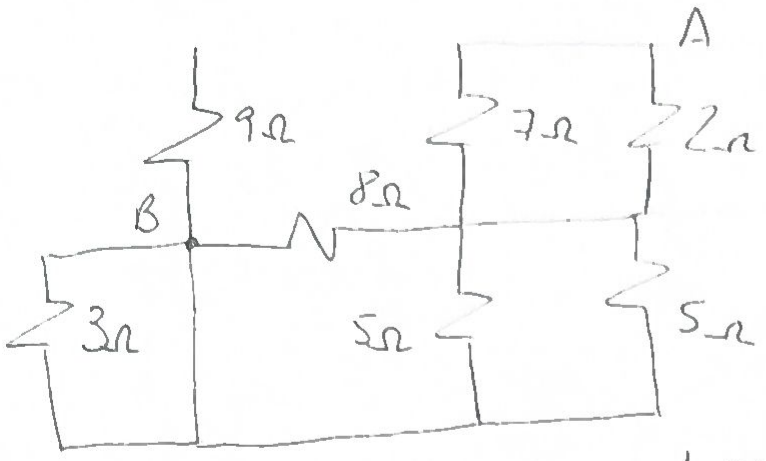
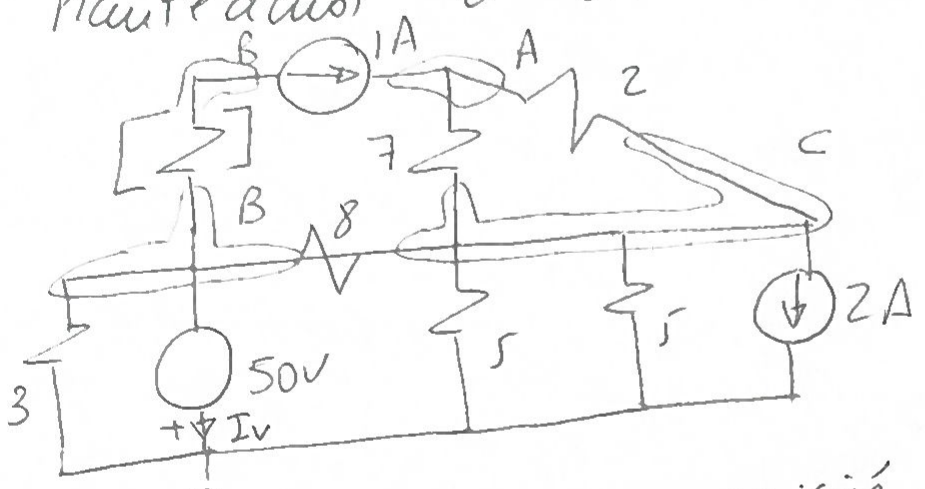
OCTUBRE 2025

1. Pasivamos fuente, bobina y condensador



$R_{TH} = (7//2) + (8//5//5) = 3,46\Omega$

Planteamos el sistema por nudos

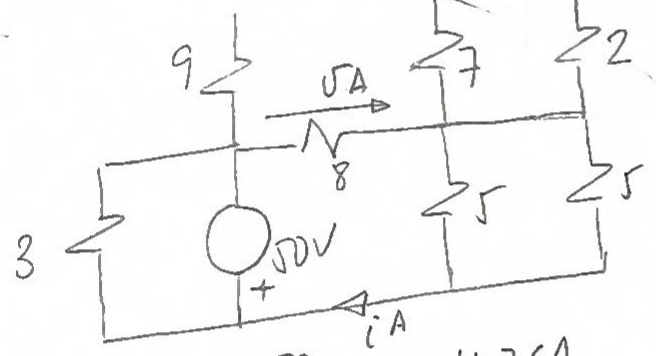


$$\begin{pmatrix} 1/2+1/7 & 0 & -1/2-1/7 \\ 0 & 1/3+1/8 & -1/8 \\ -1/2-1/7 & -1/8 & 1/8+1/2+1/5+1/5+1/3 \end{pmatrix} \begin{pmatrix} V_A \\ V_B \\ V_C \end{pmatrix} = \begin{pmatrix} 1 \\ -1-I_V \\ -2 \end{pmatrix}$$

$0 - V_B = 50$

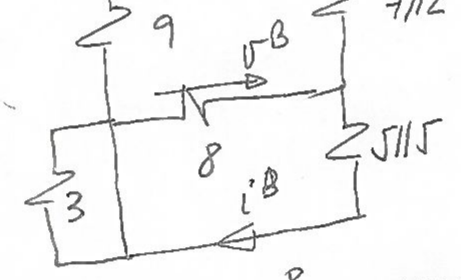
4 ecuaciones 4 incógnitas

Resolvemos por superposición.



