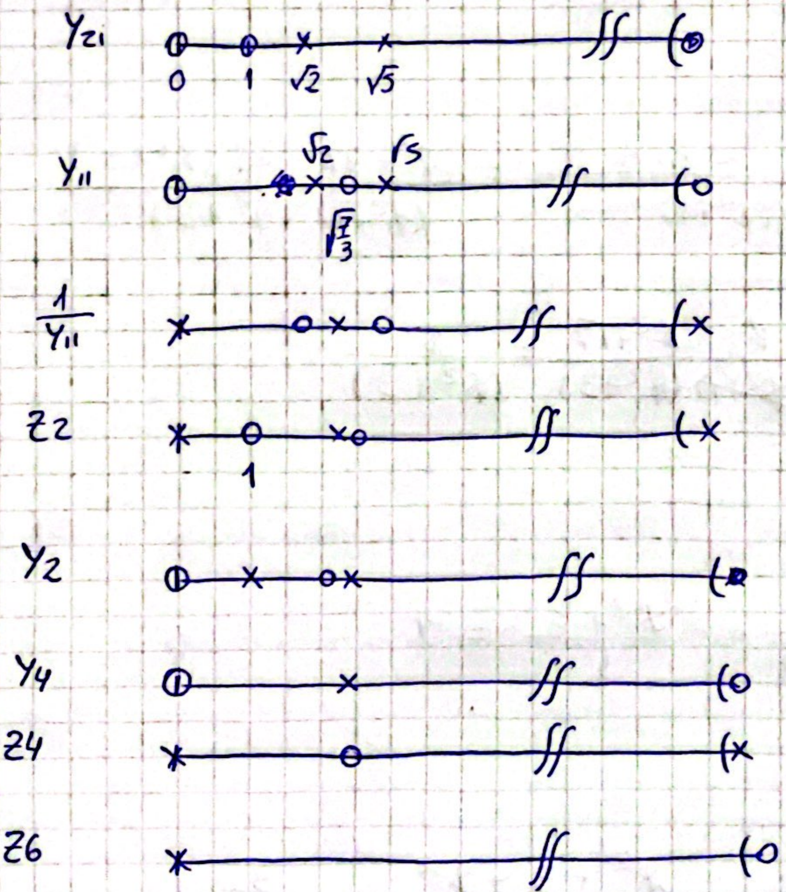
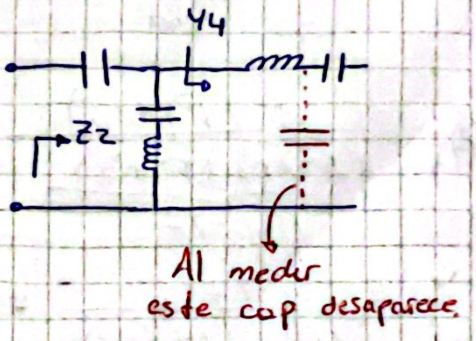
Trabajo semanal 11

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

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

a) Sintesis grafica





$$K_0 = \cancel{s} \cdot \frac{(s^2+2)(s^2+5)}{3 \cdot \cancel{s}(s^2+7/3)}\Bigg|_{s=j1} = 1 \qquad C_1 = 1$$

$$Z_2 = \frac{1}{Y_{11}} - \frac{1}{s} = \frac{s^4+7s^2+10}{3s^3+7s} - \frac{1}{s} = \frac{s^4+4s^2+3}{3s^3+7s}$$

$$2K_1 = \lim_{s^2 \to -1} \frac{\cancel{(s^2+1)}}{\cancel{s}} \frac{3\cancel{s}(s^2+7/3)}{\cancel{(s^2+1)}(s^2+3)} = \frac{3(-1+7/3)}{-1+3} = 2$$

$$C_2 = \frac{2K_1}{\omega^2} = 2$$

$$L_2 = \frac{1}{2K_1} = \frac{1}{2}$$

$$Y_4 = \underbrace{\frac{3s(s^2+7/3)}{(s^2+1)(s^2+3)}}_{Y_2} - \frac{2K_1 s}{(s^2+1)} = \frac{3s^3+7s-2s(s^2+3)}{(s^2+1)(s^2+3)}$$

