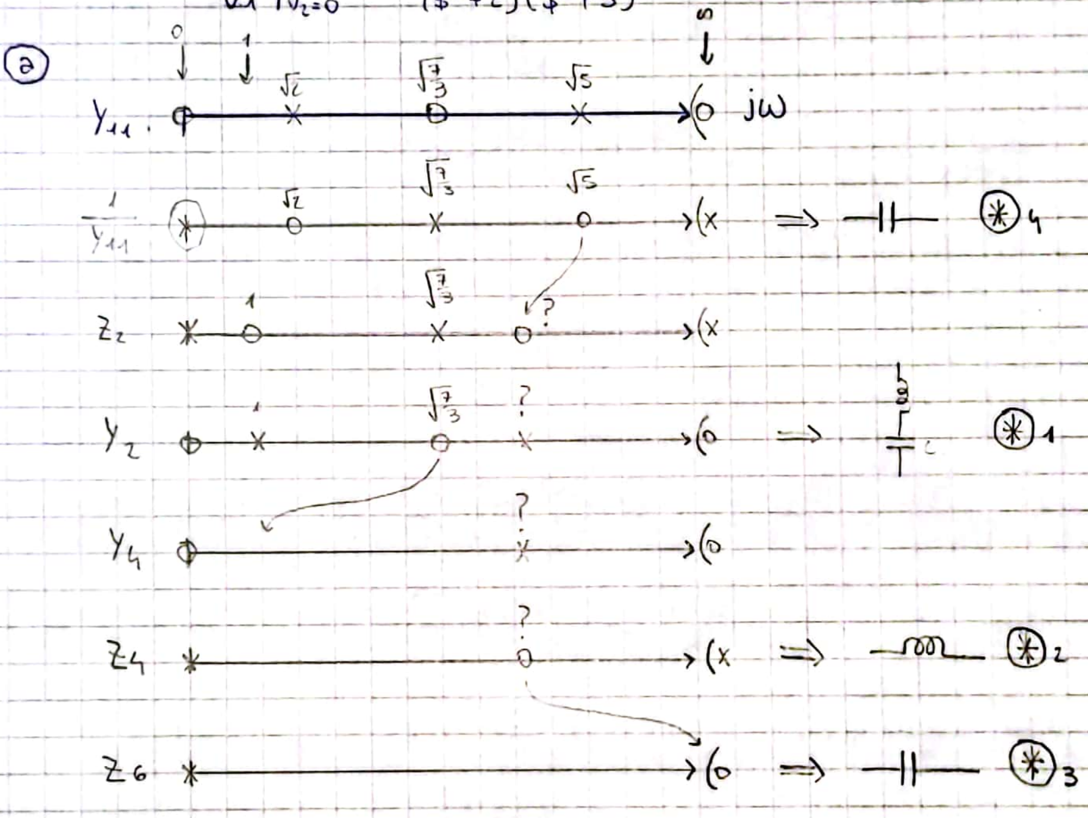
Tarea semanal N° 11

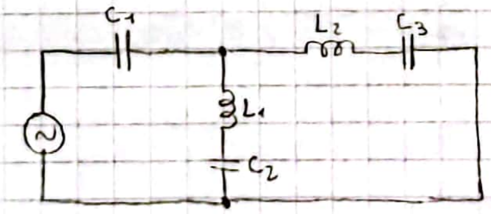
1)

$$Y_{11} = \frac{I_1}{V_1}\Big|_{V_2=0} = \frac{3\,s\,(s^2+7/3)}{(s^2+2)(s^2+5)}$$

$$Y_{21} = \frac{I_2}{V_1}\Big|_{V_2=0} = \frac{s\,(s^2+1)}{(s^2+2)(s^2+5)}$$

2)





b)

(*)$_1$ $\quad \dfrac{1}{Y_{11}} - \dfrac{k'_0}{s} = Z_2(s)\Big|_{s=j} = 0$

$$\dfrac{1}{Y_{11}} \cdot s \Big|_{s=j} = k'_0$$

$$\dfrac{(s^2+2)(s^2+5)}{3s(s^2+7/3)} \cdot s \Big|_{s=j} = k'_0$$

$$\dfrac{(-1+2)(-1+5)}{3(-1+7/3)} = \boxed{k'_0 = 1} \longrightarrow \boxed{C_1 = 1}$$

$$Z_2 = \dfrac{(s^2+2)(s^2+5)}{3s(s^2+7/3)} - \dfrac{1}{s} = \dfrac{s^4+7s^2+10-3s^2-7}{3s(s^2+7/3)} = \dfrac{s^4+4s^2+3}{3s(s^2+7/3)}$$

$$Z_2 \quad \dfrac{(s^2+1)(s^2+3)}{3s(s^2+7/3)} \qquad Y_2 = \dfrac{3s(s^2+7/3)}{(s^2+1)(s^2+3)}$$

