TS13

HOJA N° 1

FECHA

TRABAJO SEMANAL #13

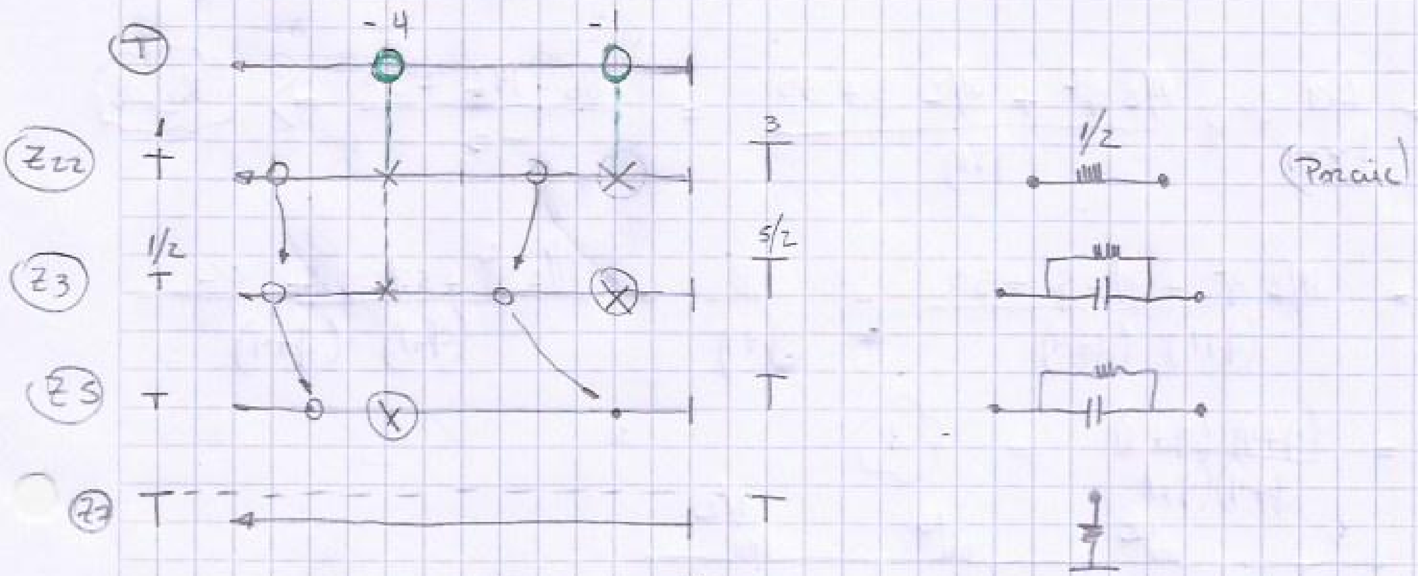
EJERCICIO #1

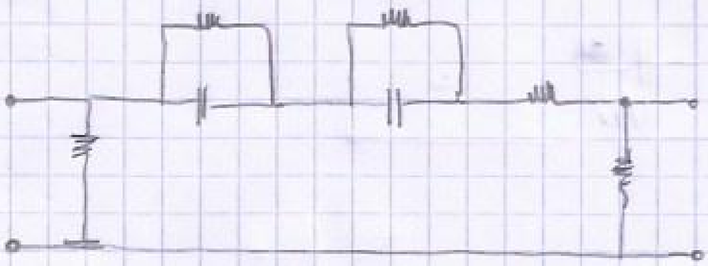
$$-\frac{I_2}{I_1} = 4 \cdot \frac{s^2+5s+4}{s^2+8s+12} \qquad Z_{21} = 64$$

$$-\frac{I_2}{I_1} = \frac{Z_{21}}{Z_{22}} = \frac{64}{Z_{22}} \longrightarrow \left[Z_{22} = 6 \cdot \frac{(s+2)(s+6)}{(s+1)(s+4)} \right]$$

$$Z_{22}(0) = 3 \qquad Z_{22}(\infty) = 1$$

SÍNTESIS GRÁFICA





Valores

$R_0 = 1/2$

$$Z_{22} = \frac{6\,(s^2 + 8s + 12)}{(s+1)\,(s+4)} =$$

$$Z_3 = \frac{6\,(s^2 + 8s + 12)}{(s+1)\,(s+4)} - 1/2 = \frac{6s^2 + 48s + 72 - 1/2\, s^2 - 5/2\, s - 2}{(s+1)\,(s+4)}$$

