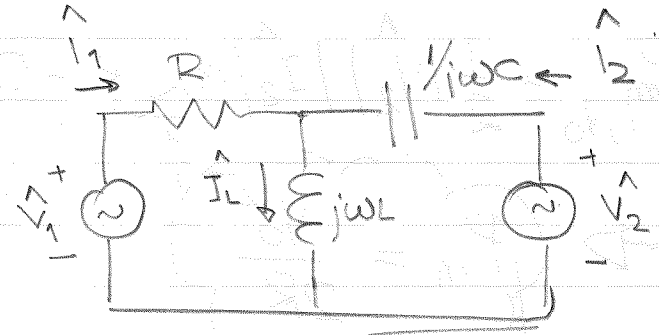
EJERCICIO 3

$$V_1(t) = V_0 \cos(\omega t) \qquad V_2(t) = -V_0 \operatorname{sen}(\omega t)$$

1) ω / $i_L = 0$?

Circuito en FASORES:

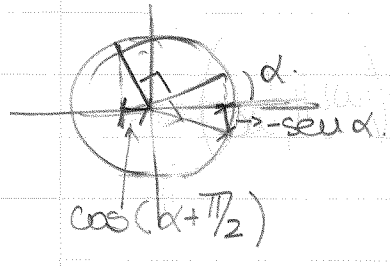


$$V_1(t) = \operatorname{Re}\{\hat{V}_1 e^{j\omega t}\} = V_0 \cos \omega t \Rightarrow \boxed{\hat{V}_1 = V_0}$$

$$V_2(t) = \operatorname{Re}\{\hat{V}_2 e^{j\omega t}\} = -V_0 \cdot \operatorname{sen}(\omega t)$$

$$\operatorname{Re}\{|\hat{V}_2| e^{j\varphi} \cdot e^{j\omega t}\} = V_0'' \cos(\omega t + \pi/2)$$

$$\Rightarrow \boxed{\hat{V}_2 = V_0 e^{j\pi/2} = jV_0}$$



Ley de nodos: $\hat{I}_1 + \hat{I}_2 = \hat{I}_L$

Ley de mallas:
$$\begin{cases} \hat{V}_1 - R\hat{I}_1 - \hat{V}_L = 0 \\ \hat{V}_2 - \frac{1}{j\omega C}\hat{I}_2 - \hat{V}_L = 0 \end{cases}$$

$$i_L(t) = 0 \Leftrightarrow \hat{I}_L = 0 \Leftrightarrow \hat{V}_L = j\omega L \cdot \hat{I}_L = 0$$

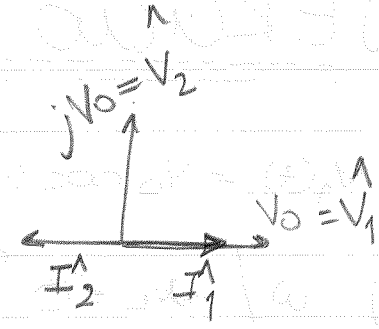
$$\Rightarrow \begin{cases} \hat{V}_1 - R\hat{I}_1 = 0 \\ \hat{V}_2 - \frac{1}{j\omega C}\hat{I}_2 = 0 \\ \hat{I}_1 = -\hat{I}_2 \end{cases}$$

$$\Rightarrow \hat{V}_1 = V_0 = R\hat{I}_1 \Rightarrow \hat{I}_1 = -\hat{I}_2 = V_0/R$$

$$\hat{V}_2 = jV_0 = +\frac{1}{j\omega C} \cdot \left(-\frac{V_0}{R}\right) \Leftrightarrow 1 = \frac{1}{\omega RC} \Rightarrow \boxed{\omega = \frac{1}{RC}}$$

2) $P_{m\,\text{fuentes}} = P_{m\,V_0} + P_{m\,jV_0}$

$$P_{m\,V_0} = \frac{1}{2}|\hat{V}_1|\cdot|\hat{I}_1|\underbrace{\cos\varphi}_{1} = \frac{V_0^2}{2R}$$



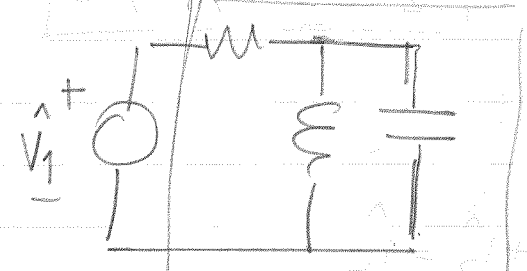
$$P_{m\,jV_0} = \frac{1}{2}|\hat{V}_2||\hat{I}_2|\underbrace{\cos\varphi}_{0} = 0$$

$$\Rightarrow \boxed{P_m = \frac{V_0^2}{2R}}$$

3) $V_1(t) = V_0\cos(\omega t)$. ω / $|\hat{I}_1|$ mínima - ?

$V_2(t) = 0$

Circuito:



$$\mathcal{Z} = R + \left(j\omega L \,\|\, \frac{1}{j\omega C}\right)$$

$$\hat{I}_1 = \frac{\hat{V}_1}{\mathcal{Z}} = \frac{V_0}{R + \dfrac{1}{\dfrac{1}{j\omega L} + j\omega C}} = \frac{V_0}{R + j\cdot\dfrac{\omega L}{1-\omega^2 LC}}$$

$|\hat{I}_1|$ es mínima si $\dfrac{\omega L}{1-\omega^2 LC}$ es máximo.

$$\Longleftrightarrow \omega^2 LC = 1 \Longleftrightarrow \boxed{\omega = \frac{1}{\sqrt{LC}}}$$