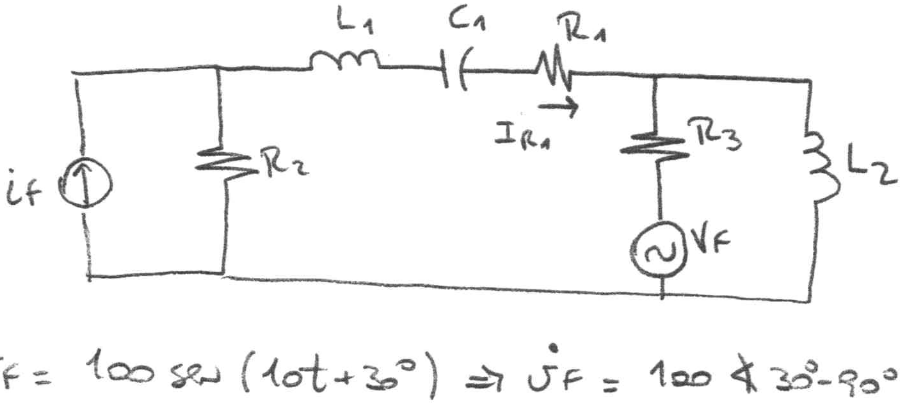
P1 Ocupando el método de circuitos regionales, obtener el valor de $\dot{I}_{R_1}$.

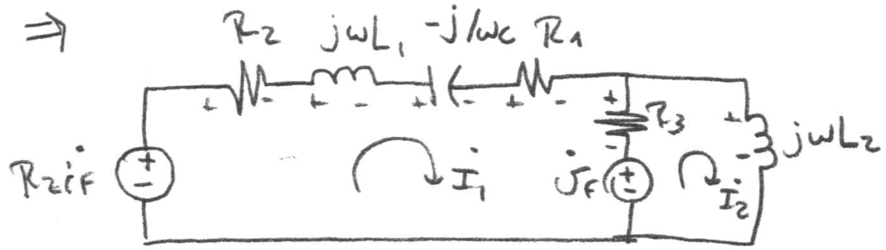


$R_1 = 10 [\Omega]$
$R_2 = 20 [\Omega]$
$R_3 = 5 [\Omega]$
$L_1 = 1 [H]$
$L_2 = 1 [H]$
$C_1 = 0{,}2 [F]$

$v_F = 100 \operatorname{sen}(10t + 30°) \Rightarrow \dot{v}_F = 100 \measuredangle 30° - 90° \Rightarrow \boxed{\dot{v}_F = 100 \measuredangle -60°}$

$i_F = 200 \cos(20t + 45°) \Rightarrow \boxed{\dot{i}_F = 200 \measuredangle 45°}$

SOL) Método regional $\Rightarrow$ Impedancias $\dot{Z}$



$$\Rightarrow (R_2 + j\omega L_1 - j/\omega c + R_1)\dot{I}_1 + R_3(\dot{I}_1 - \dot{I}_2) + \dot{v}_F = R_2 \dot{i}_F$$

$$\Rightarrow \boxed{(R_1 + R_2 + R_3 + j\omega L_1 - j/\omega c)\dot{I}_1 + (-R_3)\dot{I}_2 = R_2\dot{i}_F - \dot{v}_F}$$

$$-R_3(\dot{I}_1 - \dot{I}_2) + j\omega L_2 \cdot \dot{I}_2 = \dot{v}_F$$

$$\Rightarrow \boxed{\dot{I}_1(-R_3) + \dot{I}_2(R_3 + j\omega L_2) = \dot{v}_F}$$

$$\Rightarrow \begin{bmatrix} R_1 + R_2 + R_3 + j\omega L_1 - j/\omega c & -R_3 \\ -R_3 & j\omega L_2 + R_3 \end{bmatrix} \begin{bmatrix} \dot{I}_1 \\ \dot{I}_2 \end{bmatrix} = \begin{bmatrix} R_2 \dot{i}_F - \dot{v}_F \\ \dot{v}_F \end{bmatrix}$$

Ahora, aplico principio de superposición (por tener las fuentes $\neq \omega$'s)

