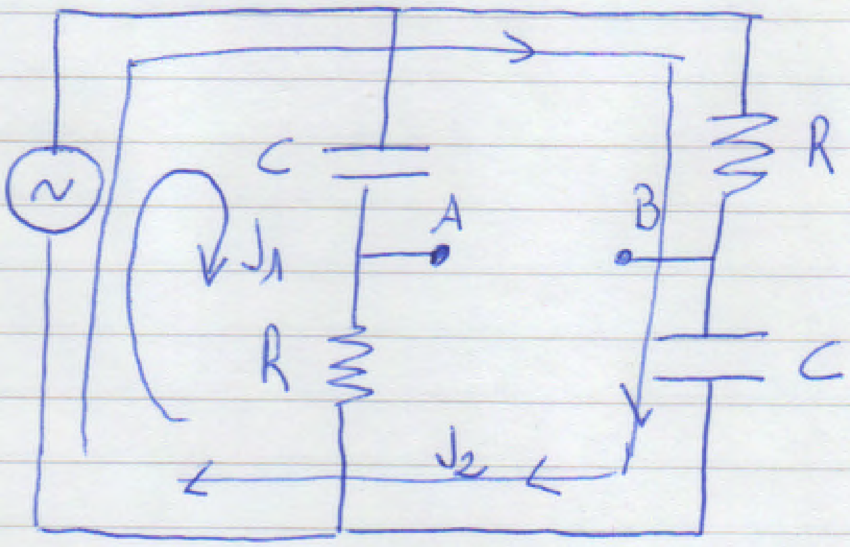
Problema 12



Planteo las ecuaciones de malla

malla 1

$$\mathcal{E}_0 e^{i\omega t} = J_{01} e^{i\omega t} \left(-\frac{i}{\omega C} + R \right)$$

malla 2

$$\mathcal{E}_0 e^{i\omega t} = J_{02} e^{i\omega t} \left(R - \frac{i}{\omega C} \right)$$

$$J_{01} = J_{02} = J_0$$

$$J_0 = \frac{\mathcal{E}_0}{\left(R - \frac{i}{\omega C} \right)} = \frac{\mathcal{E}_0}{\left(R^2 + \frac{1}{\omega^2 C^2} \right)} \left(R + \frac{i}{\omega C} \right)$$

$$J_0 = \beta\left(R + \frac{i}{\omega C}\right) \quad \text{con} \quad \beta = \frac{\mathcal{E}_0}{\left(R^2 + \frac{1}{\omega^2 C^2}\right)}$$

$$J_0 = |J_0|\, e^{i\theta}$$

$$|J_0| = \beta\left(R^2 + \frac{1}{\omega^2 C^2}\right)^{1/2} = \frac{\mathcal{E}_0}{\left(R^2 + \frac{1}{\omega^2 C^2}\right)^{1/2}}$$

$$\theta = \arctan\left(\frac{1}{\omega C R}\right)$$

$$V' = V_B - V_A = -J_1\left(-\frac{i}{\omega C}\right) + J_2\, R$$

pero $J_1 = J_2 = J_0\, e^{i\omega t}$

$$V' = J_0\, e^{i\omega t}\left(R + \frac{i}{\omega C}\right) = |V'|\, e^{i(\theta + \omega t)}$$

$$V' = \beta\left(R + \frac{i}{\omega C}\right)\left(R + \frac{i}{\omega C}\right) e^{i\omega t}$$

$$V' = \beta\left[R^2 - \frac{1}{\omega^2 C^2} + \frac{2iR}{\omega C}\right] e^{i\omega t}$$

son correctos las unidades?

$$\left[\frac{1}{\omega C}\right] = \frac{\text{seg Volt}}{\text{Coulomb}} = \frac{\text{Volt}}{\text{Ampere}} = \text{Ohm} \;\checkmark$$

Fase de $V' = \alpha$

$$\tan \alpha = \left[\frac{\frac{2R}{\omega C}}{R^2 - \frac{1}{\omega^2 C^2}} \right] = \frac{2\omega C R}{R^2 \omega^2 C^2 - 1}$$

$$|V'| = \beta \left[\left(R^2 - \frac{1}{\omega^2 C^2} \right)^2 + \frac{4R^2}{\omega^2 C^2} \right]^{1/2}$$

$$= \beta \left[R^4 + \frac{1}{\omega^2 C^2} - \frac{2R^2}{\omega^2 C^2} + \frac{4R^2}{\omega^2 C^2} \right]^{1/2}$$

$$= \beta \left[\left(R^2 + \frac{1}{\omega^2 C^2} \right)^2 \right]^{1/2} = \beta \left(R^2 + \frac{1}{\omega^2 C^2} \right)$$

$$= \frac{\varepsilon_0}{\left(R^2 + \frac{1}{\omega^2 C^2} \right)} \left(R^2 + \frac{1}{\omega^2 C^2} \right) = \varepsilon_0 .$$

[illegible]