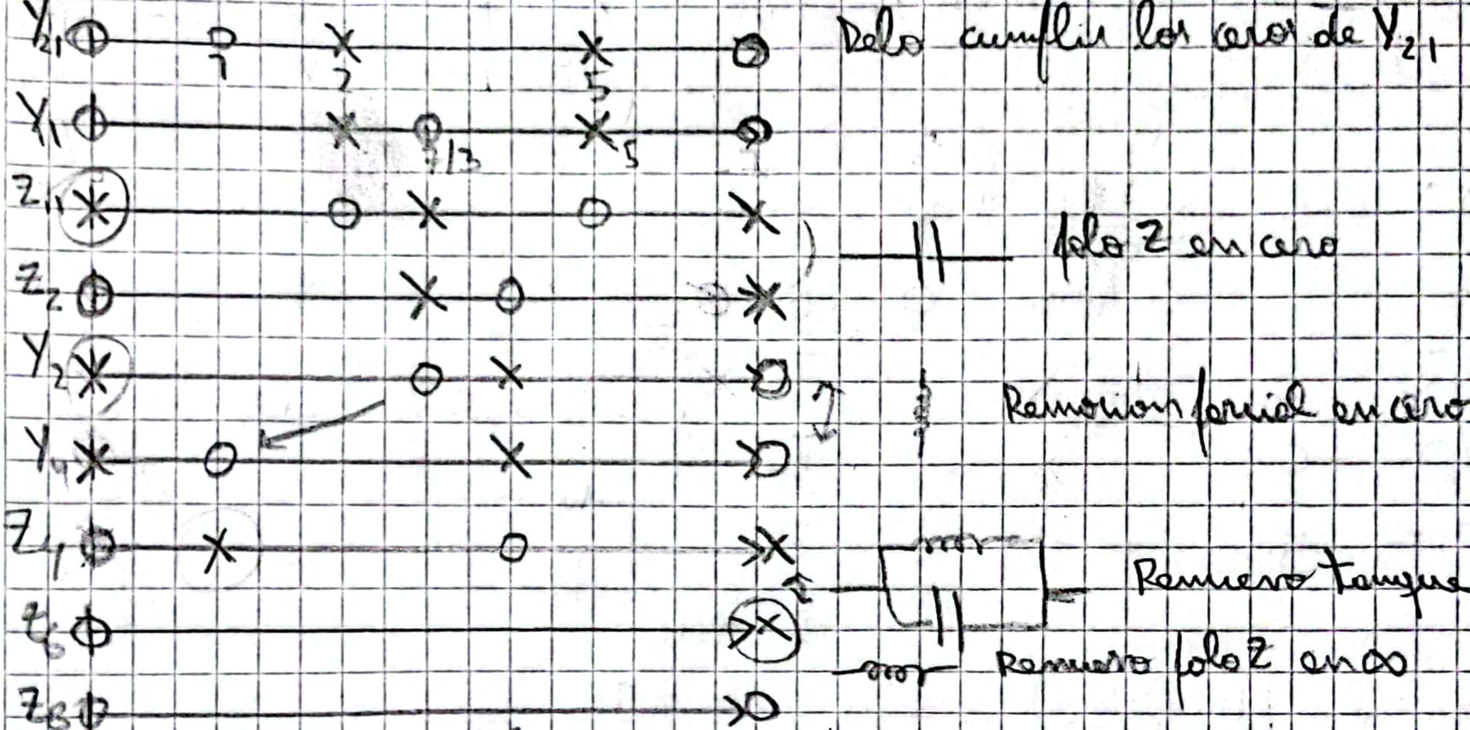
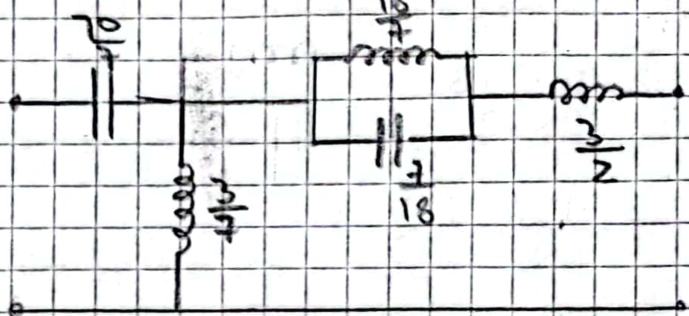
TB 12