$\Rightarrow$ 1ero hago $\dot{v}_F = 0$ y obtengo $\dot{I}_1$

$\Rightarrow$ luego hago $\dot{i}_F = 0$ y obtengo $\dot{I}_2$

$\boxed{1}$ $\dot{v}_F = 0 \Rightarrow \omega = 20$ (ω de $\dot{i}_F$)

$$\Rightarrow \begin{bmatrix} 35 + 19{,}75j & -5 \\ -5 & 20j + 5 \end{bmatrix} \begin{bmatrix} \dot{I}_1 \\ \dot{I}_2 \end{bmatrix} = \begin{bmatrix} 4000 \measuredangle 45^\circ \\ 0 \end{bmatrix}$$

$\dot{I}_1 = \dfrac{\Delta_1}{\Delta}$ $\qquad \Delta = (35 + 19{,}75j)(20j + 5) - 25 = -245 + j798{,}75$

$= 835{,}48 \measuredangle 107{,}05^\circ$ (T.I.)

$$\Delta_1 = (4000 \measuredangle 45^\circ)(20j + 5) = 82462{,}1 \measuredangle 120^\circ$$

$$\Rightarrow \dot{I}_1 = \frac{82462{,}1 \measuredangle 120^\circ}{835{,}48 \measuredangle 107{,}05^\circ} \Rightarrow \boxed{\dot{I}_1 = 98{,}7 \measuredangle 12{,}95^\circ}$$

$\boxed{ii}$ $\dot{i}_F = 0 \Rightarrow \omega = 10$ (ω de $\dot{v}_F$)

$$\Rightarrow \begin{bmatrix} 35+9,5j & -5 \\ -5 & 10j+5 \end{bmatrix} \begin{bmatrix} \dot{I}_1 \\ \dot{I}_2 \end{bmatrix} = \begin{bmatrix} -100\measuredangle -60^\circ \\ 100\measuredangle -60^\circ \end{bmatrix}$$

$$\dot{I}_1 = \frac{\Delta_1}{\Delta} \qquad \Delta = (35+9,5j)(10j+5) - 25 = 401,287\measuredangle 82,12^\circ$$

$$\Rightarrow \Delta_1 = (-100\measuredangle -60^\circ)(10j+5) - (100\measuredangle -60^\circ)\cdot(-5) = 1000\measuredangle -150^\circ$$

$$\Rightarrow \dot{I}_1 = \frac{1000\measuredangle -150^\circ}{401,287\measuredangle 82,12^\circ} \Rightarrow \boxed{\dot{I}_1 = 2,49\measuredangle 127,87^\circ}$$

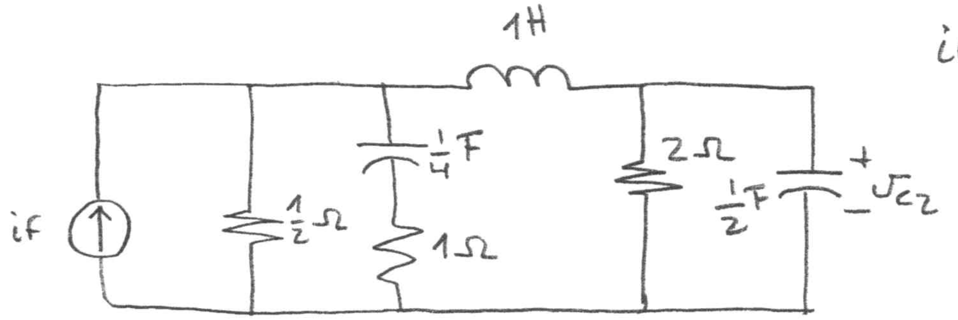
("notación", en la práctica no se pueden sumar fasores de $\neq \omega$.)

$$\Rightarrow \text{Por superposición}, \Rightarrow \dot{I}_1 = \underbrace{98,7\measuredangle 12,95^\circ}_{(\text{con } \omega = 20)} + \underbrace{2,49\measuredangle 127,87^\circ}_{(\text{con } \omega = 10)}$$

$$\Rightarrow \boxed{I_1 = 98,7\cos(20t + 12,95^\circ) + 2,49\cos(10t + 127,87^\circ)}$$

