SOLUCIÓN SEPTIEMBRE 2023

1)

$$\begin{pmatrix} 11 & 0 & -7 & 0 \\ 0 & 9 & 0 & -3 \\ -7 & 0 & 14 & -2 \\ 0 & -3 & -2 & 9 \end{pmatrix} \begin{pmatrix} i_a \\ i_b \\ i_c \\ i_d \end{pmatrix} = \begin{pmatrix} 10+v_3 \\ -20-v_3 \\ 0 \\ -v_8 \end{pmatrix}$$

$3 = i_a - i_b$

$i_d = -8$

2)

$$\begin{pmatrix} 1/5 & 0 & 0 \\ 0 & 1/6 & -1/6 \\ 0 & -1/6 & \frac{1}{3}+1/6 \end{pmatrix} \begin{pmatrix} v_A \\ v_B \\ v_C \end{pmatrix} = \begin{pmatrix} 3-i_v \\ 5+i_v \\ -5 \end{pmatrix}$$

$V_B - V_A = 10$

3) $X_L = 5j \quad X_C = -5j \quad V_g = \frac{150}{\sqrt{2}}\angle 0^\circ$

$$(3+5j)\,||\,(-5j) = \frac{(3+5j)(-5j)}{3+\cancel{5j}-\cancel{5j}} = \frac{-15j+25}{3}$$

$$I = \frac{V_g}{7+(3+5j)\,||\,(-5j)} \cdot \frac{(-5j)}{3+\cancel{5j}-\cancel{5j}} = V_g \frac{\cancel{3}}{21+25-15j} \cdot \frac{(-5j)}{\cancel{3}} =$$

$$= V_g \frac{-5j}{46-15j} = \frac{150}{\sqrt{2}} \cdot \frac{5\angle -90^\circ}{48{,}38\angle -18^\circ} = 10{,}96\angle -71{,}93^\circ$$

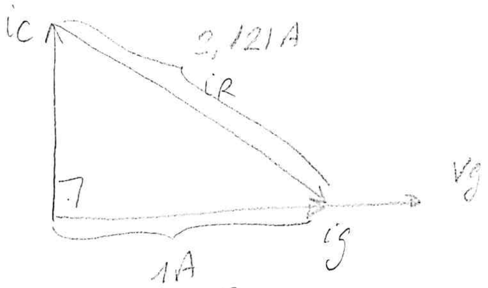
$\boxed{i(t) = 15{,}5 \cos(1000t - 71{,}93^\circ)}$

4) $P_g = \frac{150}{\sqrt{2}} \cdot 1 \cdot \cos 0^\circ = 75\sqrt{2}\,W$ (consumido por la resistencia)

$75\sqrt{2} = \frac{50^2}{R} \Rightarrow \boxed{R = 23{,}57\,\Omega}$ $\quad |I_R| = \frac{50}{23{,}57} = 2{,}121\,A$.

$I_g = I_c + I_R \rightarrow$ hacemos el diagrama fasorial

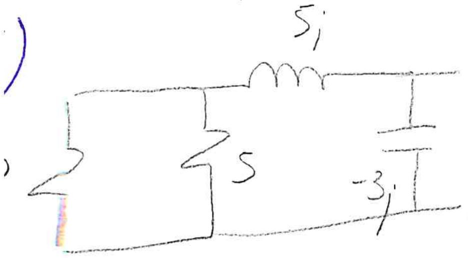
$|I_c| = \sqrt{2{,}121^2 - 1^2} = 1{,}87\,A$



$X_C = \frac{150/\sqrt{2}}{1{,}87} = 56{,}69 \rightarrow \boxed{C = 176{,}38\,\mu F}$

$X_L = \sqrt{\left(\frac{150/\sqrt{2}}{2{,}121}\right)^2 - 23{,}57^2} = 44{,}10 \rightarrow \boxed{L = 441{,}04\,mH}$

