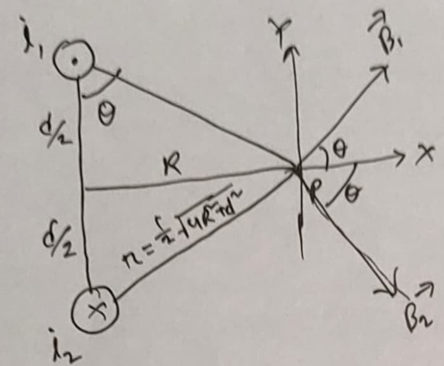
Course No.	: PHY 108
Course Title	: General Physics-II
Section	: 4
Date	: 07 June 2023

Ans. to the ques. no. 01



B_1 = Magnetic Field at P due to i_1

$$r = \sqrt{\left(\frac{d}{2}\right)^2 + R^2} = \sqrt{\frac{d^2}{4} + R^2} = \frac{1}{2}\sqrt{4R^2+d^2}$$

$$\therefore B_1 = \frac{\mu_0 i_1}{2\pi r} = \frac{\mu_0 i}{2\pi \cdot \frac{1}{2}\sqrt{4R^2+d^2}}$$

$$= \frac{\mu_0 i}{\pi\sqrt{4R^2+d^2}}$$

B_{1x} = x component of $\vec{B}_1$

$= B_1 \cos\theta$ (Right)

B_{1y} = y component of $\vec{B}_1$

$= B_1 \sin\theta$ (Up)

Again

B_2 = magnetic field ~~dut~~ at P due to i_2

$$r = \frac{1}{2}\sqrt{4R^2+d^2}$$

$$B_2 = \frac{\mu_0 i_2}{2\pi r} = \frac{\mu_0 i}{\pi\sqrt{4R^2+d^2}}$$

$$B_{2x} = B_2 \cos\theta \text{ (Right)}$$

$$B_{2y} = B_2 \sin\theta \text{ (up)}$$

B_{1y} and B_{2y} cancel each othen, because same magnitude and opposite dinection.

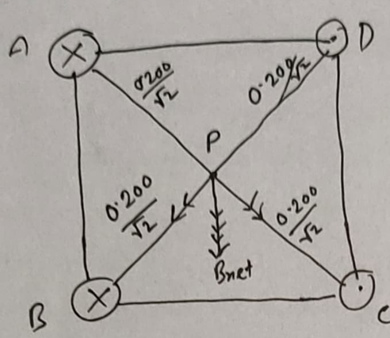
$$\therefore B_{net} = 2 B_1 \cos\theta$$

$$= 2 \times \frac{\mu_0 i}{\pi\sqrt{4R^2+d^2}} \cdot \frac{d}{2 \cdot \frac{1}{2}\sqrt{4R^2+d^2}}$$

$$B_{net} = \frac{2\mu_0 i d}{\pi(4R^2+d^2)}$$

(showed).

Ans. to the ques. no. 02



Here,

$$B_1 = \frac{\mu_0 i_1}{2\pi r} = \frac{4\pi \times 10^{-7} \times 5}{2\pi \times \frac{0.200}{\sqrt{2}}}$$

$$= 7.07 \times 10^{-6}\ T \text{ (Towards B)}$$

$$B_2 = \frac{\mu_0 i_2}{2\pi r} = \frac{4\pi \times 10^{-7} \times 5}{2\pi \times \frac{0.200}{\sqrt{2}}}$$

$$= 7.07 \times 10^{-6}\ T \text{ (towards C)}$$

$$B_3 = \frac{\mu_0 i_3}{2\pi r} = \frac{4\pi \times 10^{-7} \times 5}{2\pi \times \frac{0.200}{\sqrt{2}}}$$

$$= 7.07 \times 10^{-6}\ T \text{ (Toward B)}$$

$$B_4 = \frac{\mu_0 i_4}{2\pi r} = \frac{4\pi \times 10^{-7} \times 5}{2\pi \times \frac{0.200}{\sqrt{2}}}$$

$$= 7.07 \times 10^{-6}\ T \text{ (Towards C)}$$

$$\therefore B_{net} = \sqrt{(B_1+B_3)^2+(B_2+B_4)^2} \quad (-\hat{j})$$

$$= \sqrt{(2\times 7.07\times 10^{-6})^2+(2\times 7.07\times 10^{-6})^2} \quad (-\hat{j})$$

$$= -1.99\times 10^{-5}\ \hat{j}$$ [direction -y axis.]

Ans