//

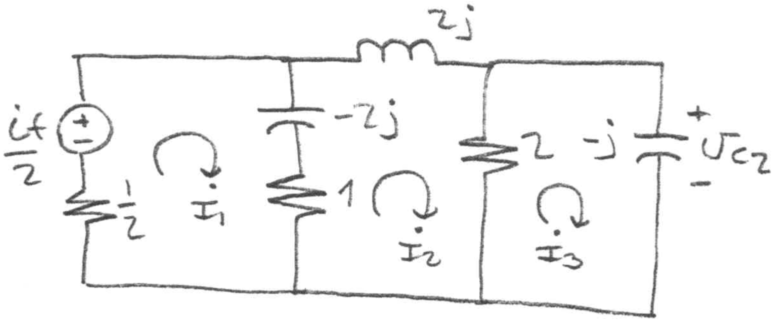
P1 Para la red de la figura en RPS, ocupando el método de las mallas, determinar $v_{c2}(t)$ en RPS.



$i_f(t) = 2\cos(2t + \pi/4)$

SOL $\dot{i}_f = 2 \measuredangle \pi/4 \Rightarrow \boxed{\dot{i}_f = 2 \measuredangle 45^\circ}$ $(\omega = 2)$

Hago TH.N. con if y método mallas ⇒ expresar todo como impedancias "Z".

⇒ 

$$Z_L = \frac{\dot{V}_L}{\dot{I}_L} = \frac{j\omega L \cancel{\dot{I}_L}}{\cancel{\dot{I}_L}} = j\omega L = 2j$$

$$Z_C = \frac{\dot{V}_C}{\dot{I}_C} = \frac{\cancel{\dot{I}_C}}{j\omega \cancel{\dot{I}_C} C} = \frac{-j}{\omega C} = -2j$$

(1) $\frac{1}{2}\dot{I}_1 - \frac{\dot{i}_f}{2} - 2j(\dot{I}_1 - \dot{I}_2) + (\dot{I}_1 - \dot{I}_2) = 0 \Rightarrow \boxed{\dot{I}_1\left(\frac{3}{2} - 2j\right) + \dot{I}_2(-1+2j) = \frac{\dot{i}_f}{2}}$

(2) $-(\dot{I}_1 - \dot{I}_2) - (-2j)(\dot{I}_1 - \dot{I}_2) + 2j\dot{I}_2 + 2(\dot{I}_2 - \dot{I}_3) = 0$

$\Rightarrow \boxed{\dot{I}_1(-1+2j) + \dot{I}_2(3 - \cancel{2j} + \cancel{2j}) + \dot{I}_3(-2) = 0}$

(3) $-2(\dot{I}_2 - \dot{I}_3) - j(\dot{I}_3) = 0 \Rightarrow \boxed{\dot{I}_2(-2) + \dot{I}_3(2-j) = 0}$

$$\Rightarrow \begin{bmatrix} 3/2 - 2j & -1+2j & 0 \\ -1+2j & 3 & -2 \\ 0 & -2 & 2-j \end{bmatrix} \begin{bmatrix} \dot{I}_1 \\ \dot{I}_2 \\ \dot{I}_3 \end{bmatrix} = \begin{bmatrix} \dot{i}_f/2 \\ 0 \\ 0 \end{bmatrix}$$

⇒ Para v_{c2} usaré $\dot{I}_3$

$\Rightarrow \dot{I}_3 = \frac{\Delta_3}{\Delta}$

$V_{c2} = I_{c2} \cdot Z_{c2}$
$= I_3 \cdot Z_{c2}$
$\boxed{\dot{V}_{c2} = \dot{I}_3 \cdot (-j)}$ (*)

$$\Delta_3 = \begin{vmatrix} 3/2 - 2j & -1+2j & \dot{i}_f/2 \\ -1+2j & 3 & 0 \\ 0 & -2 & 0 \end{vmatrix} = \frac{\dot{i}_f}{2} \cdot \left[(-1+2j)(-2)\right] = \frac{\dot{i}_f}{2}(2 - 4j)$$

