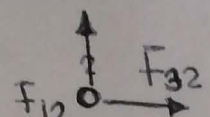
EYN501 - 01T - Parcial 3

① d ② d

① 

$$\frac{F_{12}}{\ell} = \frac{\mu_0 I_2 I_1}{2\pi a} = \frac{\mu_0 (3)(2)}{2\pi (0.25)} = 4.8 \frac{\mu N}{m} \quad 0.5$$

$$\frac{F_{32}}{\ell} = \frac{\mu_0 I_3 I_2}{2\pi a} = \frac{\mu_0 (3)(1)}{2\pi (0.25)} = 2.4 \frac{\mu N}{m} \quad 0.5$$

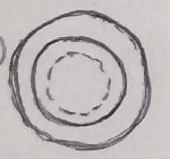
$4.8\hat{i} + 2.4\hat{j} \ \frac{\mu N}{m} \rightarrow \boxed{\vec{F} = 5.37 \mu N/m, \ \theta = 26.6^\circ}$ 0.5

② $B_a = \frac{\mu_0 I}{4\pi} \int \frac{d\vec{s}}{R^2} = \frac{\mu_0 I}{4\pi} \int \frac{R\,d\theta}{R^2} = \frac{\mu_0 I}{4\pi R} (\theta_b - \theta_a)$ 0.5

$B_1 = \frac{\mu_0 (0.65)(3)(\pi)}{4\pi (0.3)} = 2.04 \mu T$ Entrando (−) 0.5

$B_2 = \frac{\mu_0 (0.35)(3)(\pi)}{4\pi (0.3)} = 1.1 \mu T$ Saliendo (+) 0.5

$\boxed{\vec{B}_T = -0.94 \hat{k} \ \mu T}$ 0.5

③ @ 

$\oint \vec{B} \cdot d\vec{s} = \mu_0 I_{enc}^{\,0} \rightarrow \boxed{B = 0}$ 0.5

⑥ 

$\oint \vec{B} \cdot d\vec{s} = B \oint ds = BS = B(2\pi r) = \mu_0 I_{enc} = \mu_0 \left(\frac{r^2 - a^2}{b^2 - a^2} \right) J$ 0.5

$J' = J \rightarrow \frac{I_{enc}}{\pi (r^2 - a^2)} = \frac{I}{\pi (b^2 - a^2)} \Rightarrow I_{enc} \rightarrow I \left(\frac{r^2 - a^2}{b^2 - a^2} \right)$

$B = \frac{\mu_0 (1.2)}{2\pi (0.08)} \left(\frac{0.08^2 - 0.05^2}{0.1^2 - 0.05^2} \right) \rightarrow \boxed{B = 1.56 \mu T}$ 0.5

ⓒ $\oint \vec{B} \cdot d\vec{s} = B \oint ds = B(2\pi r) = \mu_0 I_{enc} = \mu_0 I$

$B = \frac{\mu_0 (1.2)}{2\pi (0.15)} \rightarrow \boxed{B = 1.6 \mu T}$ 0.5

④ $|\mathcal{E}| = \frac{d\Phi}{dt} = \frac{d(BA\cos\theta)}{dt} = A\frac{dB}{dt} = A\frac{\Delta B}{\Delta t} = L^2\left(\frac{B_f - B_o}{t_f - t_o}\right)$

$|\mathcal{E}| = (0.2)^2\left(\frac{0.4 - 1.2}{55\times10^{-3}}\right) = 0.58V$ 0.5

$I = \frac{\mathcal{E}}{R} = \frac{0.58}{10} \rightarrow \boxed{I = 58mA \circlearrowleft}$ 0.5 Valor 0.5 Sentido

⑤ $I(t) = I\left(1 - e^{-t/\tau}\right)$

ⓐ

$\tau = \frac{-t}{\ln\left(1 - \frac{IR}{\mathcal{E}}\right)} = \frac{-1.5}{\ln\left|1 - \frac{(120m)(15)}{8}\right|} = 5.88\,s$

$\tau = \frac{L}{R} \rightarrow L = \tau R = (5.88)(15) \rightarrow \boxed{L = 88.2\,H}$ 0.7

ⓑ $U = \frac{1}{2}LI^2 = \frac{1}{2}(88.2)(120\times10^{-3})^2$

$\boxed{U = 0.64J}$ 0.3