$$Z_3 = \frac{11/2\, s^2 + 91/2\, s + 70}{(s+1)\,(s+4)}$$

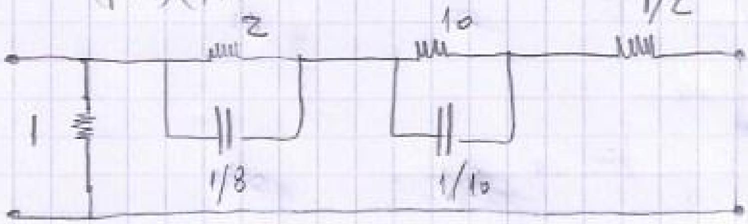
$$K_1 = \lim_{s \to -1} [\ldots] \quad \frac{11/2 - 91/2 + 70}{3} \Rightarrow K_1 = 10$$

$$Z_5 = \frac{11/2\, s^2 + 91/2\, s + 70}{(s+1)\,(s+4)} - \frac{10}{s+1} = \frac{11/2\, s^2 + 71/2\, s + 30}{(s+1)\,(s+4)}$$

$$K_2 = \lim_{s \to -4} \ldots \quad \frac{11/2\, s^2 + 71/2\, s + 30}{(s+1)} = \frac{88 - 142 + 30}{-3} \Rightarrow K_2 = 8$$

$$Z_7 = \frac{11/2\, s^2 + 71/2\, s + 30}{(s+1)\,(s+1)} - \frac{8}{(s+4)} = \frac{11/2\, s^2 + 55/2\, s + 22}{(s+1)\,(s+4)}$$