$\dot{i}_f = 2 \measuredangle 45^\circ$
$= \sqrt{2} + j\sqrt{2}$ $\Rightarrow \Delta_3 = (\sqrt{2} + j\sqrt{2})(1 - 2j) \Rightarrow \boxed{\Delta_3 = 3\sqrt{2} - j\sqrt{2}}$

$$\Delta = \left(\tfrac{3}{2} - 2j\right)\left[3(2-j) - 4\right] - (-1+2j)(-1+2j)(2-j)$$

$$\Rightarrow \boxed{\Delta = 7 - \tfrac{7}{2}j}$$

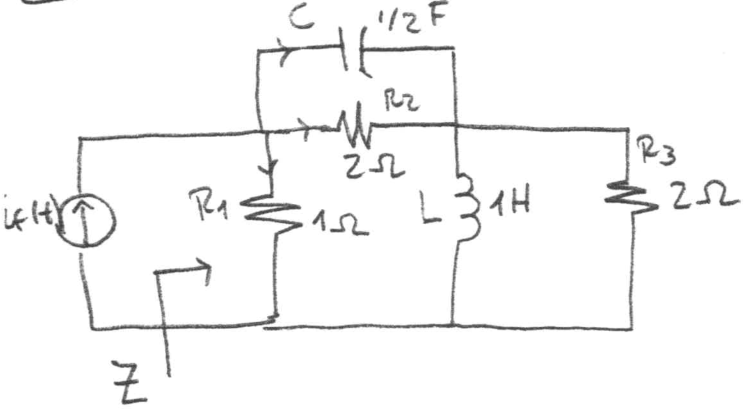
$$\Rightarrow \dot{I}_3 = \frac{\Delta_3}{\Delta} = \frac{3\sqrt{2} - j\sqrt{2}}{7 - \frac{7}{2}j} \Rightarrow \dot{I}_3 = \frac{2\sqrt{2}}{5} - j\frac{2\sqrt{2}}{35} \Rightarrow \boxed{\dot{I}_3 = 0{,}5714 \measuredangle 8{,}13^\circ}$$

$$\Rightarrow \text{Por } (*):\ \dot{V}_{C2} = \dot{I}_3 \cdot (-j) = (0{,}5714 \measuredangle 8{,}13^\circ)(-j)$$

$$\Rightarrow \boxed{\dot{V}_{C2} = 0{,}5714 \measuredangle -81{,}87^\circ}$$

$$\Rightarrow \boxed{v_{C2}(t) = 0{,}5714 \cos(2t - 81{,}87^\circ)} \quad //$$

P2 Para la Red en RPS: **a** impedancia y admitancia de entrada, vista desde los terminales de la fuente. **b** Voltaje en los terminales de la fuente. **c** Obtenga $\dot{v}_{R1}, \dot{i}_{R2}, \dot{i}_C, \dot{i}_{R1}, \dot{v}_C, \dot{v}_{R2}$



$$\left(i_F = 2\cos(2t + \pi/6)\right)$$

SOL **a** Paso todo a admitancias.

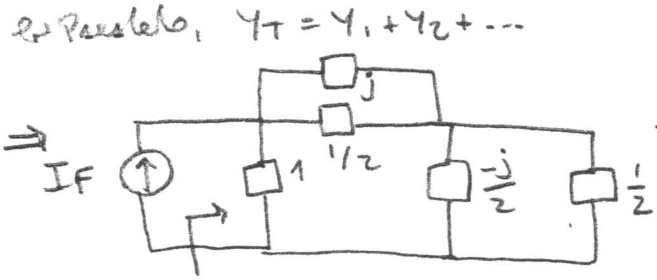
$$Y_L = \frac{I_L}{V_L} = \frac{\cancel{I_L}}{j\omega L \cancel{I_L}} = \frac{-j}{\omega L}$$

en serie, $\dfrac{1}{Y_T} = \dfrac{1}{Y_1} + \dfrac{1}{Y_2} + \dots$

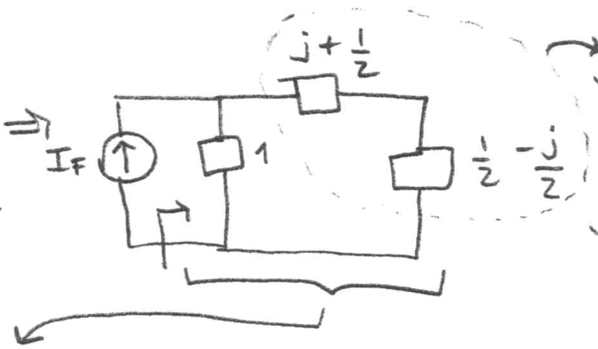
$$Y_C = \frac{I_C}{V_C} = \frac{j\omega C \cancel{V_C}}{\cancel{V_C}} = j\omega C$$