$$Y_4 = \frac{s^3+s}{(s^2+1)(s^2+3)} = \frac{s \cdot \cancel{(s^2+1)}}{\cancel{(s^2+1)}(s^2+3)} = \frac{s}{(s^2+3)}$$

$$Z_4 = \frac{(s^2+3)}{s}$$

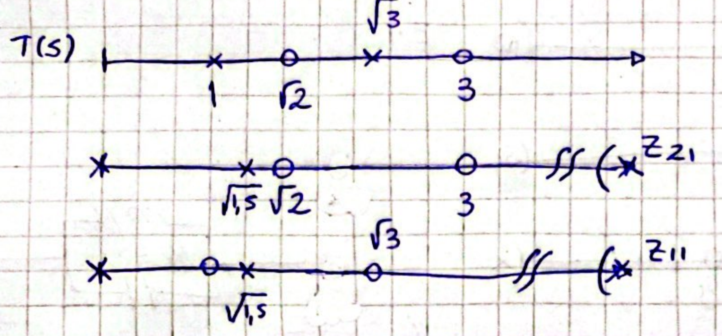
$$K_\infty = \lim_{s \to \infty} \frac{1}{s} \cdot \frac{s^2+3}{s} = 1$$

$$K_\infty = 1 \rightarrow L_3 = 1$$

$$Z_6 = \frac{(s^2+3)}{s} - s = \frac{\cancel{s^2}+3-\cancel{s^2}}{s} = \frac{3}{s}$$

$$\boxed{C_4 = \frac{1}{3}}$$

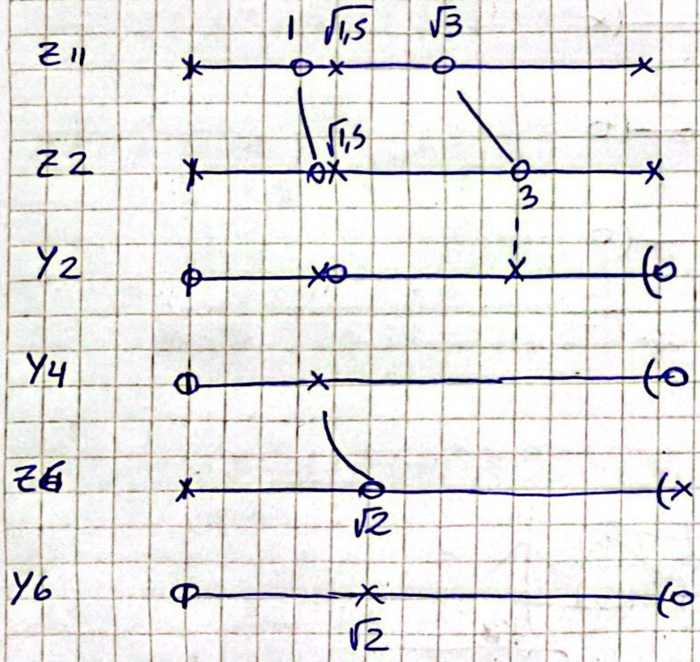
2) $\left.\frac{V_2}{V_1}\right|_{I_2=0}$ $T(s) = \frac{(s^2+2)\,(s^2+9)}{(s^2+1)\,(s^2+3)} = \frac{Z_{21}}{Z_{11}}$

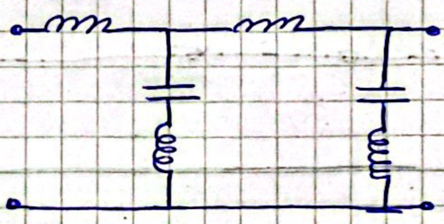


Agregamos polos con un polinomio auxiliar

$A(s) = s\,.\,(s^2+1,5)$

$Z_{21} = \frac{(s^2+2)(s^2+9)}{s\,.\,(s^2+1,5)}$ $\qquad Z_{11} = \frac{(s^2+1)\,(s^2+3)}{s\,(s^2+1,5)}$

