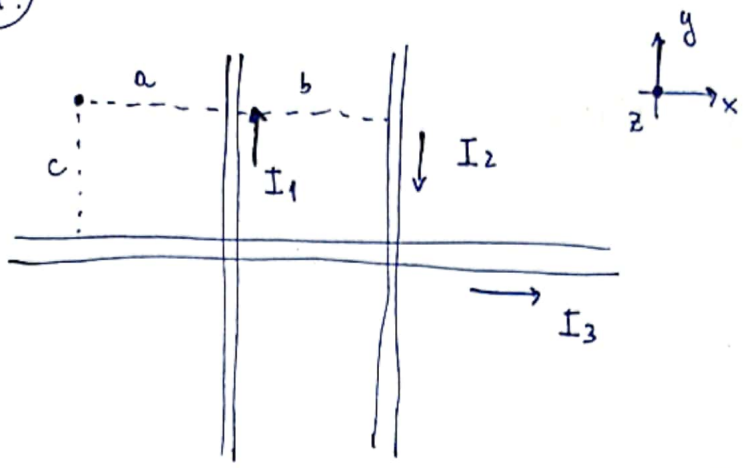
PAUTA TAREA 4

1.-



a) $\vec{B} = \vec{B}_1 + \vec{B}_2 + \vec{B}_3$

$$= \frac{\mu_0 I_1}{2\pi a}\hat{k} + \frac{\mu_0 I_2}{2\pi(a+b)}(-\hat{k}) + \frac{\mu_0 I_3}{2\pi c}\hat{k}$$

$$= \frac{\mu_0}{2\pi}\left[\frac{2,6}{0,054}\hat{k} + \frac{5,1}{0,082}(-\hat{k}) + \frac{3,2}{0,073}\hat{k}\right]$$

$$= \frac{2\pi\cdot 10^{-7}}{2\pi}\left[48,148\,\hat{k} + 62,195\,(-\hat{k}) + 43,836\,\hat{k}\right]$$

$$= 5,958\cdot 10^{-6}\,\hat{k}\ [T]$$ //

$\hat{i}$ $\hat{k}$ $\hat{j}$

b) $\vec{F}_m = q\vec{v}\times\vec{B}$

$$= 5,8\cdot 10^{-3}\left(50\cos 60\,(-\hat{i}) + 50\,\text{sen}\,60\,\hat{j}\right)\times 5,958\cdot 10^{-6}\hat{k}$$

$$= 8,639\cdot 10^{-7}\,\hat{j} + 1,496\cdot 10^{-6}\,\hat{i}\ [N]$$ //

c) $\vec{F} = I\vec{\ell}\times\vec{B}$

$$= I_2\vec{\ell}_2 \times \frac{\mu_0 I_1}{2\pi b}(-\hat{k})$$

$$= 5,1\cdot 2(-\hat{j})\times\frac{2\pi\cdot 10^{-7}\cdot 2,6}{2\pi\cdot 0,028}(-\hat{k})$$

$$\vec{F} = \frac{2\cdot 10^{-7}\cdot 5{,}1\cdot 2\cdot 2{,}6}{0{,}028}\,\hat{i}$$

$$= 1{,}894\cdot 10^{-4}\,\hat{i}\ \ [N]\ //$$

(2.-)

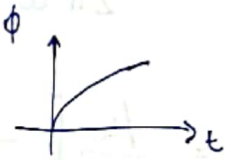
a) $$\phi = \int \vec{B}\cdot d\vec{S}$$

$$= \int \mu_0 n I\, dS$$

$$= \mu_0 n I \int dS$$

$$= 4\pi\cdot 10^{-7}\cdot 200\cdot 3\sqrt{t}\cdot[\pi\cdot(0{,}05)^2]$$

$$\phi(t) = 5{,}922\cdot 10^{-6}\sqrt{t}\ \ [Wb]\ //$$



b) $$\mathcal{E} = -N\frac{d\phi}{dt}$$

$$= -20\cdot\frac{d}{dt}\left[5{,}922\cdot 10^{-6}\sqrt{t}\right]$$

$$= -1{,}184\cdot 10^{-4}\cdot\frac{1}{2}\cdot(t)^{-1/2}$$

$$\mathcal{E}(t) = \frac{-5{,}922\cdot 10^{-5}}{\sqrt{t}}\ \ [V]\ //$$

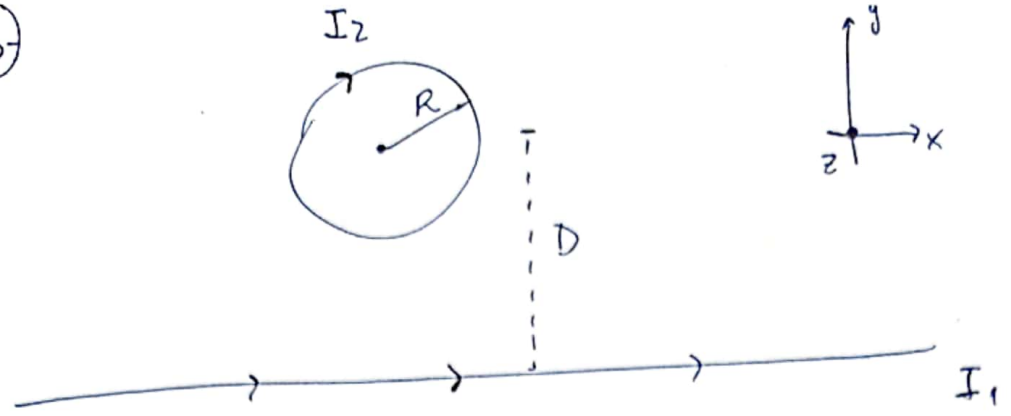
c) $$I = \frac{|\mathcal{E}|}{R}$$

$$I(t) = \frac{5{,}922\cdot 10^{-5}}{45\sqrt{t}}$$

$$= \frac{1{,}316\cdot 10^{-6}}{\sqrt{t}}\ \ [A]\ //$$

*) Como el flujo aumenta, entonces la Dirección es opuesta a la corriente del solenoide.

(3)



$$d\vec{B}_2 = \frac{\mu_0 I_2}{4\pi} \frac{d\theta}{R} (-\hat{u}) \quad :$$

CAMPO $d\vec{B}$ por un trozo infinitesimal $d\theta$ de alambre circular de radio "R" en su centro.

$$\vec{B}_2 = \frac{\mu_0 I_2}{4\pi R} \int_0^{2\pi} d\theta \, (-\hat{u})$$

$$= \frac{\mu_0 I_2}{4\pi R} 2\pi \, (-\hat{u}) = \frac{\mu_0 I_2}{2R} (-\hat{u})$$

$$= \frac{4\pi \cdot 10^{-7} \cdot 1}{2 \cdot 0{,}1} (-\hat{u}) = 6{,}28 \cdot 10^{-6} (-\hat{u}) \; [T]$$

Campo del alambre recto, en el centro del círculo:

$$\vec{B}_1 = \frac{\mu_0 I_1}{2\pi D} (\hat{u})$$

corriente hacia la derecha

$$\vec{B}_1 + \vec{B}_2 = \vec{0} \Rightarrow -\vec{B}_2 = \vec{B}_1$$

$$6{,}28 \cdot 10^{-6} \hat{x} = \frac{\mu_0 I_1}{2\pi D} \hat{x}$$

$$I_1 = \frac{2\pi \cdot 0{,}2 \cdot 6{,}28 \cdot 10^{-6}}{4\pi \cdot 10^{-7}}$$

$$\boxed{I_1 = 6{,}28 \; [A]}$$