$$Z_7 = \frac{(s+4)\,(s+1)}{(s+4)(s+1)} = 1$$



$$\frac{10}{s+1} = \frac{1}{\frac{s}{10} + \frac{1}{10}}$$

$$\frac{8}{s+4} = \frac{1}{\frac{s}{8} + \frac{4}{8}}$$

TS13

HOJA N° 2

FECHA

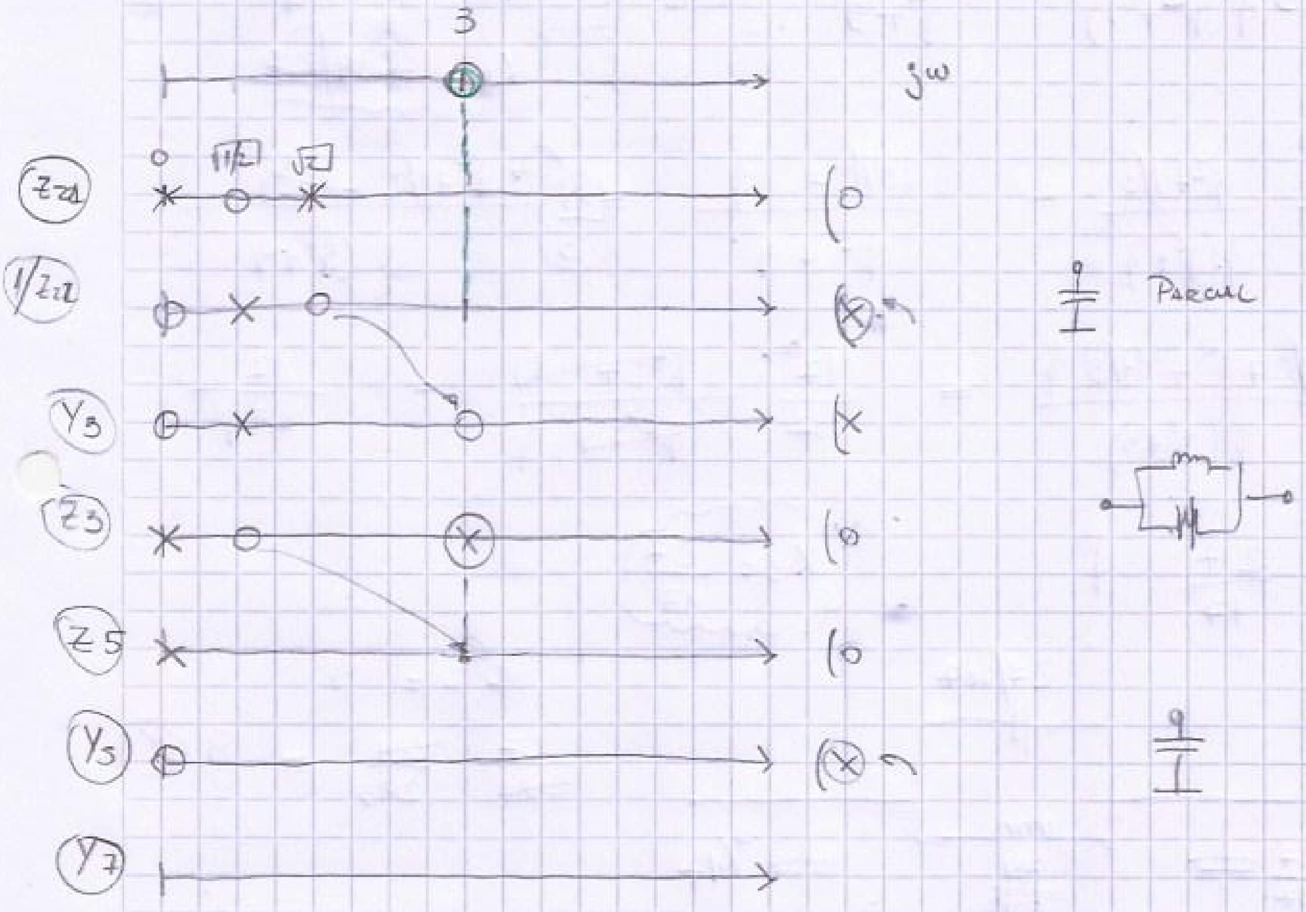
EJERCICIO #2

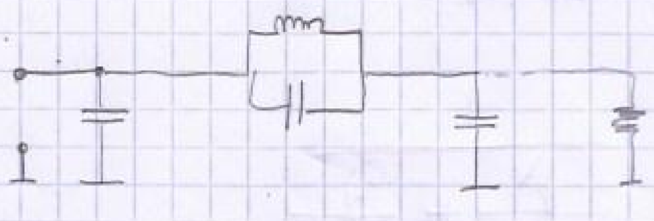
$$T(s) = \frac{V_2}{I_1} = \frac{s^2+9}{s^3+2s^2+2s+1} = \frac{s^2+9}{(s^3+2s)+(2s^2+1)}$$

DIVIDO POR LA PARTE IMPAR

$$\frac{V_2}{V_1} = \frac{\overbrace{\dfrac{s^2+9}{s^3+2s}}^{z_{21}}}{1+\underbrace{\dfrac{2s^2+1}{s^3+2s}}_{z_{22}}} \qquad z_{22} = \frac{2\,(s^2+1/2)}{s\,(s^2+2)}$$

SÍNTESIS





NOTA

Valores

$$\frac{1}{z_{22}} = \frac{s(s^2+2)}{2(s^2+1/2)} \qquad K_1 = \left.\frac{s^2+2}{2(s^2+1/2)}\right|_{s^2=-9} = \frac{7}{17}$$

$$K_1 = \frac{7}{17}$$

$$Y_3 = \frac{s(s^2+2)}{2(s^2+1/2)} - K_1 s$$

$$Y_3 = \frac{s^3+2s}{2(s^2+1/2)} - \frac{7}{17}s = \frac{s^3+2s-14/17\,s^3-7/17\,s}{2(s^2+1/2)} = \frac{3/17\,s^3+\frac{27}{17}s}{2(s^2+1/2)}$$

$$Z_3 = \frac{2(s^2+1/2)}{3/17\,s(s^2+9)} = \frac{34}{3}\frac{(s^2+1/2)}{s(s^2+9)}$$

