Ejercicio 1

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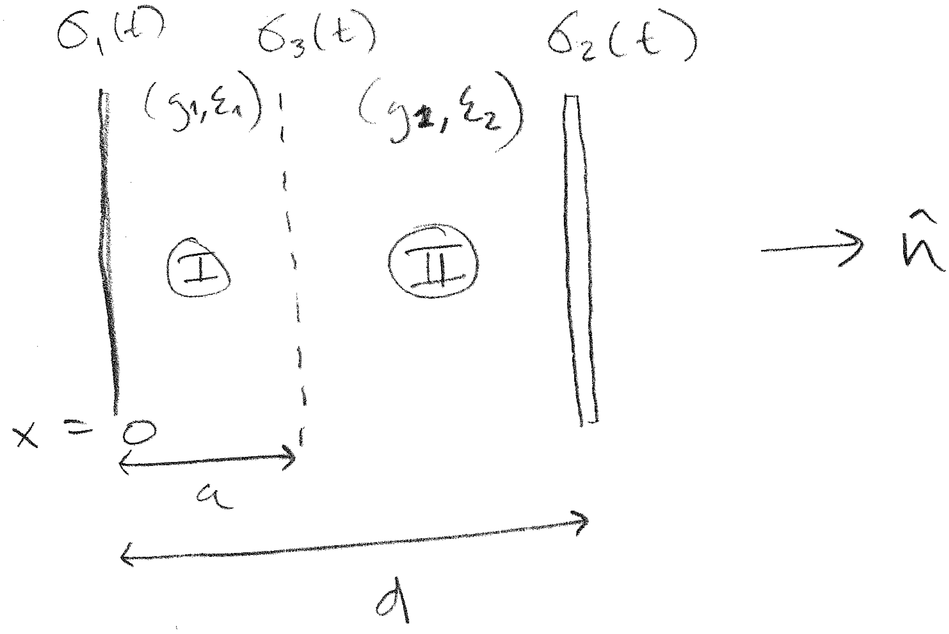

$$\rightarrow \quad \vec{J}_1 \cdot \hat{n}\Big|_{x=0} = -\dot{\sigma}_1$$

$$\vec{J}_2 \cdot \hat{n}\Big|_{x=d} = \dot{\sigma}_2$$

$$\vec{J}_1 \cdot n\Big|_{x=a} - \vec{J}_2 \cdot \hat{n}\Big|_{x=a} = \dot{\sigma}_3 = -(\dot{\sigma}_1 + \dot{\sigma}_2)$$

$$\rightarrow \quad \vec{E}_1 = \frac{\sigma_1}{\varepsilon_1}\hat{n}$$

$$\vec{E}_2 = -\frac{\sigma_2}{\varepsilon_2}\hat{n}$$

$$\boxed{\begin{array}{l} \sigma_3(t) = -(\sigma_1(t) + \sigma_2(t) \\ \sigma_3(t=0) = -(\sigma_1(t=0) + \sigma_2(t= \end{array}}$$

$$\dot{\sigma}_1 = -\frac{g}{\varepsilon_1}\sigma_1 \Rightarrow \sigma_1(t) = \sigma_{01} e^{-\frac{g}{\varepsilon_1}t}$$

$$\dot{\sigma}_2 = -\frac{g}{\varepsilon_1}\sigma_2 \qquad \sigma_2(t) = \sigma_{02} e^{-\frac{g}{\varepsilon_2}t}$$

$$\Rightarrow \boxed{\sigma_3(t) = -\sigma_{01}\, e^{-\frac{g_1}{\varepsilon_1} t} - \sigma_{02}\, e^{-\frac{g_2}{\varepsilon_2} t}}$$

b) $\phi_I(x,t) = A_I x + B_I$

$\phi_{II}(x,t) = A_{II} x + B_{II}$

$$\vec{E}_I = -\frac{\partial \phi_I}{\partial x}\hat{n} = -A_I \hat{n} = \frac{\sigma_1}{\varepsilon_1}\hat{n}$$