en Paralelo, $Y_T = Y_1 + Y_2 + \dots$

$\Rightarrow$



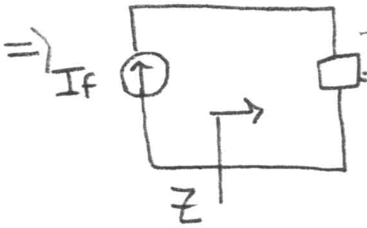
$\Rightarrow$



$$Y_T = \frac{(j+\frac{1}{2})(\frac{1}{2} - \frac{j}{2})}{j + \frac{1}{2} + \frac{1}{2} - \frac{j}{2}}$$

$$Y_T = \frac{7}{10} - j/10$$

$$\Rightarrow Y_T = 1 + \frac{7}{10} - j/10 = \frac{17}{10} - j/10$$



$\boxed{Y_T = \frac{17}{10} - \frac{j}{10}}$ Admitancia de entrada

$\Rightarrow Z_T = \frac{1}{Y_T} \quad Z_T = \dfrac{1}{\frac{17}{10} - \frac{j}{10}}$

$\Rightarrow \boxed{Z_T = \frac{17}{29} + \frac{1}{29} j}$

impedancia de entrada.

b) $\dot{V}_F = Z_T \cdot \dot{I}_F$

$\dot{I}_F = 2 \measuredangle \pi/6 = 2 \measuredangle 30^\circ$

T.I.

$\Rightarrow \dot{V}_F = \left(\frac{17+j}{29}\right) \cdot (2 \measuredangle 30^\circ) \Rightarrow \boxed{\dot{V}_F = 1{,}174 \measuredangle 33{,}36^\circ}$

$\Rightarrow$ el voltaje en los terminales de la fuente es:

$\boxed{v_F(t) = 1{,}174 \cos(2t + 33{,}36^\circ)}$ //

c) $\dot{v}_{R1} = \dot{v}_F \Rightarrow \boxed{\dot{v}_{R1} = 1{,}174 \measuredangle 33{,}36^\circ}$

además, $\dot{v}_{R1} = Z_{R1} \cdot \dot{i}_{R1} \Rightarrow \dot{i}_{R1} = \frac{Z_{R1}}{\dot{v}_{R1}} = \frac{1}{1{,}174 \measuredangle 33{,}36^\circ}$

$\Rightarrow \boxed{\dot{i}_{R1} = 0{,}8517 \measuredangle -33{,}36^\circ}$

$\dot{i}_F = \dot{i}_{R1} + \dot{i}_{R2} + \dot{i}_C \quad (1)$ pero $\dot{v}_C = \dot{v}_{R2} \Rightarrow Z_C \dot{i}_C = Z_{R2} \dot{i}_{R2}$

$\dot{i}_C = \frac{Z_{R2}}{Z_C} \dot{i}_{R2}$

$\Rightarrow \dot{i}_C = \frac{2}{-j} \dot{i}_{R2}$

$\Rightarrow (1): \quad \dot{i}_{R2} + \frac{2}{j} \dot{i}_{R2} = \dot{i}_F - \dot{i}_{R1} \qquad \dot{i}_{R2}\left(1 + \frac{2}{j}\right) = \dot{i}_F - \dot{i}_{R1}$

$\Rightarrow \dot{i}_{R2} = \dfrac{(2 \measuredangle 30^\circ) - (0{,}8517 \measuredangle -33{,}36^\circ)}{(1 + 2/j)} \Rightarrow \boxed{\dot{i}_{R2} = 0{,}799 \measuredangle 118{,}63^\circ}$

$\Rightarrow \boxed{\dot{i}_C = 1{,}599 \measuredangle -151{,}369^\circ}$

$\dot{v}_C = Z_C \cdot \dot{i}_C = (-j)(1{,}599 \measuredangle -151{,}369^\circ) \Rightarrow \boxed{\dot{v}_C = 1{,}599 \measuredangle 118{,}631^\circ}$ y $\dot{v}_C = \dot{v}_{R2}$

$\Rightarrow \boxed{\dot{v}_{R2} = 1{,}599 \measuredangle 118{,}631^\circ}$ //