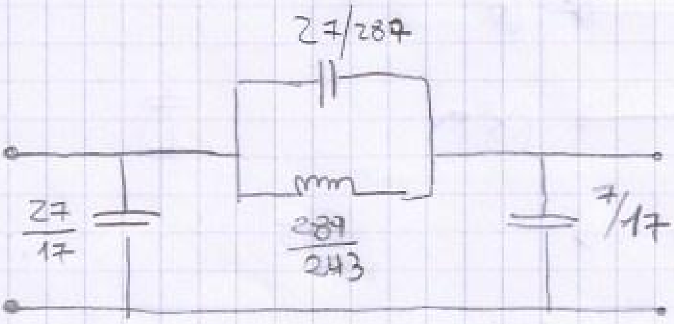
$$Z_5 = \frac{34}{3}\frac{(s^2+1/2)}{s(s^2+9)} - \frac{K_2 s}{s^2+9} \qquad K_2 = \lim_{s^2\to-9} \frac{34}{3}\frac{s^2+1/2}{s^2}$$

$$K_2 = 289/27$$

$$Z_5 = \frac{34}{3}\frac{s^2+1/2}{s(s^2+9)} - \frac{289/27\,s}{s^2+9} = \frac{34}{3}\frac{s^2+1/2-\frac{289}{27}s^2}{s(s^2+9)}$$

$$Z_5 = \frac{17/27\,s^2+17/3\,s}{s(s^2+9)} = \frac{17}{27}\frac{\cancel{(s^2+9)}}{\cancel{(s^2+9)}\,s} = \frac{17}{27s}$$

$$Y_5 = \frac{27}{17}s \qquad K_3 = \frac{27}{17}$$



$$LC = 9$$

$$\frac{27}{289}\cdot\frac{\cancel{289}}{243} = 9 \checkmark$$

$$\frac{\frac{289}{27}s}{s^2+9} = \frac{1}{\dfrac{s^2}{\frac{289}{27}s} + \dfrac{9}{\frac{289}{27}}}$$

TS13

HOJA 3

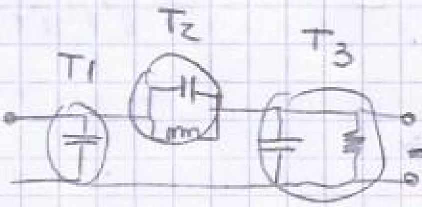
FECHA

VERIFICACIÓN

$\$ \to 0$ QUEDA SOLO LA CARGA

$\$ \to \infty$ CORTO CIRCUITO

CUADRIPOLO



¡CARGA!

$$T_x = T_1 \cdot T_2 \cdot T_3 \cdot T_4$$

$$T1 = \begin{bmatrix} 1 & \phi \\ \frac{27}{17}\$ & 1 \end{bmatrix} \begin{bmatrix} 1 & \dfrac{\frac{289}{27}\$}{\$^2+9} \\ \phi & 1 \end{bmatrix} \begin{bmatrix} 1 & \phi \\ 7/17\$+1 & 1 \end{bmatrix}$$

$$\boxed{T} \longrightarrow \begin{matrix} V_1 = V_2\,A + (-I_2)\,B \\ I1 = V_2\,C + (-I_2)\,D \end{matrix} \qquad \left.\frac{V_2}{I_1}\right|_{I_2=\phi} = \frac{1}{C}$$

$$T_1 = \begin{bmatrix} 1 & \dfrac{289/27\,\$}{\$^2+9} \\ 27/17\$ & \dfrac{17\,\$^2}{\$^2+9}+1 \end{bmatrix} \begin{bmatrix} 1 & \phi \\ 7/17\$+1 & 1 \end{bmatrix} = \begin{bmatrix} - & - \\ C & - \end{bmatrix}$$

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

$$C = \frac{27}{17}\$ + \frac{7\,\$^3}{\$^2+9} + \frac{17\,\$^2}{\$^2+9} + \frac{7}{17}\$ + 1$$

$$C = \frac{27\$(\$^2+9) + 119\$^3 + 289\$^2 + 7\$(\$^2+9) + 17(\$^2+9)}{(\$^2+9)\,17}$$

$$C = \frac{153\,\$^3 + 306\,\$^2 + 306\,\$ + 153}{(\$^2+9).\,17}$$

NOTA

$$C = \frac{9s^3 + 18s^2 + 18s + 9}{s^2 + 9}$$

$$C = \frac{s^3 + 2s^2 + 2s + 9}{s^2 + 9} \cdot \frac{1}{9}$$

$$\left.\frac{V_2}{I_1}\right|_{I_2 = 0} = \frac{1}{C} = \frac{s^2 + 9}{s^3 + 2s^2 + 2s + 9} \cdot \frac{1}{9}$$

NOTA