$$A_I = -\frac{\sigma_1}{\varepsilon_1}$$

$$A_{II} = \frac{\sigma_2}{\varepsilon_2}$$

Continuidad $\quad \phi_I(x=a) = \phi_{II}(x=a)$

$$A_I a + \underbrace{\cancel{B_I}}_{0} = A_{II} a + B_{II}$$

$$B_{II} = (A_I - A_{II})\, a$$

$$\phi_I = -\frac{\sigma_1}{\varepsilon_1} x$$

$$\phi_{II} = \frac{\sigma_2}{\varepsilon_2} x - \left(\frac{\sigma_1}{\varepsilon_1} + \frac{\sigma_2}{\varepsilon_2}\right) a$$

Ej 2

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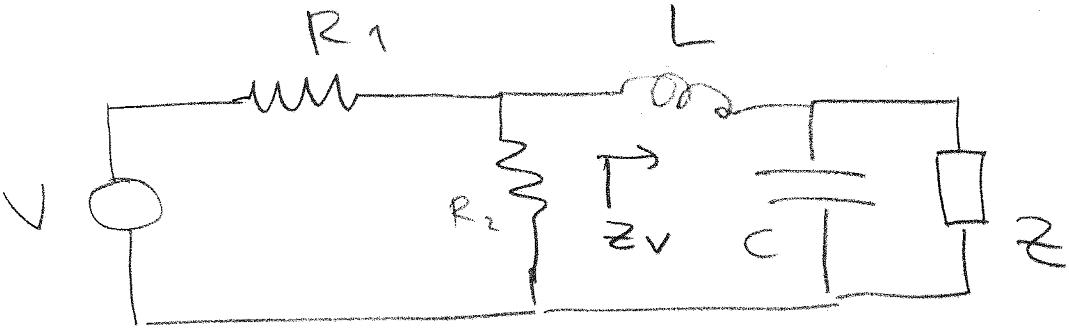

$$\rightarrow Z_v = Lj\omega + \frac{\frac{1}{Cj\omega} Z}{Z + \frac{1}{Cj\omega}} =$$

$$\boxed{Z_v = Lj\omega + \frac{Z}{Cj\omega Z + 1}}$$

a) Busco $Z_v = 0$ para potencia máxima

$$Z = -Lj\omega(Cj\omega Z + 1)$$

$$= LC\omega^2 Z - Lj\omega$$

$$\boxed{Z = \frac{-Lj\omega}{1 - LC\omega^2} = \frac{jL\omega}{LC\omega^2 - 1}}$$

b) Busco $Z_v = \infty$ para potencia mínima

$$Z = -\frac{1}{Cj\omega} = \frac{j}{C\omega}$$

Examen Dic 2010

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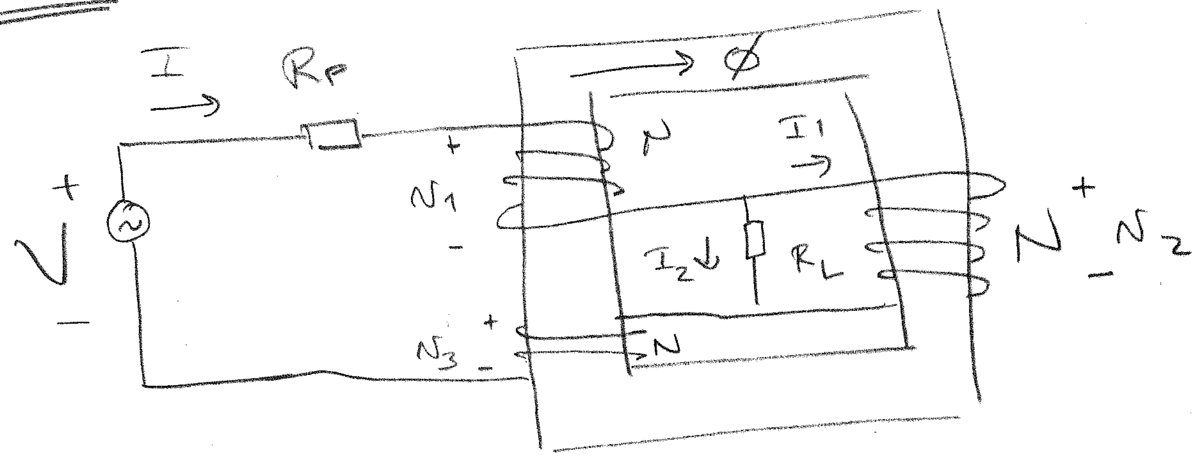
Ej 3