(*)$_1$ $\quad 2k_1 = \lim\limits_{s^2 \to -1} \dfrac{Y_2(s)(s^2+1)}{s} = \dfrac{3(-1+7/3)}{(-1+3)} = \boxed{2 = 2k_1}$

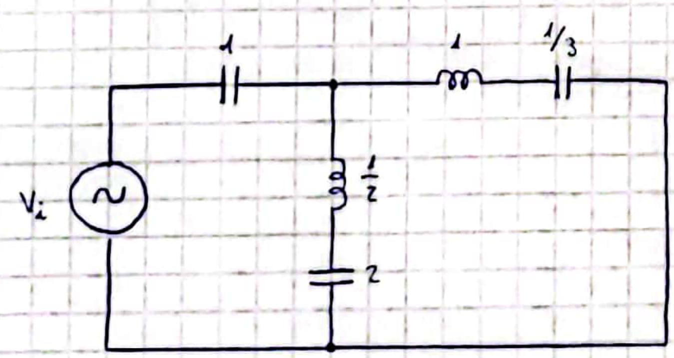
$$\dfrac{2k_1 s}{s^2+\omega_1^2} = \dfrac{1}{s\frac{1}{2k_1} + \omega_1^2 \frac{1}{2k_1 s}} = \dfrac{1}{s\frac{1}{2} + \frac{1}{s2}} \longrightarrow \boxed{L_1 = \tfrac{1}{2}} \quad \boxed{C_2 = 2}$$

$$Y_4 = \dfrac{3s(s^2+7/3)}{(s^2+1)(s^2+3)} - \dfrac{2s}{s^2+1} = \dfrac{3s^3+s7-2s^3-6s}{(s^2+1)(s^2+3)} = \dfrac{1s^2+s}{(s^2+1)(s^2+3)}$$

$$Y_4 = \dfrac{s}{s^2+3} \qquad Z_4 = \dfrac{s^2+3}{s}$$

(*)$_2$ $\Rightarrow \lim\limits_{s^2\to\infty} \dfrac{Z_4}{s} = k_\infty = \lim\limits_{s^2\to\infty} \dfrac{s^2+3}{s^2} = 1 \qquad \boxed{L_2 = 1}$

$$Z_6 = Z_4 - s = \dfrac{s^2+3}{s} - s = \dfrac{3}{s} \Longrightarrow \boxed{C_3 = \tfrac{1}{3}}$$

