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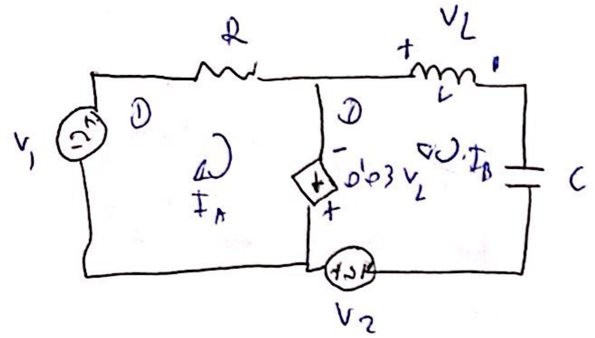
1.



$R = 100\,\Omega$

$C = 10 \cdot 10^{-6} F = 10^{-5} F$

$L = 200\, mH = 200 \cdot 10^{-3} H$

$v_1(t) = \cos(10^3 t + \frac{\pi}{2})(V)$

$v_2(t) = 2 \cdot \text{sen}(10^3 t + \frac{4\pi}{3})\, V$

$V_1 = e^{j\frac{\pi}{2}}$; $V_2 = 2 \cdot e^{j\frac{4\pi}{3}}$

a)

Resolvemos el circuito por mallas

Impedancias

$Z_R = R = 100\,\Omega$

$Z_C = \frac{1}{j \cdot wC} = -100j\,\Omega$

$Z_L = j w \cdot L = 200j\,\Omega$

Malla 1

$\Sigma \mathcal{E} = \Sigma IR \Rightarrow V_1 - \mathcal{E}_1 = I_A \cdot (Z_R)$ ①

Malla 2

$\mathcal{E}_1 - V_2 = I_B \cdot (Z_C + Z_L)$

$\mathcal{E}_1 = I_B \cdot (Z_C + Z_L)$ ②

$0'03 V_L = I_A - I_B$

$V_L = I_B \cdot Z_L = I_B \cdot 200j$

① $\mathcal{E}_1 = -100 I_A + e^{j\frac{\pi}{2}} = -100 I_A + j$

② $\mathcal{E}_1 = I_B \cdot (Z_C + Z_L) = I_B \cdot (100j)$

$0'03 \cdot (I_B \cdot 200j) = I_A - I_B$

$I_B \cdot 6j = I_A - I_B$

$I_A = I_B \cdot (6j + 1)$

① $\mathcal{E}_1 = -100 \cdot (I_B) \cdot (6j + 1) + j$

② $\mathcal{E}_1 = I_B \cdot (100j)$

$-100 I_B \cdot (6j + 1) + j = I_B \cdot 100j$

$600 I_B j - 100 I_B = I_B \cdot 100j$

$600j I_B - 100j I_B - 100 I_B = 0$

$500j I_B - 100 I_B = 0$

$I_B \cdot (500j - 100) = 0$ → $I_B = 0$; $I_B = 5098 j^{1'768}$

$-100 \dot{I}_B \cdot (6j+1)\dot{I}_j = \dot{I}_B \cdot 100 j$

$\dot{I}_B \cdot 100 j - 100 \dot{I}_B = \dot{I}_j + 1$

$\dot{I}_B \cdot (100j - 100) = \dot{I}_j + 1$

$\dot{I}_B = 0'03 - 0'04j = 0'05 \cdot e^{j - 0'927}$

$\dot{I}_B = 0'05\, e^{j - 0'922}$ A

$\dot{I}_A = 0'304 \cdot e^{j 0'479}$

$\dot{I}_A = (6j+1) \cdot \dot{I}_B = 6'08 e^{j 1'406} \cdot \dot{I}_B$ A

La potencia instantánea en la resistencia es:

$$p(t) = \frac{V I}{2} \cdot [\cos(2\omega t + \alpha_V + \alpha_I) + \cos(\alpha_V - \alpha_I)]$$

La intensidad que atraviesa R es $\dot{I}_A$

$i_A(t) = 0'304 \cdot \cos(10^3 t + 0'479)$ A

$v_i(t) = \cos(10^3 t + \pi/2)$

$\dot{V} = e^{j\pi/2}$

$\dot{I} = 0'304 \cdot e^{j 0'479}$

$p(t) = \frac{0'304}{2} \cdot [\cos(2 \cdot 10^3 t + 2'05) + 0'461] =$

$= 0'152 \cdot [\cos(2 \cdot 10^3 t + 2'05) + 0'461]$ W

$\bar{P} = 0'152 \cdot 0'461 = 0'07$ W

$V = 1$ V

$I = 0'304$ A

b) Potencia media bobina

$$P_m = \frac{1}{T} \cdot \int_0^T \frac{V^2}{2L\omega} \cdot \sin(2\omega) dt = -\frac{V_m^2}{2L\omega t} \cdot \int_0^T \sin(2\omega t) dt = 0$$

Puesto que la bobina es una carga reactiva, en un ciclo completo no consume ni cede potencia y por tanto la potencia media es 0