Assignment #3

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Q2:-

Given:-

$m = 10g$ $q = 80\times10^{-6}C$

$V = (20\times10^{3})\hat{i}\ ms^{-1}$ $g = -9.8\hat{j}\ ms^{-2}$

$B = ?$

Solution:-

$F = mg$ & $F = qvB$

As $v \perp B$ so $\theta = 90^{\circ}$

$\sin 90^{\circ} = 1$

So,

$qVB = mg$

$B = \frac{mg}{qV}$

$B = \frac{10\times10^{-3}\times -9.8}{80\times10^{-6}\times20\times10^{3}}$

$\boxed{B = -0.061\ T\ \hat{k}}$

Q14:-

Given:-

$B = 1.20\ mT$ $V = V_x - V_y = 3.90\ \mu V$

$d = 0.850\ cm = 0.85\times10^{-2}\ m$

$V = ?$

Sol:-

We know that

$V = \frac{E}{d} = \frac{[V_x - V_y]}{\frac{d_{xy}}{B}}$

$V = \frac{3.9\times10^{-6}}{(0.85\times10^{-2})(1.2\times10^{-3})}$

$\boxed{V = 0.382\ ms^{-1}}$

Q39:-

$i = 5000\ A$ $\quad L = 100 m$

$B = 60 \times 10^{-6}\ T$ $\quad \theta = 70^\circ$

$F_{magnitude} = ?$ $\quad$ Direction = ?

Solution:-

$F = ILB \sin\theta$

$F = 5000 \times 100 \times 60 \times 10^{-6} \sin 70^\circ$

$\boxed{F = 28.2\ N}$

b)

Using right hand rule we can find that the direction of Force is West.

Q 40:-

$L = 1.80\ m$ $\quad i = 13A$

$\theta = 35^\circ$ $\quad B = 1.50\ T$

$F = ?$

Solution:-

$F = ILB \sin\theta$

$= 13 \times 1.80 \times 1.50 \sin 35^\circ$

$\boxed{F = 20.1\ N}$ Ans

Chap # 28

Q 3:-

$B = 39 \times 10^{-6}\ T$

$r = 8 \times 10^{-2}\ m$

$I = ?$

Sol:-

$$B = \frac{\mu_0 I}{2\pi r}$$

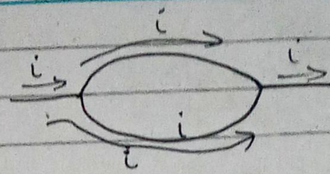
$$I = \frac{B\,2\pi r}{\mu_0} = \frac{39 \times 10^{-6} \times 2 \times \pi \times 8 \times 10^{-2}}{4\pi \times 10^{-7}}$$

$\boxed{I = 16A}$

Q4

$i = 5$ A

B at centre = ?



Sol :-

Since conductor is split into 2 identical semi-circles, they both will have some magnetic field B and will cancel each other at centre C:-

So at C $\boxed{B = 0}$

Q35:-

$i_1 = 4 \times 10^{-3}$ A $\quad$ $i_2 = 6.8 \times 10^{-3}$ A

$d_1 = 2.4 \times 10^{-2}$ m $\quad$ $d_2 = 5 \times 10^{-2}$ m

$$\frac{F_{21x}}{L} = ?$$

Sol:-

$$r = \sqrt{d_1^2 + d_2^2}$$

$$r = \sqrt{(2.4\times10^{-2})^2 + (5\times10^{-2})^2}$$

$$r = 0.05 \text{ m}$$

The x-component of force is

$F_{21x} = F_{21} \cos\theta$ $\qquad$ $\therefore \theta = \frac{d_2}{r}$

So,

$$\frac{F_{21x}}{L} = \frac{\mu_o i_1 i_2 d_2}{2r\pi\sqrt{d_1^2 + d_2^2}}$$

$$= \frac{(4\pi\times10^{-7})(4\times10^{-3})(6.8\times10^{-3})(0.050)}{2\pi(0.5)(0.05)}$$

$$= \boxed{8.84 \times 10^{-11} \text{ N/m}} \text{ Ans}$$

Q42

$J = 15\ A m^{-2}$ $\quad d = 20 \times 10^{-2}\ m$

$\mu_o = 4\pi \times 10^{-7}\ Tm/A$ $\quad A = \frac{1}{2}(4d)(3d)$

$\quad = 6d^2$

Solution:-

$$\oint \vec{B} \cdot \vec{ds} = \mu_o i = \mu_o j A$$

$$= (4\pi \times 10^{-7})(15)(6d^2)$$

$$= (4\pi \times 10^{-7})(15)(6)(0.04) \quad \because d = 20 \times 10^{-2}$$

$$= \boxed{4.52 \times 10^{-6}\ T.m}$$