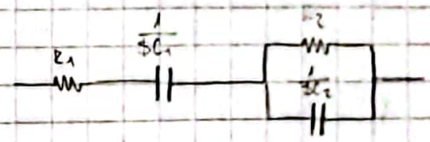


2) $\boxed{Z}$

$$Z_{21} = \frac{V_2}{I_1}\Big|_{I_2=0}$$

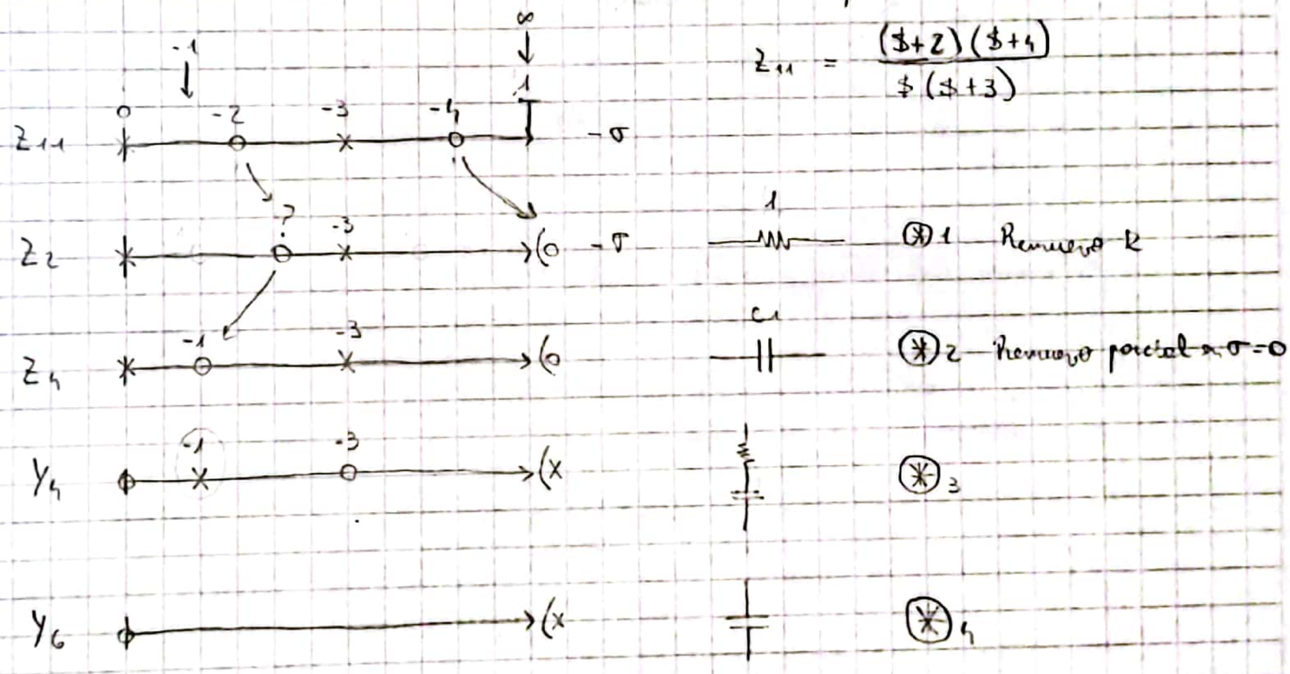
$$T(s) = \frac{V_2}{V_1}\Big|_{I_2=0} = \frac{K\,(s+1)}{(s+2)(s+4)} = \frac{\frac{K(s+1)}{D} \longrightarrow Z_{21}}{\frac{(s+2)(s+4)}{D} \longrightarrow Z_{11}}$$

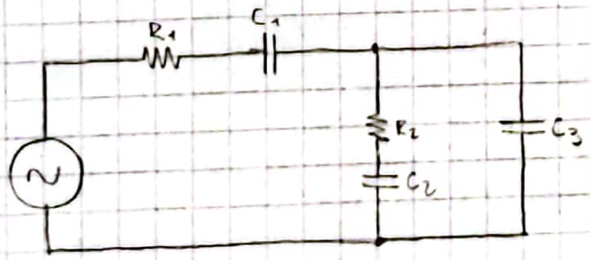
$$Z_{11} = \frac{V_1}{I_1}\Big|_{I_2=0}$$



- Procurar alternancia de Z_{11}
- Procurar $\sigma = 0$ y $\sigma \to \infty$
- Procurar ceros de Z_{21} como remociones de polos en Z_{11}

$$Z_{11} = \frac{(s+2)(s+4)}{s(s+3)}$$





⊛1 $\Rightarrow Z_2 = Z_{11} - 1 = \frac{(s+2)(s+4)}{s(s+3)} - 1 = \frac{s^2+s6+8}{s(s+3)} - \frac{s^2+3s}{s(s+3)} = \frac{3s+8}{s(s+3)}$

⊛2 $Z_4(s)\Big|_{s=-1} = Z_2 - \frac{k'_0}{s} = 0$

$k'_0 = Z_2\, s\Big|_{s=-1} = \frac{-3+8}{(-1+3)} = 2,5 \Rightarrow \left[C_1 = 0,4\right]$

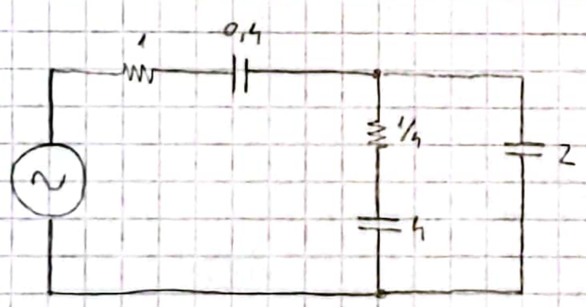
$Z_4 = Z_2 - \frac{1}{s0,4} = \frac{3s+8}{s(s+3)} - \frac{2,5}{s} = \frac{3s+8-2,5s-7,5}{s(s+3)} = \frac{0,5s+0,5}{s(s+3)}$

⊛3 $Y_4 = \frac{2s(s+3)}{s+1}$ $\qquad \frac{2k_1 s}{s+\sigma_1}$

$2k_1 = \lim_{s\to -1} Y_4 \frac{(s+1)}{s} = 2(-1+3) = 4 \longrightarrow \frac{1}{\frac{1}{4}+\frac{1}{s4}} \rightarrow \left[R = 1/4,\; C_2 = 4\right]$

