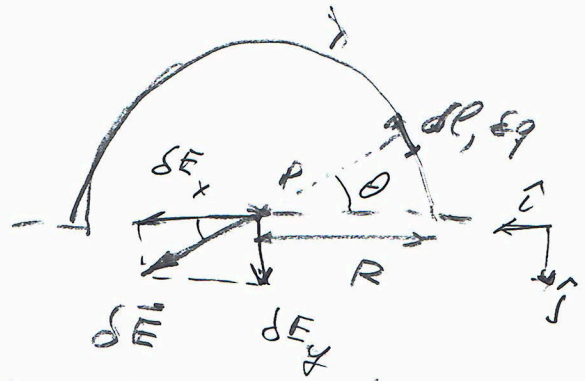
EXAMEN TECNÓLOGO MECÁNICO
FÍSICA II - 24/02/2021

Problema 1



$$\delta E = \frac{1}{4\pi\varepsilon_0}\frac{\delta q}{R^2} = \frac{1}{4\pi\varepsilon_0}\frac{\lambda\,\delta\ell}{R^2}$$

$$\delta E_y = \delta E \operatorname{sen}\theta = \frac{\lambda\,\delta\ell}{4\pi\varepsilon_0 R^2}\operatorname{sen}\theta$$

δE_x de los elementos a la derecha se anulan con los elementos simétricos a la izquierda.

$$\delta\ell = R\,\delta\theta \Rightarrow dE_y = \frac{\lambda}{4\pi\varepsilon_0 R}\operatorname{sen}\theta\,\delta\theta$$

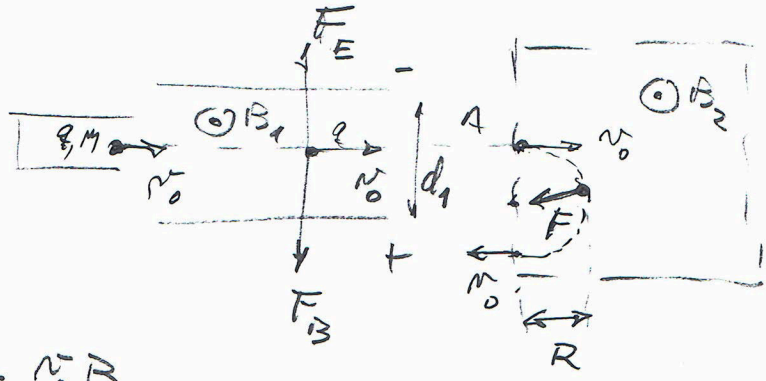
$$E_y = E_{TOTAL} = \int_0^{\pi}\frac{\lambda}{4\pi\varepsilon_0 R}\operatorname{sen}\theta\,d\theta = -\frac{\lambda}{4\pi\varepsilon_0 R}\cos\theta\Big|_0^{\pi}$$

a) $$\boxed{\vec{E}_{TOTAL} = \hat{j}\,\frac{\lambda}{2\pi\varepsilon_0 R}}$$

$$\delta V_p = \frac{1}{4\pi\varepsilon_0}\frac{\delta q}{R} = \frac{\lambda}{4\pi\varepsilon_0}\frac{\delta\ell}{R} \Rightarrow V_p = \int_0^{\pi R}\frac{\lambda\,d\ell}{4\pi\varepsilon_0 R}$$

