NORTH SOUTH UNIVERSITY

Department of Mathematics & Physics

Assignment – 9

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Course No. : PHY 108
Course Title : General Physics-II
Section : 4
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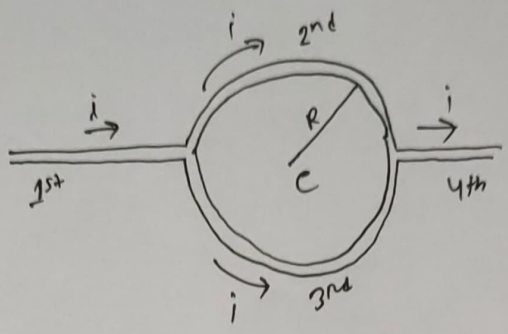
Ans. to the ques. no. 4



Using Biot and Savart Law:

1st Part,

$$B_1 = \frac{\mu_0 i\phi}{4\pi R}$$

$$d\vec{B}_1 = \frac{\mu_0 i d\vec{s} \times \vec{r}}{4\pi r^3} = \frac{\mu_0 i ds r \sin\theta}{4\pi r^3} \quad ; \theta = 0°$$

$$= 0$$

4th Part,

$$d\vec{B}_4 = \frac{\mu_0 i ds r \sin\theta}{4\pi r^3} \quad ; \theta = 180°$$

$$= 0$$

2nd Part,

$$B_2 = \frac{\mu_0 i\phi}{4\pi R} = \frac{\mu_0 \frac{i}{2} \cdot \pi}{4\pi R} \ (\otimes)$$

3rd Part,

$$B_3 = \frac{\mu_0 \frac{i}{2} \pi}{4\pi R} \quad (\odot)$$

Therefore,

$$B_{net} = B_2 + B_3$$

$$= 0 \quad [\because \text{Magnitude same and opposite direction.}]$$

Ans. to the ques. no. 07

Given that,

radius, $a = 13.5$ cm

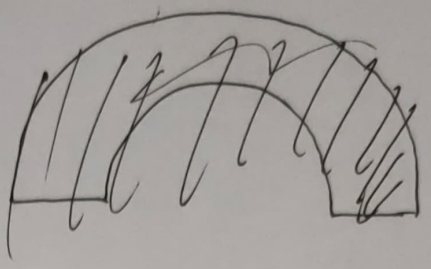
$= 0.135$ m

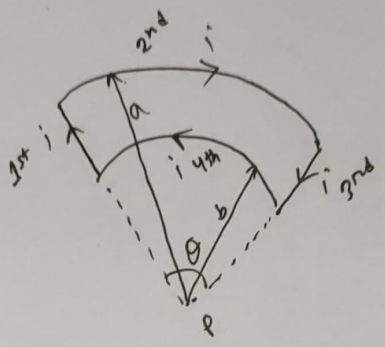
radius, $b = 10.7$ cm

$= 0.107$ m

angle, $\theta = 74^\circ = \frac{74\pi}{180}$ radian

$i = 0.411$ A





a)

1st Part,

$$d\vec{B}_1 = \frac{\mu_0 i d\vec{s} \times \vec{r}}{4\pi r^3} = \frac{\mu_0 i ds r \sin\theta}{4\pi r^3} \quad ; \theta = 180°$$

$$= 0$$

3rd Part,

$$d\vec{B}_3 = \frac{\mu_0 i ds r \sin\theta}{4\pi r^3} \quad ; \theta = 0°$$

$$= 0$$

2nd Part,

$$B_2 = \frac{\mu_0 i \phi}{4\pi R} = \frac{4\pi \times 10^{-7} \times 0.411 \times 74\pi}{4\pi \times 0.135 \times 180}$$

$$= 3.93 \times 10^{-7} \text{ T} \quad \text{(into the page)}$$

4th Part,

$$B_4 = \frac{\mu_0 i \phi}{4\pi R} = \frac{4\pi \times 10^{-7} \times 0.411 \times 74\pi}{4\pi \times 0.107 \times 180}$$

