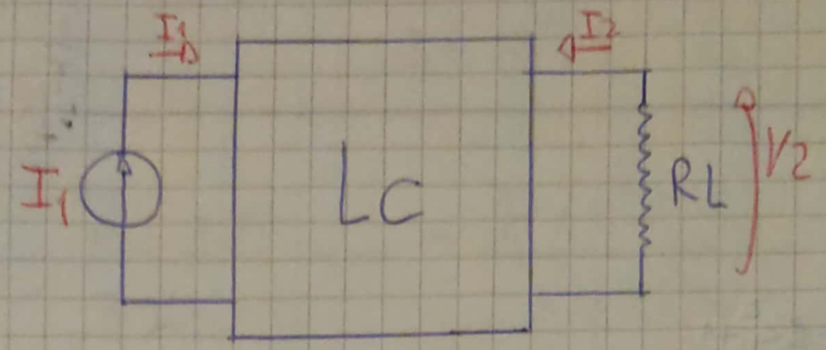
2)



DATOS

$T(s) = \frac{V_2}{I_1} = K\frac{s^2+9}{s^3+2s^2+1+2s}$

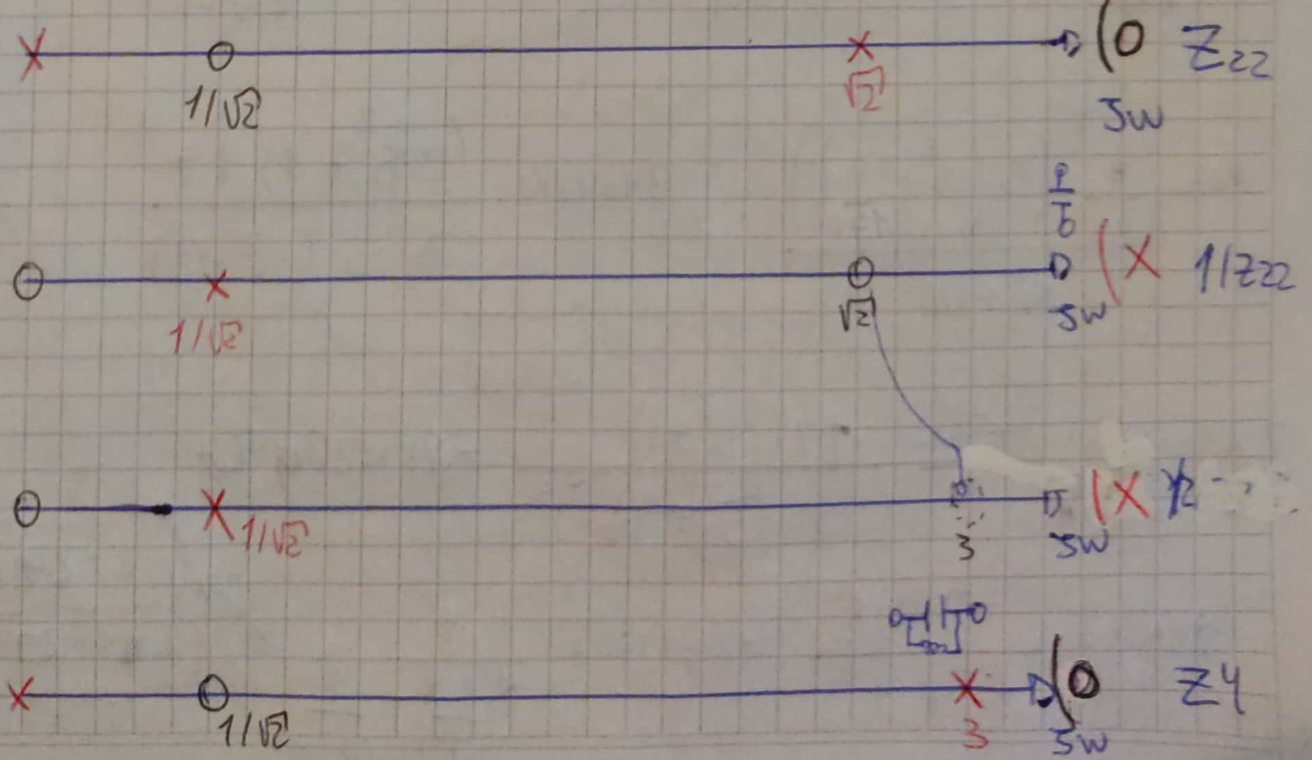
a) PARTIENDO DE:

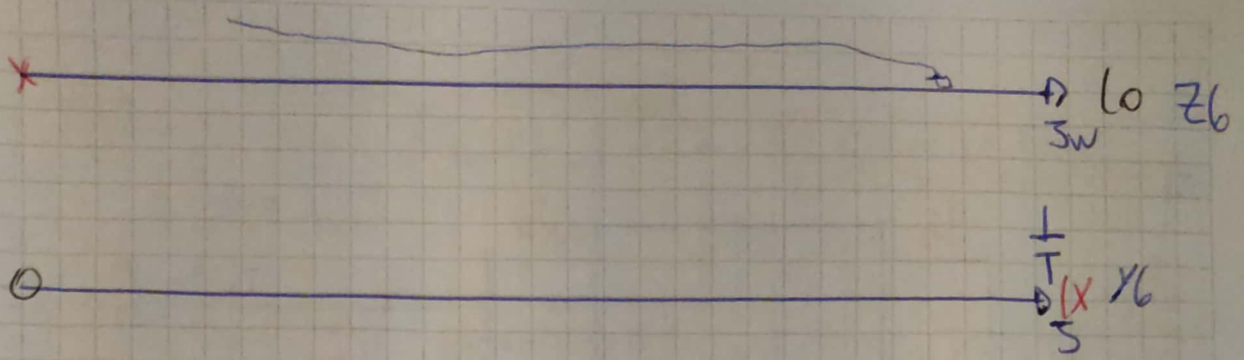
$V_2 = z_{21} \cdot I_1 + z_{22}\underbrace{(-V_2)/R_L}_{(+I_2)} \rightarrow \left.\frac{V_2}{I_1}\right|_{I_2=-V_2/R_L} = \frac{z_{21}}{1+z_{22}/\underbrace{R_L}_{1}} = K\frac{s^2+9}{s^3+2s^2+1+2s}$

$\left.\frac{V_2}{I_1}\right|_{I_2=(-V_2)/R_L} = \frac{K(s^2+9)}{(s^3+2s)\left(\frac{2s^2+1}{s^3+s.2}\right)}$

$z_{21} = \frac{K(s^2+9)}{s^3+2s}$

$z_{22} = \frac{2s^2+1}{s^3+2s} = 2\frac{s^2+1/2}{s(s^2+2)}$





b) FORMA ANALÍTICA

$$1/z_{22} = \frac{s(s^2+2)}{2s^2+1} \; ; \; \left[1/z_{22} - \frac{y_1}{K_\infty s} \right]_{s=\infty} = y_2 \Big|_{\substack{s=\pm 3 \\ j\omega_1}}^{=0} \; ; \; K_\infty = s^{-1}/z_{22} \Big|_{s=-3}$$

$$K_\infty = \frac{(9+2)}{-2\cdot 9+1} \Rightarrow K_\infty = 7/17 \rightarrow y_1 = y_{C3} = s\frac{7}{17} \rightarrow C3 = 7/17$$

$$Y_2 = \frac{1}{Z_{22}} - Y_1 = \frac{s^3+2s - \left(s\frac{7}{17}\cdot 2s^3 + \frac{7}{17}s\right)}{2s^2+1} \Rightarrow Y_2 = \frac{\frac{3}{17}s^3 + \frac{27}{17}s}{2s^2+1}$$

$$Y_2 = \frac{\frac{3}{34}\left(s\left(s^2+9\right)\right)}{s^2+1/2} \; ; \; Z_4 = 1/Y_2 = \frac{(2s^2+1)17}{3s(s^2+9)}$$

$$2K_1 = \lim_{s^2 \to -9} \frac{\cancel{(s^2+9)}}{s} \frac{17(2s^2+1)}{3s\cancel{(s^2+9)}} \Rightarrow 2K_1 = 289/27$$

$$Z_{L1C2} = \frac{2K_1 s}{s^2+9} \Rightarrow Z_{L1C2} = \frac{1}{\underbrace{s\frac{27}{289}}_{sC} + \frac{1}{s\frac{289}{243}}}$$