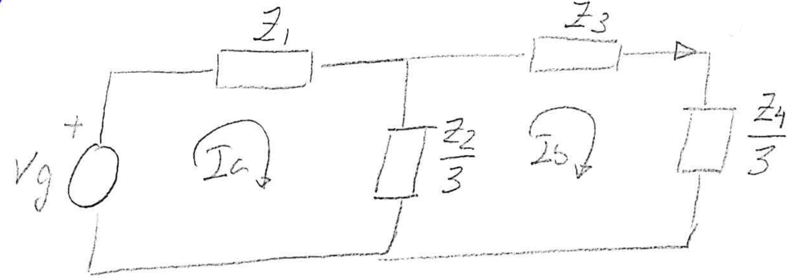
5)



$Z_{th} = ((20\,||\,5)+5j)\,||\,(-3j) = 1{,}8 - 3{,}9j$

$\boxed{X^{max} = 3{,}9\,\Omega}$

6) Hacemos el equivalente monofásico λ - λ



$|I_b| = 10 \cdot \sqrt{3}$

$I_b = 10 \cdot \sqrt{3} \angle 0°$

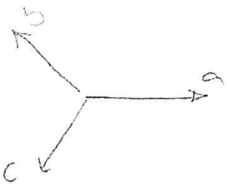
$$\begin{pmatrix} Z_1 + \frac{Z_2}{3} & -\frac{Z_2}{3} \\ -\frac{Z_2}{3} & \frac{Z_2}{3} + Z_3 + \frac{Z_4}{3} \end{pmatrix} \begin{pmatrix} I_a \\ I_b \end{pmatrix} = \begin{pmatrix} V_g \\ 0 \end{pmatrix} \Rightarrow \begin{pmatrix} 6 - 1,33j & -5 + 3,33j \\ -5 + 3,33j & 9,33 + 3,66j \end{pmatrix} \begin{pmatrix} I_a \\ I_b \end{pmatrix} = \begin{pmatrix} V_1 \\ 0 \end{pmatrix}$$

$$I_a = \frac{-(9,33 + 3,66j)}{-5 + 3,33j} I_b = (0,95 + 1,36j) I_b = 28,73 \angle 55,06°$$

$\boxed{A = 28,73 A}$

$$V_g = (6 - 1,33j) \cdot (28,73 \angle 55,06°) + 10\sqrt{3}(-5 + 3,33j) = 43,42 + 177,09j = 182,33 \angle 76,22°$$

$V = 182,33 \cdot \sqrt{3} \Rightarrow \boxed{V = 315,8 V}$



7)

$\boxed{V = \frac{300}{\sqrt{2}} \cdot \sqrt{3} = 367,42 V}$

$Q_g = \sqrt{3} \cdot |V| \cdot |I| \cdot \operatorname{sen} \phi \Rightarrow \boxed{|I| = \frac{1800}{\sqrt{3} \cdot 367,42 \cdot \operatorname{sen}(\arccos 0,9)} = 6,48 A}$

$Q_g = \sqrt{3} \cdot W_1 \Rightarrow W_1 = \frac{-1800}{\sqrt{3}} \Rightarrow \boxed{W_1 = -1039 W}$

$P_g = \sqrt{3} \, |V| \, |I| \cdot \cos\phi \Rightarrow P_g = 3711,42 W.$

$P_L = 2 \cdot (6,48)^2 \cdot 3 = 251,94 W$

$Q_L = 1 \cdot (6,48)^2 \cdot 3 = 125,97 VAr$

$P_C = P_g - P_L = 3459,48 W$

$Q_C = Q_g + Q_L = 1925,97 VAr$

$P_C = W_2 + W_3 = 3459,48$

$Q_C = \sqrt{3}(W_2 - W_3) = -1925,97$

$2\sqrt{3} W_2 = \sqrt{3} \cdot 3459,48 - 1925,97 \Rightarrow$

$\Rightarrow \boxed{W_2 = 1173,76}$

$\boxed{W_3 = 2285,71}$