$Y_6 = Y_4 - \frac{4s}{s+1} = \frac{2s^2+6s-4s}{s+1} = \frac{2s\cancel{(s+1)}}{\cancel{s+1}} = 2s$

⊛4 Remuevo capacitor $\longrightarrow Y_6 = 2s \longrightarrow \left[C_3 = 2\right]$

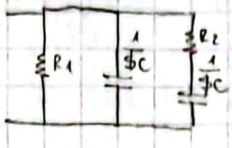


NOTA

$\boxed{Y}$

$$T_2(s) = \left.\frac{V_2}{V_1}\right|_{I_2=0} = K\,\frac{s+1}{(s+2)(s+4)}$$

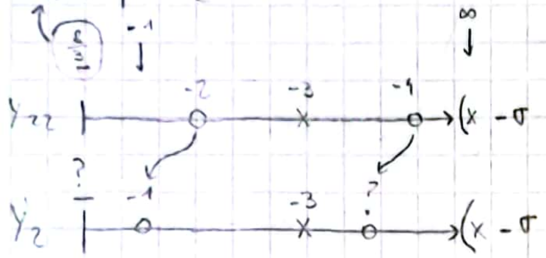
$$y_{21} = \left.\frac{I_2}{V_1}\right|_{V_2=0} \qquad y_{22} = \left.\frac{I_2}{V_2}\right|_{V_1=0}$$

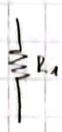


$$Y(0) \to Y_C = 0,\ Y_R = R \qquad Y(\infty) \to Y_C = \infty,\ Y_R = R$$

$$Y_{22}(s) = \frac{(s+2)(s+4)}{(s+3)}$$

Remoción parcial

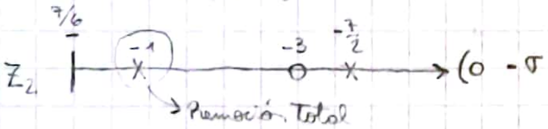




$$\left.\begin{array}{l} 0 < Y(0) < \frac{1}{R_1} \\ \frac{1}{R_1}+\frac{1}{R_2} < Y(\infty) < \infty \end{array}\right\} Y(\infty) > Y(0)$$

$$\left.Y_2(s)\right|_{s=-1} = 0 = \left.Y_{22} - K'_0\right|_{s=-1} \Rightarrow K'_0 = \frac{(-1+2)(-1+4)}{-1+3} = 1{,}5 \Rightarrow \boxed{R_1 = \frac{2}{3}}$$

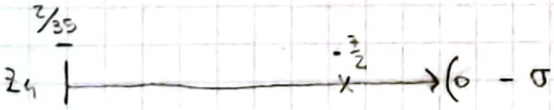
$$Y_2 = \frac{(s+2)(s+4)}{(s+3)} - \frac{3}{2} = \frac{s^2+6s+8-\frac{3}{2}s-\frac{9}{2}}{s+3} = \frac{s^2+\frac{9}{2}s+\frac{7}{2}}{s+3} = \frac{(s+1)(s+\frac{7}{2})}{s+3}$$



Remoción Total

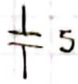
$$\lim_{s\to -1}(s+1)\frac{(s+3)}{(s+1)(s+\frac{7}{2})} = \frac{4}{5} = K_1 \Rightarrow \frac{K_1}{s+1} = \frac{1}{s\frac{5}{4}+\frac{5}{4}} \qquad R = \frac{4}{5},\quad C = \frac{5}{4}$$

$$Z_4 = \frac{s+3}{(s+1)(s+\frac{7}{2})} - \frac{\frac{4}{5}}{s+1} = \frac{s+3-s\frac{4}{5}-\frac{14}{5}}{(s+1)(s+\frac{7}{2})} = \frac{s\frac{1}{5}+\frac{1}{5}}{(s+1)(s+\frac{7}{2})} = \frac{\frac{1}{5}}{s+\frac{7}{2}}$$



Remoción total

$$\lim_{s\to\infty}\frac{s+\frac{7}{2}}{\frac{1}{5}}\cdot\frac{1}{s} = 5 = K_\infty \Rightarrow C = 5$$



$$Y_6 = \frac{s+\frac{7}{2}}{\frac{1}{5}} - 5s = \frac{35}{2} \longrightarrow$$