TS12

Sintetizar el cuadripolo

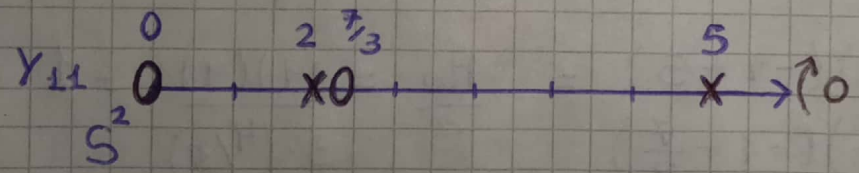
$$Y_{11} = \frac{I_1}{V_1}\bigg|_{V_2=0} = \frac{3 \cdot S(S^2 + 7/3)}{(S^2+2)(S^2+5)}$$

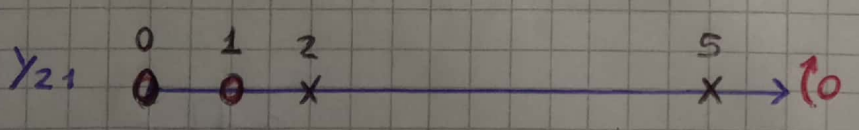
$$Y_{21} = \frac{I_2}{V_1}\bigg|_{V_2=0} = \frac{S(S^2+1)}{(S^2+2)(S^2+5)}$$

a) Hallar la topología mediante la síntesis gráfica

b) Calcular el valor de los componentes, síntesis analítica

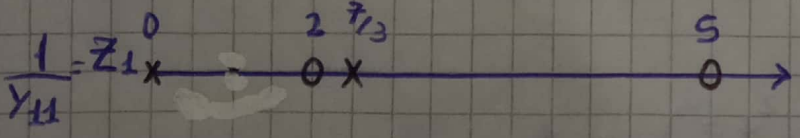
Síntesis mediante método gráfico





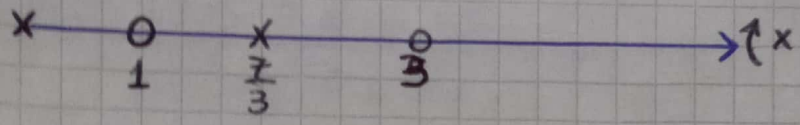
Siendo que

$Y_{11} = Y_1 = \frac{1}{Z_1}$

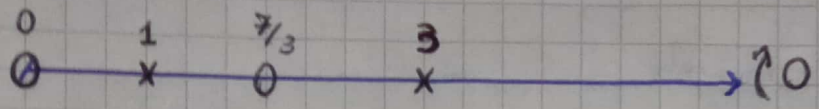


Sabiendo que debo tener ceros en 1 y en 0 para restar Y_{12}, debo meter paralelamente en 0 para meter el 2 para la izquierda

Z_2

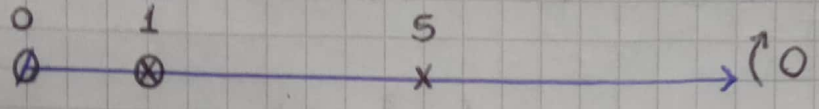


Y_2



remuevo el polo en 1 moviendo 7/3

Y_4



Cumple con 0 en 0, 1 e ∞ (condición de Y_{21})

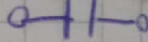
b) Síntesis Analítica

$$Z_1 = \frac{(s^2+2)(s^2+5)}{3 \cdot s\left(s^2+\frac{7}{3}\right)}$$

$$Z(-1) = \frac{(-1+2)(-1+5)}{3(-1)(-1+\frac{7}{3})} = \frac{K_0}{s} = \frac{(1)(4)}{3 \cdot (4/3)} = 1$$

$K_0 = 1$

remuevo un capacitor en serie



$$Z_2(s) = \frac{(s^2+2)(s^2+5)}{3 \cdot s\left(s^2+\frac{7}{3}\right)} - \frac{1}{s}$$

$$Z_2(s) = \frac{s(s^2+2)(s^2+5) - 3 \cdot s^3 - 57}{3 \cdot s^2\left(s^2+\frac{7}{3}\right)}$$

$$Z_2 = \frac{S^5 + 7\cdot S^3 + 10\cdot S - 3\cdot S^3 - 7\cdot S}{3\cdot S^2\left(S^2 + \frac{7}{3}\right)}$$

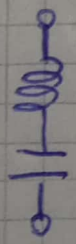
$$Z_2 = \frac{S^4 + 4\cdot S^2 + 3}{3\cdot S\left(S^2 + \frac{7}{3}\right)} = \frac{(S^2+1)(S^2+3)}{3\cdot S\left(S^2 + 7/3\right)}$$

$$Y_2 = \frac{3\cdot S\left(S^2 + \frac{7}{3}\right)}{S^4 + 4\cdot S^2 + 3} = \frac{3\cdot S\left(S^2 + \frac{7}{3}\right)}{(S^2+1)(S^2+3)}$$

remuevo en 1

$$\lim_{S^2 \to -1} \frac{3\cdot S\left(S^2 + 7/3\right)}{(S^2+1)(S^2+3)} = \frac{2\cdot SH}{(S^2+1)}$$

$$\lim_{S^2 \to -1} \frac{3}{2}\,\frac{(-1) + \frac{7}{3}}{(-1)+3} = \frac{3}{2}\cdot\frac{\left(\frac{4}{3}\right)}{2} = 1 = H_1$$



$$Y_6 = \frac{3\cdot S\left(S^3 + \frac{7}{3}\cdot S\right)}{(S^2+1)(S^2+3)} - \frac{2\cdot S}{(S^2+1)}$$

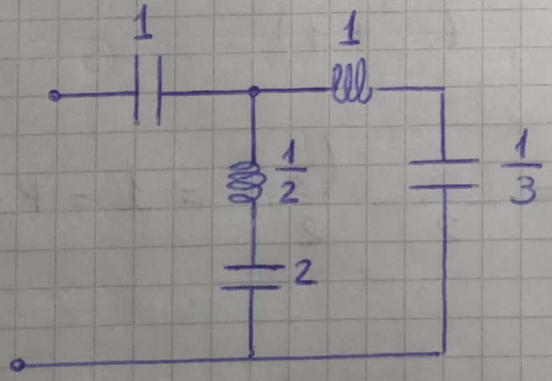
$$Y_6 = \frac{(3\cdot S^3 + 7\cdot S)(S^2+1) - 2\cdot S(S+3)}{(S^2+1)(S^2+3)}$$

$$Y_6(s) = \frac{(s^2+1)\cdot s}{(s^2+1)(s^2+3)} = \frac{s}{(s^2+3)}$$

$$Z_6(s) = \frac{(s^2+3)}{s}$$ aplico Cauer

$$s^2+3 \;\big|\; s$$
$$-s^2 \qquad\quad s \to z \text{ inductor serie}$$
$$3$$
$$s \;\big|\; 3$$
$$\frac{1}{3}\cdot s \to y \quad \text{capacitor en derivación}$$
$$0$$

Síntesis Final



Valores del torque

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

$$\frac{2K_1}{\omega^2} = \frac{2}{1} = 2$$