$243 \rightarrow 9.27$

$C2 = 27/289$

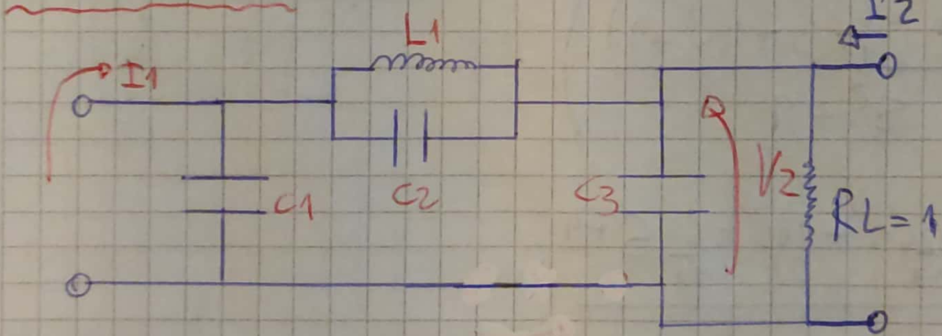
$L1 = 289/243$

$$Z6 = Z4 - Z_{L1C2} = \frac{17(2s^2+1) - \cancel{3}^{1} s \frac{289}{\cancel{27}_{9}} s}{3s(s^2+9)}$$

$$Z6 = \frac{\frac{17}{9}s^2 + 17}{3s(s^2+9)} = \frac{\frac{17}{9}\cancel{(s^2+9)}}{3s\cancel{(s^2+9)}}$$

$$Y6 = \frac{27}{17} s \longrightarrow \boxed{C1 = 27/17}$$

CIRCUITO FINAL



$$T1 = \begin{pmatrix} 1 & 0 \\ sC1 & 1 \end{pmatrix}; \quad T2 = \begin{pmatrix} 1 & \left(\frac{s^2L1C2+1}{sL1}\right)^{-1} \\ 0 & 1 \end{pmatrix}; \quad T3 = \begin{pmatrix} 1 & 0 \\ \frac{sC3RL+1}{RL} & 1 \end{pmatrix}$$

$$T = T1 \cdot T2 \cdot T3 = \begin{pmatrix} \cdots & \cdots \\ \underbrace{sC1}_{\frac{27}{17}} & \frac{s^2L1C1+1}{s^2L1C2+1} \end{pmatrix} \begin{pmatrix} 1 & 0 \\ \frac{sC3+1}{1} & 1 \end{pmatrix}$$

$$T = \begin{pmatrix} \cdots & & \cdots \\ \underbrace{Y_{c1} + (Y_{c1} Z_{L1C2} + 1)(Y_{c3+1})}_{C} & \cdots & \end{pmatrix}$$

$$C = Y_{c1} + (Y_{c1} Z_{L1C2} + 1)(Y_{c3} + 1)$$

$$C = s\frac{27}{17} + \left(s\frac{7}{17} + 1\right)\left(s\frac{\overset{1}{\cancel{27}}}{\underset{1}{\cancel{17}}} \frac{\left(\overset{17}{\cancel{289}}\ \overset{1}{\cancel{27}}\right)s}{s^2+9} + 1\right)$$

$$C = s\frac{27}{17} + \left(\frac{7}{17}s + 1\right)\left(\frac{18s^2 + 9}{s^2+9}\right)$$

$$C = s\frac{27}{17} + \left(\frac{s^3\frac{126}{17} + \frac{63}{17}s + 18s^2 + 9}{s^2+9}\right)$$

$$C = \frac{\frac{243}{17}s + s^3\frac{27}{17} + \frac{126}{17}s^3 + 18s^2 + \frac{63}{17}s + 9}{s^2+9}$$

$$C = \frac{9s^3 + 18s^2 + 18s + 9}{s^2+9} \rightarrow C = \frac{9(s^3 + 2s^2 + 2s + 1)}{s^2+9}$$

$$T(s) = 1/C \rightarrow T(s) = \frac{1}{9}\,\frac{s^2+9}{s^3 + 2s^2 + 2s + 1} \quad ; K = 1/9$$