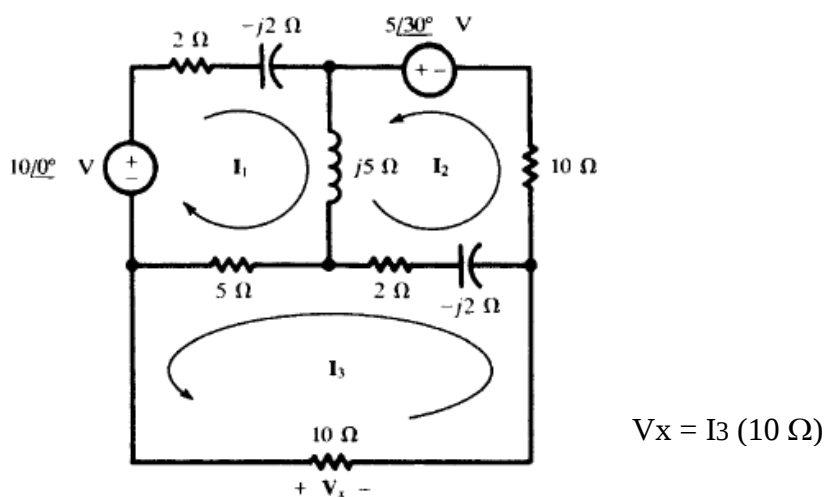


Teoría de Circuitos

Métodos de resolución de circuitos. Problemas resueltos

1- Calcular V_x aplicando método de corrientes de malla.

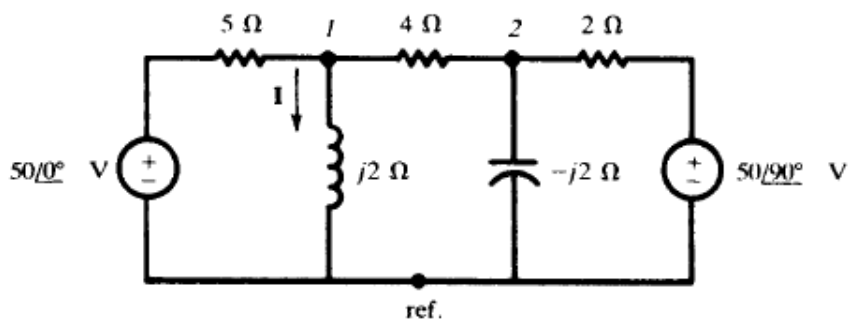


$$\begin{bmatrix} 7+j3 & j5 & 5 \\ j5 & 12+j3 & -(2-j2) \\ 5 & -(2-j2) & 17-j2 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 10 \angle 0^\circ \\ 5 \angle 30^\circ \\ 0 \end{bmatrix}$$

$$I_3 = \frac{\begin{vmatrix} 7+j3 & j5 & 10 \angle 0^\circ \\ j5 & 12+j3 & 5 \angle 30^\circ \\ 5 & -2+j2 & 0 \end{vmatrix}}{\begin{vmatrix} 7+j3 & j5 & 5 \\ j5 & 12+j3 & -2+j2 \\ 5 & -2+j2 & 17-j2 \end{vmatrix}} = \frac{667.96 \angle -169.09^\circ}{1534.5 \angle 25.06^\circ} = 0.435 \angle -194.15^\circ \text{ A}$$

$$V_x = I_3(10) = 4.35 \angle -194.15^\circ \text{ V.}$$

2- Calcular I por tensiones de nodo.

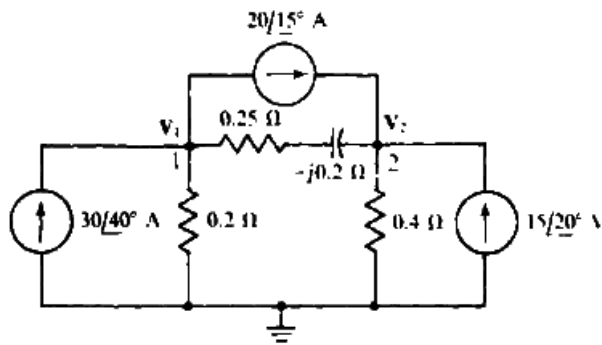


$$\begin{bmatrix} \frac{1}{5} + \frac{1}{j2} + \frac{1}{4} & -\frac{1}{4} \\ -\frac{1}{4} & \frac{1}{4} + \frac{1}{-j2} + \frac{1}{2} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} \frac{50 \angle 0^\circ}{5} \\ \frac{50 \angle 90^\circ}{2} \end{bmatrix}$$

$$V_1 = \frac{\begin{vmatrix} 10 & -0.250 \\ j25 & 0.750 + j0.500 \end{vmatrix}}{\begin{vmatrix} 0.450 - j0.500 & -0.250 \\ -0.250 & 0.750 + j0.500 \end{vmatrix}} = \frac{13.52 \angle 56.31^\circ}{0.546 \angle -15.94^\circ} = 24.76 \angle 72.25^\circ \text{ V}$$

