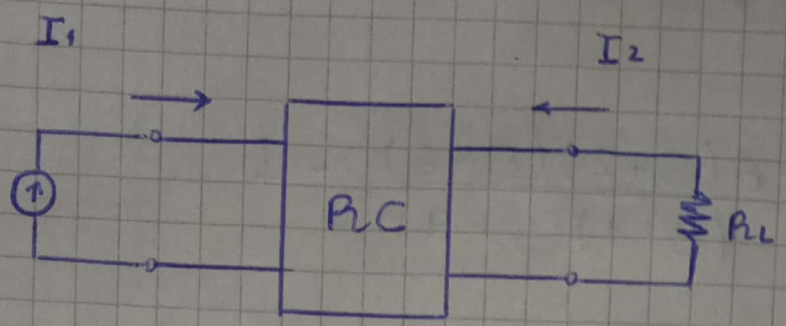
TS13



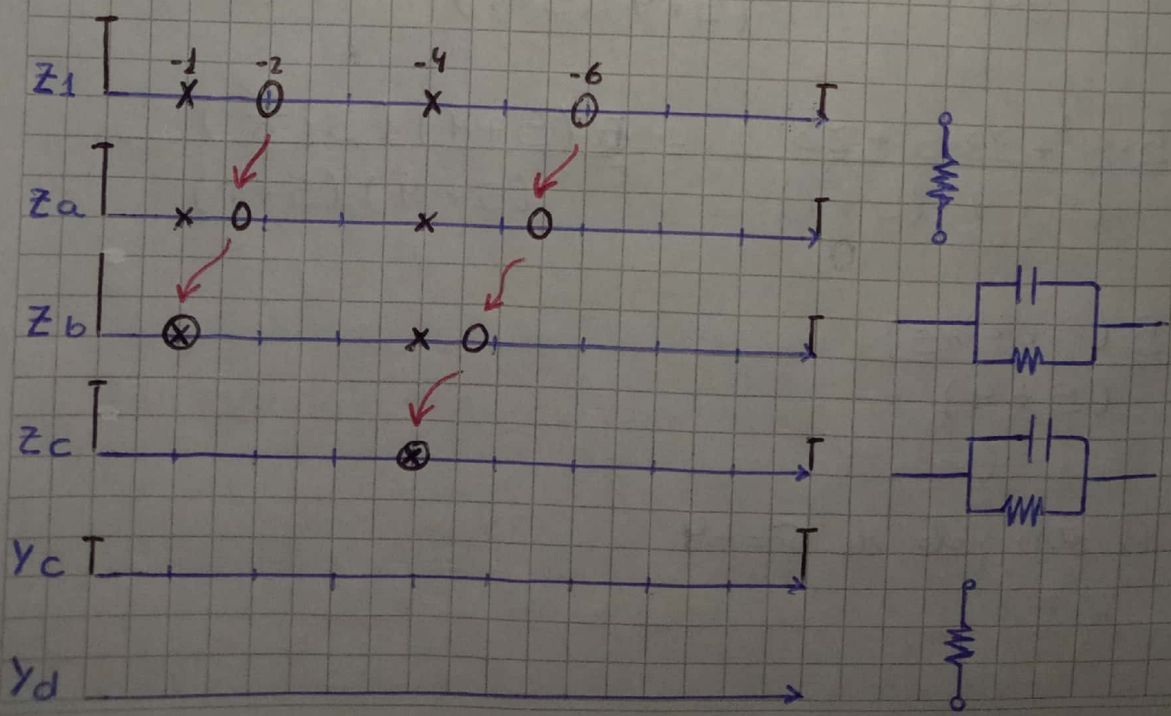
• Síntesis Gráfica

$$T(S) = \frac{(-I_2)}{I_1} = H \, \frac{S^2 + 5 \cdot S + 4}{S^2 + 8 \cdot S + 12} \qquad Z_{21} = 6H$$