1) $Y_{11} = \frac{I_1}{V_1}\Big|_{V_2=0} = \frac{3s(s^2+7/3)}{(s^2+2)(s^2+5)}$ $\quad Y_{21} = \frac{I_2}{V_1}\Big|_{V_2=0} = \frac{s(s^2+1)}{(s^2+2)(s^2+5)}$



Después de calcular abajo



b) $Z_{11} = \frac{(s^2+2)(s^2+5)}{3s(s^2+7/3)} \to k_0 = \lim_{s\to 0} \frac{(s^2+2)(s^2+5)}{3(s^2+7/3)} = \frac{10}{7}$

$Z_2 = \frac{s^4+7s^2+10}{3s(s^2+7/3)} - \frac{10}{7s} = \frac{s^4+7s^2+10-\frac{30}{7}s^2-10}{3s(s^2+\frac{7}{3})} = \frac{s^4+\frac{19}{7}s^2}{3s(s+\frac{7}{3})}$

$Z_2 = \frac{s(s^2+\frac{19}{7})}{3(s^2+\frac{7}{3})} \to Y_2 = \frac{7(3s^2+7)}{s(7s^2+19)}$

$Y_4\Big|_{s^2=-1} = 0 = Y_2 - Y_3 = \frac{7(3s^2+7)}{s(7s^2+19)}\Big|_{s^2=-1} - \frac{k_1}{s}\Big|_{s^2=-1} = 0 \to k_1 = \frac{7(3s^2+7)}{7s^2+19}\Big|_{s^2=-1} = \frac{7}{3}$

$Y_1 = \frac{21s^2+49}{s(7s^2+19)} - \frac{7}{3s} = \frac{\frac{14}{3}s^2+\frac{14}{3}}{s(7s^2+19)} = \frac{14(s^2+1)}{3s(7s^2+19)}$

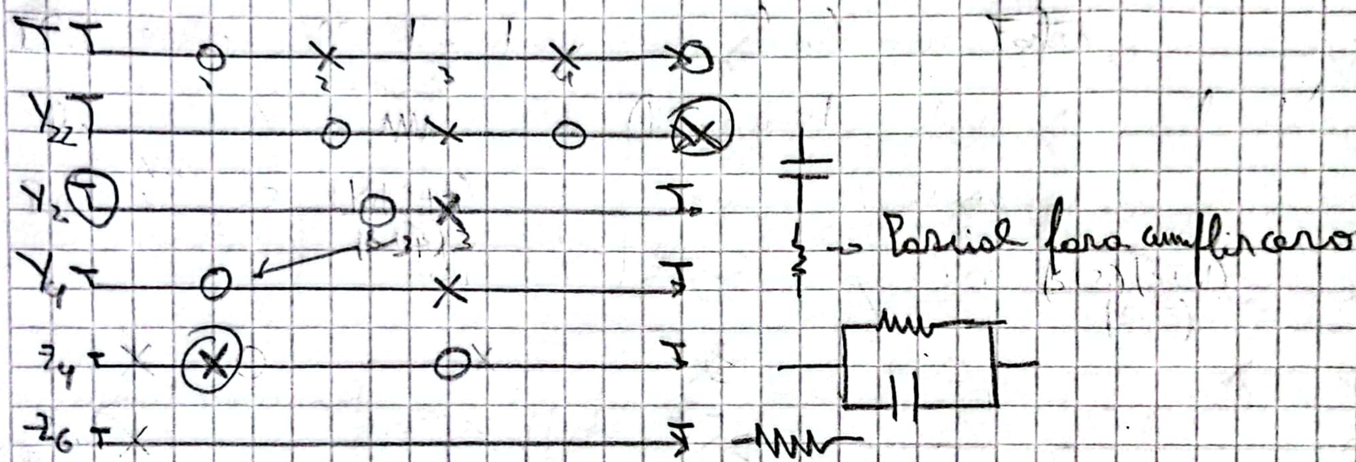
$2k_2 = \lim_{s^2\to -1} \frac{\cancel{s^2+1}}{\cancel{s}} \frac{3\cancel{s}(7s^2+19)}{14\cancel{(s^2+1)}} = \frac{18}{7}$

$$Z_6 = \frac{21s^3+57s}{14(s^2+1)} - \frac{18}{7}\frac{s}{(s^2+1)}\cdot\frac{14}{14} = \frac{21s^3+27s}{14(s^2+1)} = \frac{21s(s^2+1)}{14(s^2+1)}$$

$$K_3 = \lim_{s\to\infty} \frac{21}{14}\frac{s}{s} = \frac{3}{2}$$

2) $T(s) = \frac{V_2}{V_1}\Big|_{I_2=0} = \frac{K(s+1)}{(s+2)(s+4)}$ $\frac{P/D}{Q/D}$ $Gr\{P\} \le Gr\{Q\}$