$$= 4.96 \times 10^{-7} \text{ (Out of the page)}$$

Here,

$$B_4 > B_2$$

Therefore,

$$B_{net} = B_4 - B_2 \quad [\text{As they are opposite direction}]$$

$$= (4.96 \times 10^{-7} - 3.93 \times 10^{-7}) \text{ T}$$

$$= 1.03 \times 10^{-7} \text{ T (Out of the page)}$$

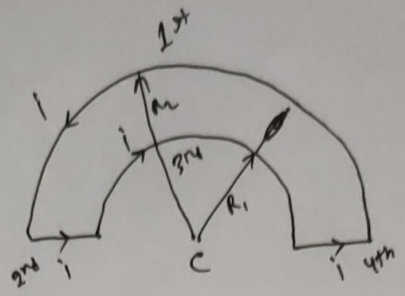
Ans. to the ques. no. 08

Given,

Radius. $R_2 = 7.80 \text{ cm} = 0.078 \text{ m}$

$R_1 = 3.15 \text{ cm} = 0.0315 \text{ m}$

$i = 0.281 \text{ A}$



2nd Part,

$$d\vec{B} = \frac{\mu_0 i d\vec{s} \times \vec{R}}{4\pi R^3} = \frac{\mu_0 i ds \sin\theta}{4\pi R^3} \quad [\because \theta = 0^\circ]$$

$$= 0$$

4th Part,

$$d\vec{B} = \frac{\mu_0 i d\vec{s} \times \vec{R}}{4\pi R^3} = \frac{\mu_0 i ds \sin\theta}{4\pi R^3} \quad [\because \theta = 180^\circ]$$

$$= 0$$

1st Part,

$$B_1 = \frac{\mu_0 i \phi}{4\pi R} = \frac{4\pi \times 10^{-7} \times 0.281 \times \pi}{4\pi \times 0.078}$$

$$= 1.13 \times 10^{-6} \text{ T} \quad (\text{Out of the page})$$

3rd Part,

$$B_3 = \frac{\mu_0 i \phi}{4\pi R} = \frac{4\pi \times 10^{-7} \times 0.281 \times \pi}{4\pi \times 0.0315}$$

$$= 2.80 \times 10^{-6} \text{ T} \quad (\text{into the page})$$

Here,

$B_3 > B_1$

Therefore,

$B_{net} = B_3 - B_1$

$= (2.80 \times 10^{-6} - 1.13 \times 10^{-6})\ T$

$= 1.67 \times 10^{-6}\ T$ (into the page)

Ans

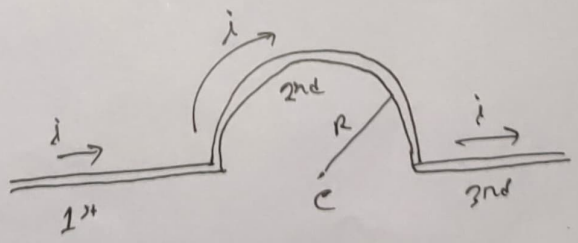
Ans. to the ques. no.: 10

Given,

Radius, $R = 9.26\ cm = 0.0926\ m$

length, $L = 13.1\ cm = 0.131\ m$ (Don't need)

current, $i = 34.8\ mA = 34.8 \times 10^{-3}\ A$



1st Part,

$$d\vec{B} = \frac{\mu_0 i\, d\vec{s} \times \vec{R}}{4\pi R^3} = \frac{\mu_0 i\, ds \sin\theta}{4\pi R^3} \qquad [\because \theta = 0^\circ]$$

$$= 0$$

3rd Part,

$$d\vec{B} = \frac{\mu_0 i\, ds \sin\theta}{4\pi R^3} \qquad [\because \theta = 180^\circ]$$

$$= 0$$

2nd Part,

$$B_2 = \frac{\mu_0 i\phi}{4\pi R} = \frac{4\pi \times 10^{-7} \times 34.8 \times 10^{-3} \times \pi}{4\pi \times 0.0926}$$

$$= 1.18 \times 10^{-7}\ T \text{ (into the page)}$$