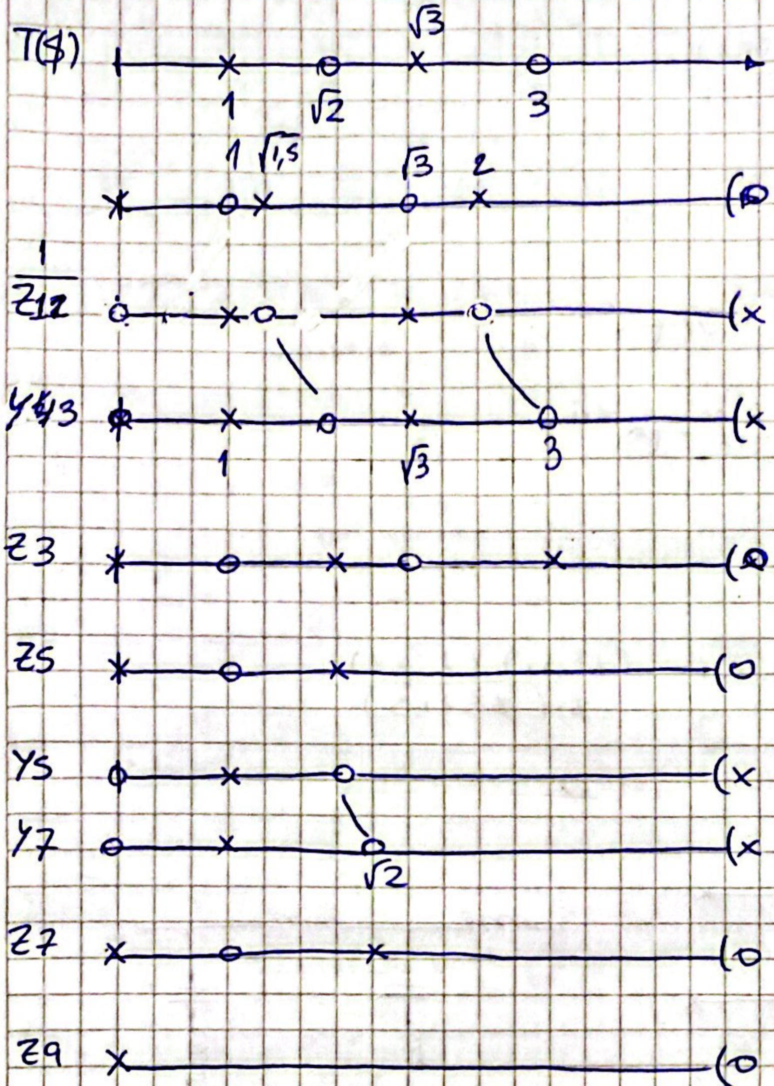


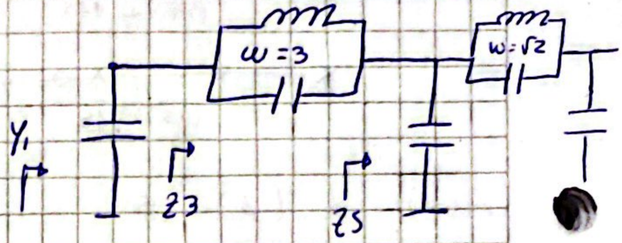


Para la condicion de medición esto no sirve porque me anula el ultimo tanque cuando lo mido

Utilizo otro polinomio auxiliar $A(s) = s(s^2+1{,}5)(s^2+4)$

$$Z_{11} = \frac{(s^2+1)\, s(s^2+3)}{s(s^2+1{,}5)(s^2+4)}$$





$$\frac{1}{Z_{11}} = \frac{s(s^2+1{,}5)(s^2+4)}{(s^2+1)(s^2+3)}$$

$$\cancel{K_d = \frac{1}{s}\,\frac{s(s^2+1{,}5)(s^2+4)}{(s^2+1)(s^2+3)}} =$$

$$K_\infty = \frac{1}{\cancel{s}}\,\frac{\cancel{s}(s^2+1{,}5)(s^2+4)}{(s^2+1)(s^2+3)} = \boxed{\frac{25}{32} = C_1}$$

$$Y_3 = \frac{1}{Z_{11}} - k_{\infty 12}\$$$

$$Y_3 = \frac{\$(\$^2+1,5)(\$^2+4)}{(\$^2+1)(\$^2+3)} - \frac{25}{32}\$$$

$$Y_3 = \frac{\$^5 + 4\$^3 + 1,5\$^3 + 6\$ - \frac{25}{32}\$^5 - \frac{25}{8}\$^3 - \frac{75}{32}\$}{\$^4 + 4\$^2 + 3}$$