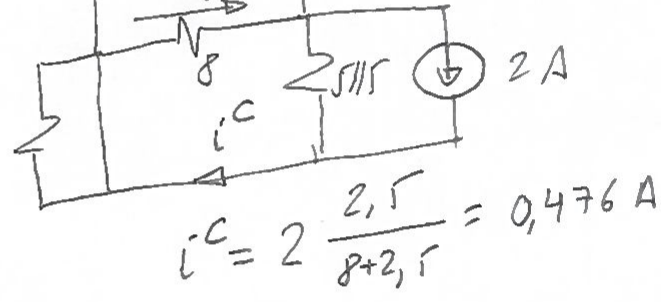
$$i^A = -\frac{50}{8+2,5} = -4,76A$$

$$V^A = -50\frac{8}{8+2,5} = -38,09V$$



$$i^B = 1\frac{8}{8+2,5} = 0,76A$$

$$V^B = -8\frac{2,5}{8+2,5} = -1,90V$$

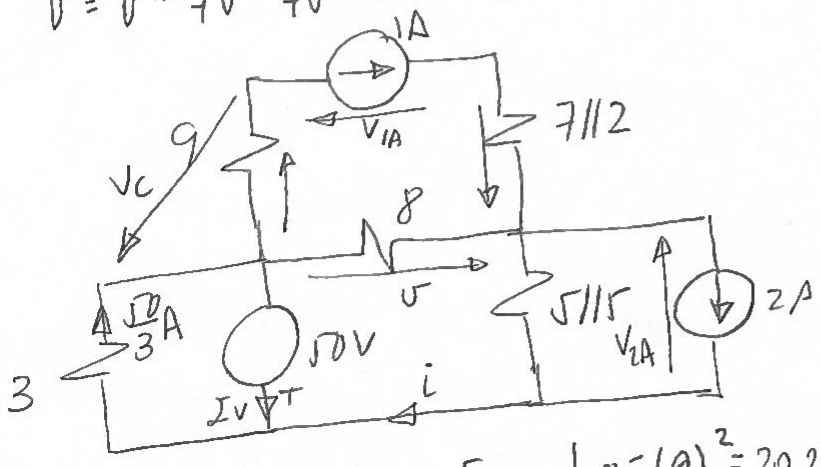


$$i^C = 2\frac{2,5}{8+2,5} = 0,476A$$

$$V^C = 8i^C = 3,80V$$

$$i = i^A + i^B + i^C = -3,524A$$

$$V = V^A + V^B + V^C = -36,18V$$



$V_C = 9 \cdot 1 = 9V \quad E_C = \frac{1}{2}0,5(9)^2 = 20,25J$

$E_L = \frac{1}{2}1.2(-3,524)^2 \Rightarrow E_L = 7,45J$

$I_V + i' = \frac{50}{3} \Rightarrow I_V = \frac{50}{3} - i' = 20,9A$

$P_{50V} = 50 \cdot 20,9 = 1009,53W$ (generada)

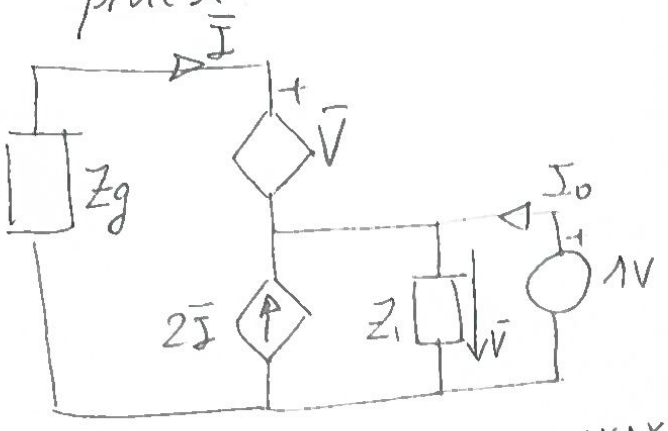
$V_{2A} = 50 + V \Rightarrow V_{2A} = 13,81V$

$P_{2A} = 2 \cdot V_{2A} = 27,63W$ (generada)

$V_{1A} = (7//2) \cdot 1 - V + 9 \cdot 1 = 46,71V$

$P_{1A} = 1 \cdot V_{1A} = 46,71W$ (generada)