Sabiendo que $T(S) = \dfrac{Z_{21}}{Z_{22}} = \dfrac{6 \cdot H}{Z_{22}}$

$$Z_{22} = \frac{6\,(S^2 + 8 \cdot S + 12)}{(S^2 + 5 \cdot S + 4)} = Z_1$$

Se me impone que debo terminar con una resistencia



- Síntesis Analítica

Remuevo la resistencia que me impone la topología R_L siendo que $R_L = 1$

$$Z_a = Z_1 - R_L = \frac{6(S+2)(S+6)}{(S+1)(S+4)} - 1$$

$$Z_a = \frac{5 \cdot S^2 + 43 \cdot S + 68}{(S+1)(S+4)}$$

Retiro polo en $\sigma = -1$ y obtengo el tanque RC

$$\lim_{S \to -1} \frac{5 \cdot S^2 + 43 \cdot S + 68}{(S+4)\cancel{(S+1)}} = \frac{K_1}{\cancel{(S+1)}}$$

$$\frac{5(1) + 43(-1) + 68}{(3)} = \underbrace{K_1 = 10}$$

$$Z_b = Z_a - \frac{K}{S+1} = \frac{5 \cdot S^2 + 43 \cdot S + 68}{(S+4)(S+1)} - \frac{10}{(S+1)}$$

$$Z_b = \frac{5 \cdot S^2 + 33 \cdot S + 28}{(S+4)(S+1)} = \frac{5(S+1)(S+\frac{28}{5})}{(S+4)(S+1)}$$

$$Z_b = \frac{5 \cdot (S + 28/5)}{(S+4)}$$

Retiro el otro polo de $\sigma = -4$

Escaneado con CamScanner

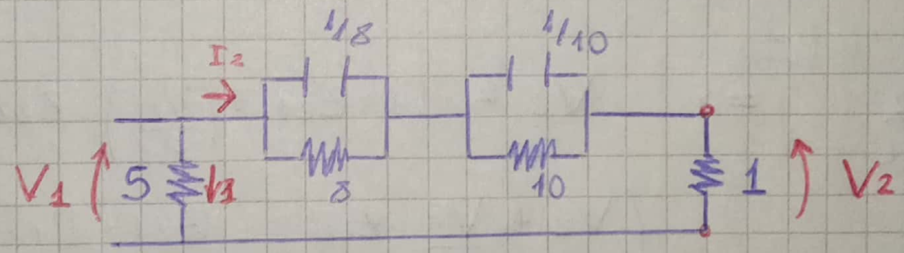
$$\lim_{S \to -4} \frac{5\left(S+\frac{28}{5}\right)}{(S+4)} = \frac{K_2}{(S+4)} \Rightarrow 5\left(-4+\frac{28}{5}\right) = K_2$$

$$\boxed{K_2 = 8}$$

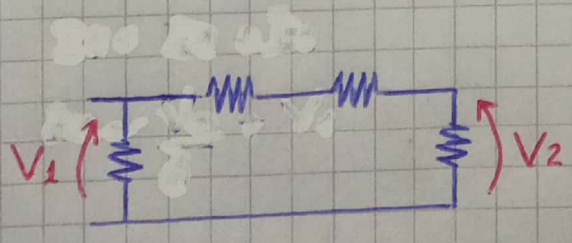
$$Z_C = \frac{5\left(S+\frac{28}{5}\right)}{(S+4)} - \frac{8}{(S+4)} = 5$$

Valor de la resistencia restante es de 5

Se obtiene la siguiente síntesis



Se analiza en $S = 0$ para hallar H

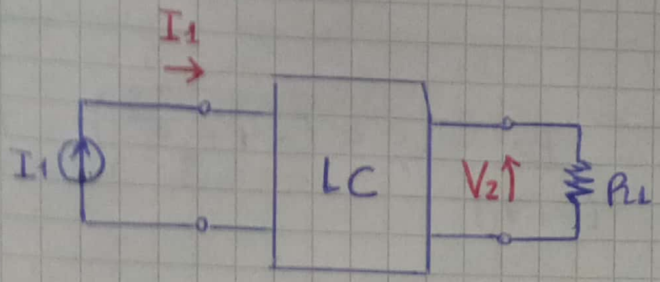


$$V_1 \frac{1}{18+1} = V_2$$

$$\frac{V_2}{V_1} = \frac{1}{19}$$

$$T(S \to 0) = \frac{(0)^2 + (0)\cdot 5 + 4}{0+0+12} H = \frac{1}{19} \to H = \frac{3}{19}$$

