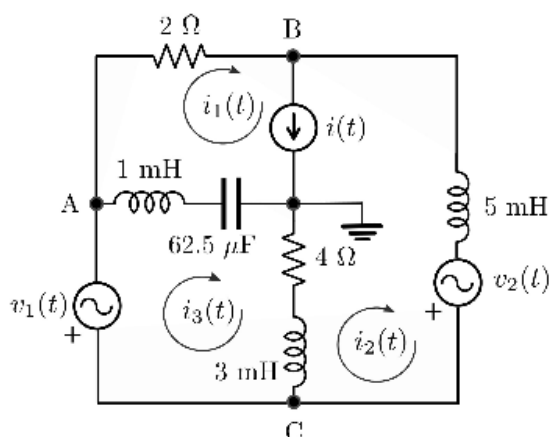


Examen 22 junio 2021 - Alterna.



$$i(t) = 10 \sqrt{2} \cos(4000t - 30^\circ) \rightarrow$$

$$I = 10 \angle -30^\circ \quad 4000 \text{ rad/s}$$

$$v_1(t) = 5 \cdot \sqrt{2} \cos(1000t) \rightarrow$$

$$V_1 = 5 \quad 1000 \text{ rad/s}$$

$$v_2(t) = 2 \cdot \sqrt{2} \cos(4000t) \rightarrow$$

$$V_2 = 2 \quad 4000 \text{ rad/s V}$$

Se aplica superposición porque hay dos frecuencias diferentes:

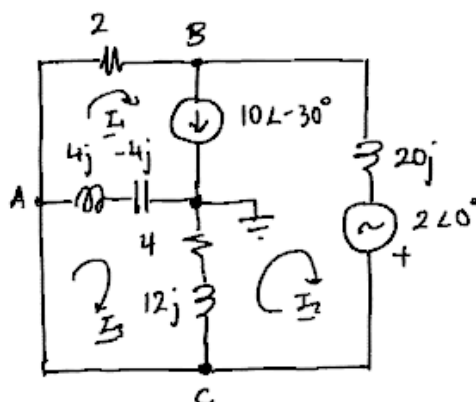
$$\omega = 4000 \text{ rad/s}$$

$$1 \text{ mH} \rightarrow 4j\Omega$$

$$62,5 \mu\text{F} \rightarrow -4j\Omega$$

$$3 \text{ mH} \rightarrow 12j\Omega$$

$$5 \text{ mH} \rightarrow 20j\Omega$$



$$(1) 2 \cdot I_1 + V_x + (4j - 4j)(I_1 - I_3) = 0$$

$$(2) 20jI_2 - 2 \angle 0^\circ + (4 + 12j)(I_2 - I_3) - V_x = 0$$

$$(3) (4j - 4j)(I_3 - I_1) + (4 + 12j)(I_3 - I_2) = 0 \rightarrow I_3 = I_2$$

(1)+(2)

$$\left. \begin{array}{l} 2 \cdot I_1 + 20jI_2 - 2 \angle 0^\circ = 0 \\ I_1 - I_2 = 10 \angle -30^\circ \end{array} \right\} \rightarrow \begin{array}{l} (I_2 + 10 \angle -30^\circ)2 + 20jI_2 - 2 \angle 0^\circ = 0 \\ (2 + 20j)I_2 = 2 \angle 0^\circ - 20 \angle -30^\circ \end{array}$$

$$I_2 = 0,91 \angle 62,6^\circ$$

$$I_1 = 10 \angle -24,8^\circ$$

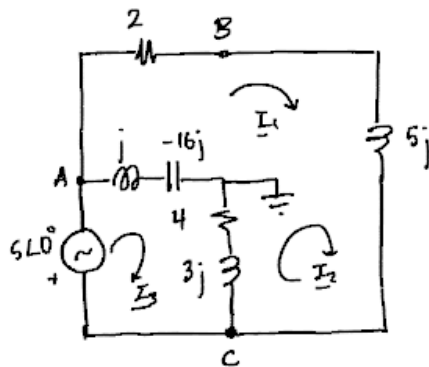
$$I_3 = 0,91 \angle 62,6^\circ$$

$$i_1(t) = 10 \sqrt{2} \cos(4000t - 24,8^\circ) \text{ A}$$

$$i_2(t) = 0,91 \sqrt{2} \cos(4000t + 62,6^\circ) \text{ A} = i_3(t)$$

$$V_A = V_C = 0 ; V_B = -2I_1 = 20 < 155,2 \rightarrow v_B(t) = 20\sqrt{2} \cos(4000t + 155,2) \text{ V}$$

1000 rad/s



$$I_1 = I_2 \text{ V}$$

$$\begin{cases} (2 + 5j)I_1 + (4 + 3j)(I_1 - I_3) + (-15j)(I_1 - I_3) = 0 \\ -15j(I_3 - I_1) + (4 + 3j)(I_3 - I_1) + 5 = 0 \end{cases}$$

$$I_1 = \frac{-5 < 0^\circ}{2 + 5j} = 0,93 < 111,8^\circ$$

$$(4 - 12j)I_3 = -5 + (4 + 3j - 15j)I_1$$

$$V_C = (I_2 - I_3)(4 + 3j) = 1,98 < 108,13^\circ$$

$$V_A = V_C - 5 = 5,92 < 161,5^\circ$$

$$V_B = V_A - 2I_1 = 4,93 < 178,2^\circ$$

$$I_3 = \frac{-5 + (4 - 12j) \cdot 0,93 < 111,8^\circ}{4 - 12j} = 0,68 < 134^\circ \text{ A}$$

$$I_3 - I_2 = 0,68 < 134^\circ - 0,93 < 111,8^\circ = 0,395 < -108,7^\circ \text{ A}$$

Luego

$$v_A(t) = 5,92 \cdot \sqrt{2} \cos(1000t + 161,5^\circ) \text{ V}$$

$$v_B(t) = 4,93 \cdot \sqrt{2} \cos(1000t + 178,2^\circ) + 20 \cdot \sqrt{2} \cos(4000t + 155,2^\circ) \text{ V}$$

$$v_C(t) = 1,98 \cdot \sqrt{2} \cos(1000t + 108,13^\circ) \text{ V}$$

Potencias

Resistencias	1000 rad/s	4000 rad/s
$R = 2\Omega$	$0,93^2 \cdot 2$	$10^2 \cdot 2$
$R = 4\Omega$	$0,395^2 \cdot 4$	0
	2,36 W	200 W

Fuentes	1000 rad/s	4000 rad/s
$V_1$	$-5 \cdot 0,68 < -134$ $= 2,36 + 2,44j$	0
$V_2$	0	$2 \cdot 0,91 < 62,6$ $= 0,84 + 1,61j$
$I$	0	$-20 < 155,2 \cdot 10 < 30$ $= 199,17 + 18,1j$

