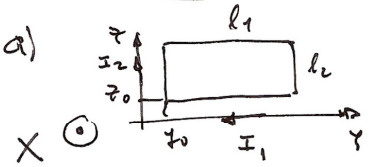
Versão B 2º mini Teste E80 LEAmb + LEMat + LQuí 28/11/2007

a)



$\oint (\vec{B}.d\vec{s}) = \mu_0 I^{int}$ fio infinito $\mathcal{L} \gg l_1, l_2$

I_1 $|B_1| 2\pi z = \mu_0 I_1$ $\quad \vec{B}_1 = \frac{\mu_0}{4\pi} \frac{2I_1}{z}(-\vec{e}_x)$

I_2 $|B_1| 2\pi y = \mu_0 I_2$ $\quad \vec{B}_2 = \frac{\mu_0}{4\pi} \frac{2I_2}{y}(-\vec{e}_x)$

$$\vec{B} = \frac{\mu_0}{4\pi} 2\left(\frac{I_1}{z} + \frac{I_2}{y}\right)(-\vec{e}_x) = B_x \vec{e}_x$$

b) $\Phi = \int_S (\vec{B}.\vec{n})\, dS$ $\quad \vec{n} = -\vec{e}_x$ $\otimes \vec{n}$ $\quad (\vec{B}.\vec{n}) = \frac{\mu_0}{4\pi} 2\left(\frac{I_1}{z} + \frac{I_2}{y}\right)$

$dS = dy\, dz$

$$\Phi_{espira} = \frac{\mu_0}{4\pi} 2 \left[I_1 \int_{y_0}^{y_0+l_1} dy \int_{z_0}^{z_0+l_2} \frac{dz}{z} + I_2 \int_{y_0}^{y_0+l_1} \frac{dy}{y} \int_{z_0}^{z_0+l_2} dz \right]$$

$$\Phi_{TOTAL} = N * \Phi_{espira} = \left[\frac{\mu_0}{4\pi} 2N l_1 \left(\ln \frac{z_0+l_2}{z_0}\right)\right] I_1 + \left[\frac{\mu_0}{4\pi} 2N l_2 \left(\ln \frac{y_0+l_1}{y_0}\right)\right] I_2$$

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

$L_1 = \frac{\mu_0}{4\pi} 2N l_1 \left(\ln \frac{z_0+l_2}{z_0}\right) = 2{,}6\,\mu Henry$

$L_2 = \frac{\mu_0}{4\pi} 2N l_2 \left(\ln \frac{y_0+l_1}{y_0}\right) = 1{,}76\,\mu Henry$

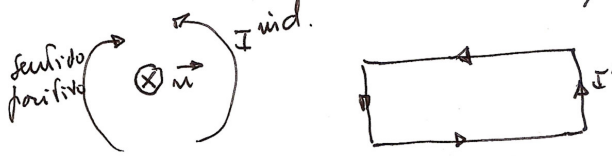
$\Phi_{TOTAL} = (2{,}6\times10^{-6} * 10^{-3}) + (1{,}76\times10^{-6} * 4\times10^{-3})$

$\Phi_{TOTAL} = 9{,}6\ n\ Weber$

d) $\frac{d\Phi_{TOTAL}}{dt} = L_1 \frac{dI_1}{dt} = 2L_1 \alpha t$ $\quad \varepsilon^{ind} = -\frac{d\Phi_{TOTAL}}{dt}$ $\quad \varepsilon^{ind} = R I^{ind}$

$$I^{ind} = -\frac{2L_1 \alpha t}{R}$$

e) $t = 2s \Rightarrow I^{ind} = -\frac{2 \times 2{,}6\times10^{-6} * 0{,}1 \times10^{-3} * 2}{171}$ $\quad \boxed{I = -0{,}11\ pA}$



NOTA: $\alpha > 0$ logo $\frac{d\Phi}{dt} > 0$

Lei de Lenz: $\Phi_{inicial} = \Phi_{TOT} + \Phi_{ind.}$ } logo $\Phi_{ind} < 0$;

na c) $\Phi_{inicial} = +9{,}6\,nW$