2



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

Se sabe que que es un cuadripolo sin perdidas

$$\begin{cases} V_2 = (-I_2)\cdot R_L \\ V_2 = I_1\cdot Z_{21} + (-I_2)\cdot Z_{22} \end{cases}$$

$$(-I_2) = \frac{V_2}{R_L} \Rightarrow V_2 = I_1\cdot Z_{21} + \left(\frac{V_2}{R_L}\right)\cdot Z_{22}$$

$$\left(V_2 + \frac{V_2}{R_L}\cdot Z_{22}\right) = Z_{21}\cdot I_1$$

$$\frac{V_2}{I_1} = \frac{Z_{21}\cdot R_L}{R_L + Z_{22}}$$

Si normalizo $R_L = 1$

$$T(S) = \frac{Z_{21}}{1+Z_{22}}$$

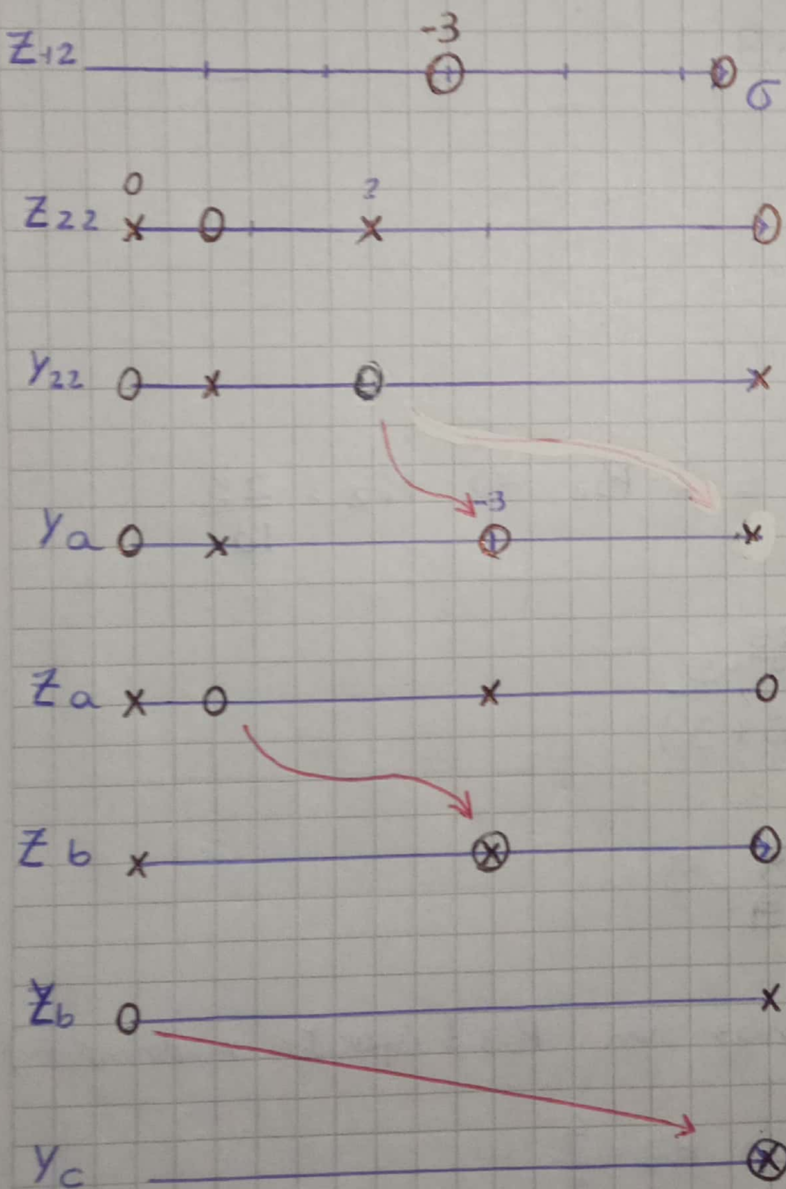
Si es NO disipativo aplico condiciones de "Paridad"