→ Circuito magnético

$$R\phi = 2Ni - Ni_1$$

→ Faraday

$$V_1 = \frac{dN\phi}{dt} = V_3$$

$$V_2 = -\frac{dN\phi}{dt}$$

→ Mallas (Trabajo con fasores ahora)

$$V = IR_F + \cancel{V_1} + \cancel{V_2} + V_3$$

$$V = IR_F + V_3 = IR_F + V_1$$

→ $$V_1 = \frac{2N^2}{R} I jw - \frac{N^2}{R} I_1 jw$$

$$\Rightarrow V = IR_F + \frac{2N^2}{R} I j\omega - \frac{N^2}{R} I_1 j\omega$$

$$\rightarrow I_2 R_L = \frac{N^2}{R} I_1 j\omega - \frac{2N^2}{R} I j\omega$$

$$(I - I_1) R_L = \frac{N^2}{R} I_1 j\omega - \frac{2N^2}{R} I j\omega$$

$$I_1 = \frac{\overbrace{\left(\frac{2N^2}{R} j\omega + R_L\right)}^{H} I}{\left(\frac{N^2}{R} j\omega + R_L\right)}$$

$$V = I\left(R_F + \frac{2N^2}{R} j\omega\right) - \frac{N^2}{R} j\omega H \; I$$

$$I = \frac{V}{R_F + \frac{2N^2}{R} j\omega - \frac{N^2}{R} j\omega H}$$

$$= \frac{V \left(\frac{N^2}{R} j\omega + R_L\right)}{\left(\frac{N^2}{R} j\omega + R_L\right)\left(R_F + \frac{2N^2}{R} j\omega\right) - \frac{N^2}{R} j\omega \left(\frac{2N^2}{R} j\omega + R\right.}$$

$$= \frac{V \left(\frac{N^2}{R} j\omega + R_L\right)}{\frac{2R_L N^2}{R} j\omega + \frac{R_F N^2}{R} j\omega + R_L R_F - \frac{R_L N^2}{R} j\omega}$$

$$\Rightarrow \quad I = \frac{V\left(\frac{N^2}{R} j\omega + R_L\right)}{\frac{N^2}{R} j\omega (R_L + R_F) + R_L R_F}$$

$$I_1 = \frac{V\left(\frac{2N^2}{R} j\omega + R_L\right)}{(\qquad)}$$

$$\Rightarrow \quad \boxed{\phi = \frac{N \; R_L \; V}{R\left[(R_L + R_F)\frac{N^2 j\omega}{R} + R_L R_F\right]}}$$

$$\longrightarrow \quad I_2 = I - I_1$$

$$\boxed{I_2 = -\frac{V \frac{N^2}{R} j\omega}{\left[\frac{N^2 j\omega}{R}(R_L + R_F) + R_L R_F\right]}}$$

$$P = \frac{R_L}{2} |I_2|^2 = \frac{R_L}{2} \frac{\left(\frac{N^2}{R}\omega\right)^2 |V|^2}{\left[(R_L R_F)^2 + \left(\frac{N^2 \omega (R_L + R_F)}{R}\right)^2\right]}$$