3. Calculamos la Z_{th} con el método de fuente de prueba



$\bar{V} = 1$

$\bar{V} + 1 + \bar{Z}_g\bar{I} = 0 \Rightarrow \bar{I} = -2/Z_g$

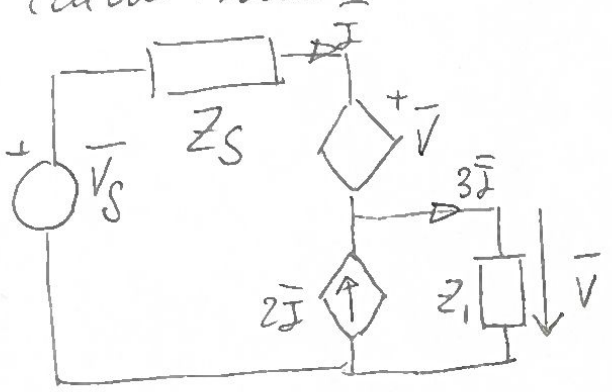
$\bar{I}_0 + \bar{I} + 2\bar{I} = \frac{1}{Z_1} \Rightarrow \bar{I}_0 = \frac{1}{Z_1} + \frac{6}{Z_g}$

$\bar{I}_0 = 0,02 - 0,072j \quad Z_{th} = \frac{1}{\bar{I}_0} \Rightarrow Z_{th} = 3,6+12,8j$

Por lo tanto $Z^{max} = Z_{th}^* \Rightarrow Z^{max} = 3,6 - 12,8j$

$R = 3,6\,\Omega \quad L = 0 \quad C = 248,67\,\mu f$

Calculamos la V_{th}

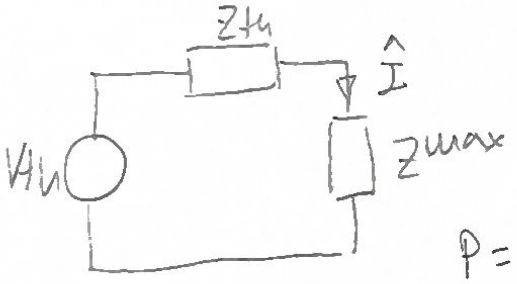


$\bar{V} = 3\bar{I}Z_1$

$\bar{V}_S = \bar{Z}_g\bar{I} + 2\bar{V} \Rightarrow \bar{V}_S = Z_S\bar{I} + 6Z_1\bar{I} \Rightarrow$

$\Rightarrow \bar{I} = \frac{\bar{V}_S}{Z_g + 6Z_1} \Rightarrow \bar{I} = 0,02 - 0,04j$

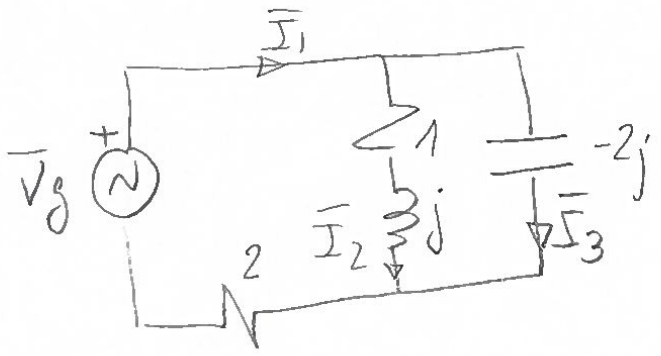
$\bar{V} = 7,8 - 0,6j \qquad \bar{V}_{th} = 7,8 - 0,6j$



$\hat{I} = \frac{V_{th}}{Z_{th} + Z^{max}} = \frac{7,8 - 0,6j}{2 \cdot 3,6} = 1,0833 - 0,0833j = 1,086\angle -4,4°$

$P = 3,6 \cdot (1,086)^2 = 4,25W \qquad Q = -12,8\,(1,086)^2 = -15,11\,VAr.$

4. Resolvemos el circuito



$\bar{I}_1 = \frac{\bar{V}_g}{2 + (-2j) \,//\, (1+j)} = 5A \rightarrow \boxed{A_1 = 5A}$

$\bar{I}_2 = \bar{I}_1 \frac{-2j}{-2j + 1 + j} = 5 - 5j \rightarrow \boxed{A_2 = 7,07A}$

$\bar{I}_3 = \bar{I}_1 - \bar{I}_2 = 5 - 5 + 5j = 5j \rightarrow \boxed{A_3 = 5A}$

$P_g = 20 \cdot 5 = 100W$

$Q_g = 0\ VAr$

2. Ejercicio resuelto en el examen de Junio 2024