$$Y_3 = \frac{7/32\,\$^5 + \frac{19}{8}\$^3 + \frac{117}{32}\$}{\$^4 + 4\$^2 + 3}$$

$$Y_3 = \frac{\$.(\$^2+9)(\$^2+\overset{13/7}{1,8571})}{(\$^2+1)(\$^2+3)}$$

→ Raices calculadas con python !! ☺

$$Z_3 = \frac{(\$^2+1)(\$^2+3)}{\$(\$^2+9)(\$^2+1,8571)}$$

$$2k_i = \lim_{\$^2\to -9} \frac{\cancel{(\$^2+9)}}{\$} \cdot \frac{(\$^2+1)(\$^2+3)}{\$\,\cancel{(\$^2+9)}(\$^2+1,8571)}$$

$$2k_i = \frac{(-9+1)(-9+3)}{(-9+1,8571)} \cdot \frac{1}{-9} = 0,74666 = \frac{56}{75}$$

$$C_2 = \frac{56}{675}$$

$$L_2 = \frac{75}{56}$$

Me da distinto en python pero las raices me dan.

$$\cancel{Z_3 = \frac{(\$^2+1)(\$^2+13/7)}{\$^2}}$$

$$Z_5 = \frac{(\$^2+1)(\$^2+3)}{\$(\$^2+9)(\$^2+13/7)} - \frac{\frac{56}{75}\$}{(\$^2+9)}$$

$$Z_5 = \frac{\$^4 + 4\$^2 + 3 - \frac{56}{75}\$^4 - \frac{104}{75}\$^2}{\$(\$^2+9)(\$^2+13/7)} = \frac{\cancel{(\$^2+9)}(\$^2+\frac{25}{19})}{\$\,\cancel{(\$^2+9)}(\$^2+13/7)}$$

$$Z5 = \frac{\left(s^2 + \frac{25}{19}\right)}{s\left(s^2 + \frac{13}{7}\right)}$$

$$Y5 = \frac{s\left(s^2 + 13/7\right)}{s^2 + \frac{25}{19}}$$

$$Y7 = Y5 - K_{\sqrt{2}}\, s$$

$$K_{\sqrt{2}} = \frac{1}{\cancel{s}} \cdot \frac{\cancel{s}\left(s^2 + 13/7\right)}{s^2 + \frac{25}{19}}\Bigg|_{j\sqrt{2}} = \frac{19}{91} = C3$$

$$Y7 = \frac{s\left(s^2 + 13/7\right)}{s^2 + \frac{25}{19}} - \frac{19}{91} \cdot s = \frac{s^3 + 13/7 s - \frac{19}{91} s^3 - \frac{25}{91} s}{s^2 + \frac{25}{19}}$$

$$Y7 = \frac{\frac{72}{91} s^3 + \frac{144}{91} s}{s^2 + \frac{25}{19}} = \frac{s \cdot \left(s^2 + 2\right)}{s^2 + \frac{25}{19}}$$

$$Z7 = \frac{s^2 + \frac{25}{19}}{s \cdot \left(s^2 + 2\right)}$$

$$2K_i = \lim_{s^2 \to -2} \frac{\cancel{s^2+2}}{s} \frac{s^2 + \frac{25}{19}}{s\cancel{\left(s^2+2\right)}} = \frac{-2 + \frac{25}{19}}{-2} = \frac{13}{38}$$

$$L4 = \frac{38}{13} \qquad C4 = \frac{13}{76}$$

$$Z9 = \frac{s^2 + \frac{25}{19}}{s\left(s^2+2\right)} - \frac{13/38 \cdot s}{\left(s^2+2\right)} = \frac{s^2 + \frac{25}{19} - 13/38\, s^2}{s\left(s^2+2\right)}$$

$$Z9 = \frac{25/38\, s^2 + \frac{25}{19}}{s\left(s^2+2\right)} = \frac{\cancel{s^2+2}}{s\cancel{\left(s^2+2\right)}} = \frac{1}{s}$$

Es un cap en serie pero me agrega un 0 en DC

Pongo el capacitor en derivación para no meter un 0 y afectar la transferencia