b) $$\boxed{V_p = \frac{\lambda}{4\varepsilon_0}}$$

Problema 2



Mov. rect. y uniforme de la carga en la región 1 $\Rightarrow F_E = F_B$

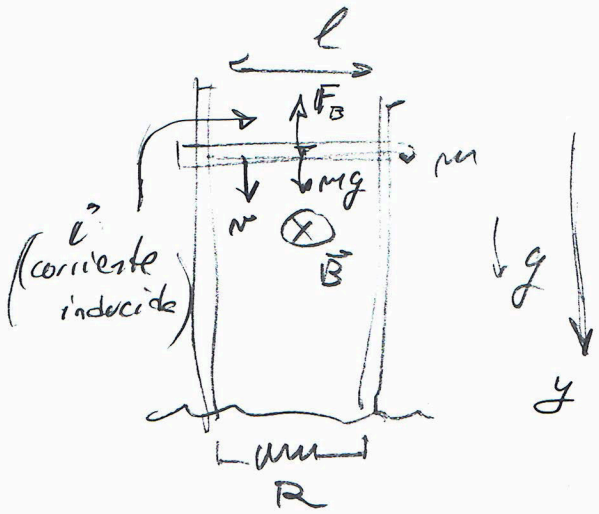
$$qE = qv_0B_1 \Rightarrow E = v_0B_1$$

$$E = \frac{\Delta V}{d_1} \Rightarrow \boxed{a)\ \Delta V = v_0 B_1 d_1}$$

$$F = qv_0B_2 = \frac{Mv_0^2}{R} \Rightarrow v_0 = \frac{qRB_2}{m} = \frac{\pi R}{\Delta t} \Rightarrow$$

$$\boxed{b)\ \Delta t = \frac{\pi m}{qB_2}}$$

Problema 3



$$F_{neta} = mg - F_B$$

$$ma = mg - BiL$$

$$i = \frac{\mathcal{E}}{R} = \frac{LvB}{R}$$

$$\Rightarrow ma = mg - \frac{B^2L^2v}{R} \Rightarrow \text{aceleración no es constante}$$

Porque depende de la velocidad, la fuerza magnética de la corriente inducida no es constante.

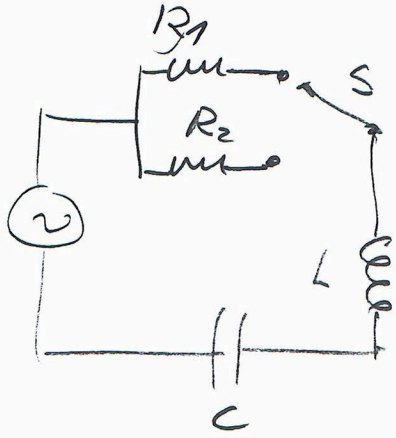
a) $\boxed{\frac{dv}{dt} = g - \frac{B^2L^2v}{mR}}$

Cuando $\frac{dv}{dt} = 0 \rightarrow g - \frac{B^2L^2v}{mR} = 0 \Rightarrow$

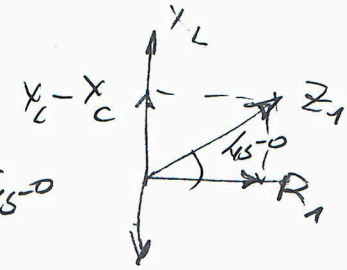
b) $\boxed{v = \frac{mgR}{B^2L^2}}$

Problema 4

$R_1 = 300\ \Omega$ $R_2 = 100\ \Omega$



Llave en R_1:

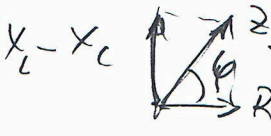


$X_L - X_C = R_1 \tan 45^\circ$

$X_L - X_C = 300\ \Omega$

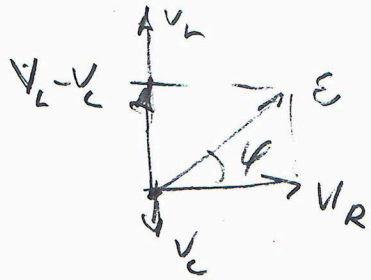
No cambia porque dependen de ω, L y C que no cambian.

Llave en R_2:



$\frac{X_L - X_C}{R_2} = \tan\varphi \Rightarrow \frac{300}{100} = \tan\varphi \Rightarrow$ **a) $\varphi = 71,5^\circ$**

$P = \frac{V_R^2}{R} = \frac{\mathcal{E}^2 \cos^2\varphi}{R}$ (V_R^2 → valor rms)



$P_1 = \frac{\mathcal{E}^2 \cos^2\varphi_1}{R_1}$ $P_2 = \frac{\mathcal{E}^2 \cos^2\varphi_2}{R_2}$

$\Rightarrow \frac{P_1}{P_2} = \frac{\cos^2\varphi_1 R_2}{\cos^2\varphi_2 R_1} = \frac{\cos^2 45^\circ \cdot 100}{\cos^2 71,5^\circ \times 300} \Rightarrow$ **b) $\frac{P_1}{P_2} = 1,66$**