Adopto $Y_{22} = \frac{(s+2)(s+4)}{(s+3)}$ → Para cumplir los ceros → Para alternancia



$$K_\infty = \lim_{s\to\infty} \frac{(s+2)(s+4)}{s(s+3)} = \frac{s^2+6s+8}{s^2+3s} = 1$$

$$Y_2 = Y_{22} - s = \frac{s^2+6s+8}{s+3} - \frac{s^2+3s}{s+3} = \frac{3s+8}{s+3}$$

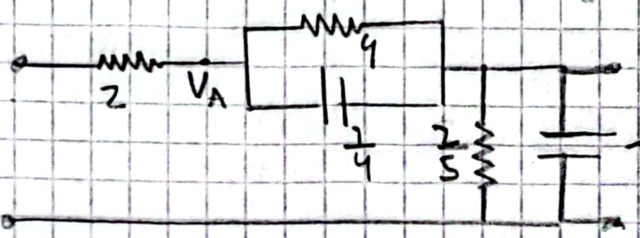
$$Y_4\Big|_{s=-1} = 0 = Y_2 - K_1 = 0 \to K_1 = \frac{3\cdot -1+8}{3-1} = \frac{5}{2}$$

$$Y_4 = \frac{3s+8}{s+3} - \frac{5}{2}\frac{(s+3)}{(s+3)} = \frac{\frac{1}{2}s+\frac{1}{2}}{s+3} = \frac{1}{2}\frac{(s+1)}{s+3}$$

2. $K_2 = \lim_{s\to -1} \frac{(s+3)2}{s+1}\frac{(s+1)}{1} = 4$

$$Z_6 = \frac{2(s+3)}{s+1} - \frac{4}{s+1} = \frac{2s+2}{s+1} = 2$$

Retiro Resistencia $R=2$ $Z_8 = Z_6 - 2 = 0$



NOTA

Calculo de K: $T(s) = \frac{V_o}{V_i}$

$$I_{R_2} = I_{C_4} + I_{R_4} \to \frac{V_i - V_A}{2} = (V_A - V_o)\left(\frac{1}{4} + 4s\right)$$

$$V_i - V_A = (V_A - V_o)\left(\frac{1}{2} + 8s\right) \to V_i - V_A = V_A\left(\frac{1}{2} + 8s\right) - V_o\left(\frac{1}{2} + 8s\right)$$

$$\to V_i + V_o\left(\frac{1}{2} + 8s\right) = V_A\left(\frac{3}{2} + 8s\right) \to V_A = \frac{V_i + V_o(1/2 + 8s)}{\frac{3}{2} + 8s}$$

$$\to I_{R_4} + I_{C_4} = I_{R_{P_1}} + I_{C_1} = \frac{V_i - V_A}{2}$$

$$\to \frac{V_i}{2} - \frac{V_i}{2\left(8s + \frac{3}{2}\right)} - \frac{V_o\left(\frac{1}{2} + 8s\right)}{2\left(\frac{3}{2} + 8s\right)} = V_o\left(\frac{5}{2} + s\right)$$

$$\to V_i\left(\frac{1}{2} - \frac{1}{2\left(8s + \frac{3}{2}\right)}\right) = V_o\left(\frac{5 + 2s}{2} + \frac{\frac{1}{2} + 8s}{2\left(\frac{3}{2} + 8s\right)}\right)$$

$$\to V_i \frac{8s + 1/2}{\cancel{2\left(8s + \frac{3}{2}\right)}} = V_o \frac{(2s + 5)\left(8s + \frac{3}{2}\right) + 8s + \frac{1}{2}}{\cancel{2\left(8s + \frac{3}{2}\right)}}$$

$$\frac{V_o}{V_i} = \frac{8s + 1/2}{16s^2 + 43s + \frac{15}{2} + 8s + \frac{1}{2}} = \frac{8s + 1/2}{16s^2 + 51s + 8}$$