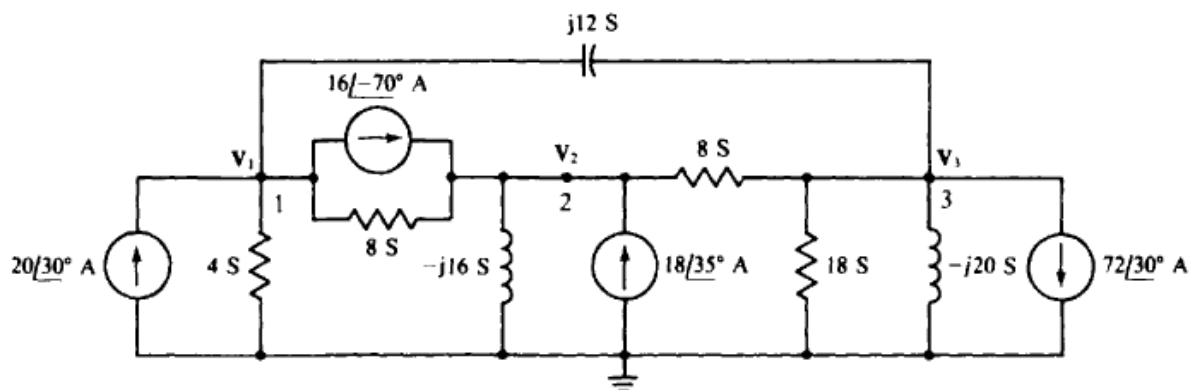
$$I = \frac{24.76 \angle 72.25^\circ}{2 \angle 90^\circ} = 12.38 \angle -17.75^\circ \text{ A}$$

3- Encontrar las tensiones en los nodos



$$\begin{bmatrix} 7.69/14.7 & -3.12/38.7 \\ -3.12/38.7 & 5.31/21.6 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 14.6/75.4 \\ 35.0/17.1 \end{bmatrix}$$

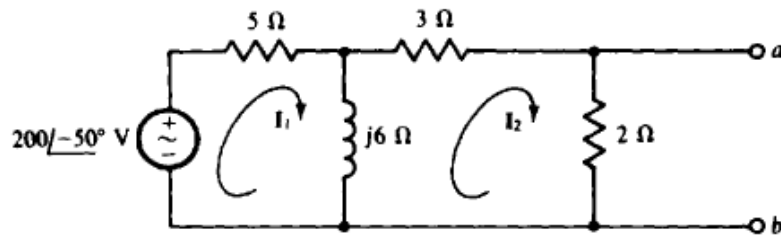
4- Encontrar las tensiones en los nodos



$$\begin{aligned}
 (12 + j12)V_1 - 8V_2 - j12V_3 &= 27.7/\underline{64.7^\circ} \\
 -8V_1 + (16 - j16)V_2 - 8V_3 &= 20.8/\underline{-13.1^\circ} \\
 -j12V_1 - 8V_2 + (26 - j8)V_3 &= -72/\underline{30^\circ}
 \end{aligned}$$

$$V_1 = 2.07/\underline{-26.6^\circ} \text{ V}, \quad V_2 = 1.38/\underline{7.36^\circ} \text{ V}, \quad \text{and} \quad V_3 = 1.55/\underline{-146^\circ} \text{ V}.$$

5- Encontrar el circuito equivalente de Thevenin entre a y b.



$$Z_{th} = 2 \parallel (3 + j6 \parallel 5) = \frac{2[3 + 5(j6)(5 + j6)]}{2 + 3 + 5(j6)(5 + j6)} = 1.55/\underline{5.27^\circ} \Omega$$

$$I_2 = \frac{\begin{vmatrix} 5 + j6 & 200/\underline{-50^\circ} \\ -j6 & 0 \end{vmatrix}}{\begin{vmatrix} 5 + j6 & -j6 \\ -j6 & 5 + j6 \end{vmatrix}} = \frac{-(-j6)(200/\underline{-50^\circ})}{(5 + j6)^2 - (-j6)^2} = \frac{1200/\underline{40^\circ}}{65/\underline{67.4^\circ}} = 18.46/\underline{-27.4^\circ} \text{ A}$$

$$V_{th} = 2I_2 = 2(18.46/\underline{-27.4^\circ}) = 36.9/\underline{-27.4^\circ} \text{ V}$$