impongo que Z_{21} es impar

$$Z_{21} = \frac{S^2+9}{S^3+2\cdot S} \qquad Z_{22} = \frac{2\cdot S^2+1}{S^3+2\cdot S}$$

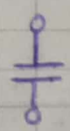
$$T(s) = \frac{\dfrac{s^2+9}{s^3+2\cdot s}}{1+\dfrac{2\cdot s^2+1}{s^3+2\cdot s}} = \frac{P}{Q} \quad , Q$$

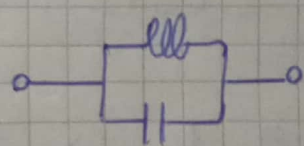
Sintetizo $Z_{22} = \dfrac{2\cdot s^2+1}{s^3+2\cdot s} = \dfrac{2\cdot s^2+1}{(s^2+2)\,s}$

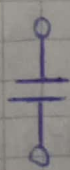


Debo respetar el cero en $\sigma = -3$ y ∞

remuevo parcialmente a ∞







Remuevo parcialmente en ∞

$$\lim_{S^2\to}\left(\frac{S^3+2\cdot S}{2\cdot S^2+1}\right) = K_1\cdot S \Rightarrow K_1 = \frac{1}{5}$$

$$Y_a = Y_{22} - K_1\cdot S$$

$$Y_a = \frac{S^3+2\cdot S}{2\cdot S^2+1} - \frac{1}{5}\cdot S = \frac{\frac{3}{5}\cdot S^3+\frac{9}{5}\cdot S}{2\cdot S^2+1}$$

Remuevo el polo en -3

$$Z_a = \frac{5}{3}\,\frac{2\cdot S^2+1}{S\,(S^2+3)}$$

$$Z_b = Z_a - \frac{2K\cdot S}{(S^2+3)} =$$

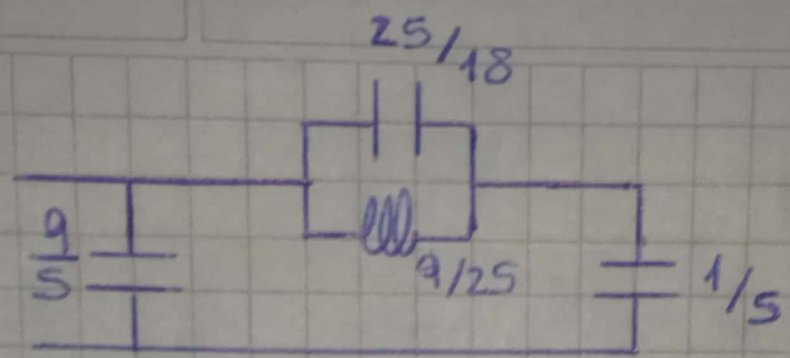
$$\lim_{S^2\to -3} \frac{5}{3}\,\frac{2\,(S^2+\frac{1}{2})}{S^2} = 2\cdot K_2 \Rightarrow K_2 = \frac{25}{18}$$

$$Z_b = \frac{5}{3}\frac{(2\cdot S^2+1)}{S\,(S+3)} - \frac{\frac{25}{9}\cdot S}{(S+3)}$$

$$Z_b = \frac{5}{9}\cdot\frac{1}{S} \rightarrow Y_b = \frac{9}{5}\cdot S$$

remuevo en ∞ y obtengo un K_3 (capacitor en derivación)

$$\lim_{S\to\infty} Y_b = \frac{9}{5}\cdot S = K_3\cdot S \Rightarrow K_3 = \frac{9}{5}$$



(Síntesis de Z_{22})