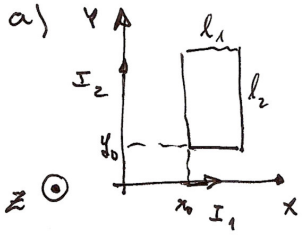
Versão A 2º mini-teste EBO LEAmb + LEMat + LQuim 28/11/2007

a)



$\oint(\vec{B}\cdot d\vec{s}) = \mu_0 I^{int}$: fios infinitos $\Rightarrow$ não l_1, l_2

I_1 $|B_1|\, 2\pi y = \mu_0 I_1$ $\quad \vec{B}_1 = \frac{\mu_0}{4\pi}\frac{2I_1}{y}\vec{e}_z$

I_2 $|B_2|\, 2\pi x = \mu_0 I_2$ $\quad \vec{B}_2 = \frac{\mu_0}{4\pi}\frac{2I_2}{x}(-\vec{e}_z)$

$$\vec{B}(x,y) = \frac{\mu_0}{4\pi}\, 2\left[\frac{I_1}{y} - \frac{I_2}{x}\right]\vec{e}_z \equiv B_z\,\vec{e}_z$$

b) $\Phi = \int_S (\vec{B}\cdot\vec{n})\, ds$ $\quad \vec{n} = \vec{e}_z$ $\odot \vec{n}$ logo $(\vec{B}\cdot\vec{n}) = B_z$ $\quad ds = dx\,dy$

$$\Phi_{espira} = \frac{\mu_0}{4\pi}\, 2\left[I_1 \int_{x_0}^{x_0+l_1} dx \int_{y_0}^{y_0+l_2} \frac{1}{y}\,dy - I_2 \int_{x_0}^{x_0+l_1}\frac{1}{x}\,dx \int_{y_0}^{y_0+l_2} dy\right]$$

$$\Phi_{TOTAL} = N\,\Phi_{espira} = \frac{\mu_0}{4\pi}\, 2N I_1 l_1 \ln\frac{y_0+l_2}{y_0} - \frac{\mu_0}{4\pi}\, 2N I_2 l_2 \ln\frac{x_0+l_1}{x_0}$$

c) $\Phi_{TOTAL} = L_1 I_1 - L_2 I_2$

$L_1 = \frac{\mu_0}{4\pi}\, 2N l_1 \ln\frac{y_0+l_2}{y_0}$ $\quad L_1 = 0{,}36\ \mu$ Henry

$L_2 = \frac{\mu_0}{4\pi}\, 2N l_2 \ln\frac{x_0+l_2}{x_0}$ $\quad L_2 = 0{,}35\ \mu$ Henry

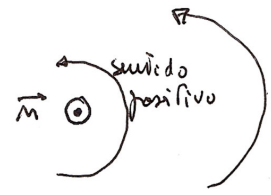
$$\Phi_{TOTAL} = (0{,}36 * 10^{-6} * 0{,}5\times 10^{-3}) - (0{,}35\times 10^{-6} * 2\times 10^{-3}) = -0{,}52 \text{ n Weber}$$

d) $\frac{d\Phi_{TOTAL}}{dt} = L_1\frac{dI_1}{dt} = L_1\,\alpha$ $\quad \varepsilon^{ind} = -\frac{d\Phi_{TOTAL}}{dt} = -L_1\,\alpha$

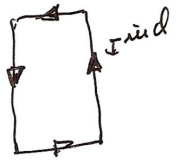
$I^{ind} = \frac{\varepsilon^{ind}}{R}$ $\quad I^{ind} = -\frac{L_1\alpha}{R}$ $\quad I^{ind} = -\frac{0{,}36\times 10^{-6} * (-0{,}1\times 10^{-3})}{15}$

$I^{ind} = +2{,}4\ p$A (constante no tempo)

e)



logo



NOTA: $\alpha < 0$ logo $\frac{d\Phi_{TOTAL}}{dt} < 0$

Pela Lei de Lenz $\Phi_{inicial} = \Phi_{TOTAL} + \Phi_{ind.}$ } logo $\Phi_{induzido} > 0$; $\vec{B}^{ind} \uparrow\uparrow \vec{n}$

na c) $\Phi_{inicial} = -0{,}52$ n Weber.

logo