

Tarea Semanal 11

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

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

El componente de cierre no puede terminar en paralelo x_{ϕ} sino me lo anula la condición de medición y no forma parte del cuadrupolo

$$\begin{cases} Z V_1 = Z_{11} I_1 + Z_{12} I_2 \\ V_2 = Z_{21} I_1 + Z_{22} I_2 \end{cases}$$

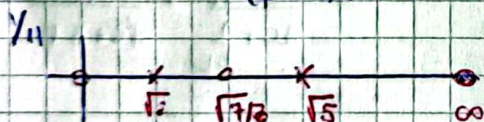
$$\begin{cases} I_1 = Y_{11} V_1 + Y_{12} V_2 \\ I_2 = Y_{21} V_1 + Y_{22} V_2 \end{cases} \rightarrow \frac{I_2}{I_1} \Big|_{V_2=0} = \frac{Y_{21}}{Y_{11}} = \frac{\phi(\phi^2 + 1)}{3\phi(\phi^2 + 7/3)} = T(\phi)$$

⊗ $V_2=0$

a) Síntesis Gráfica



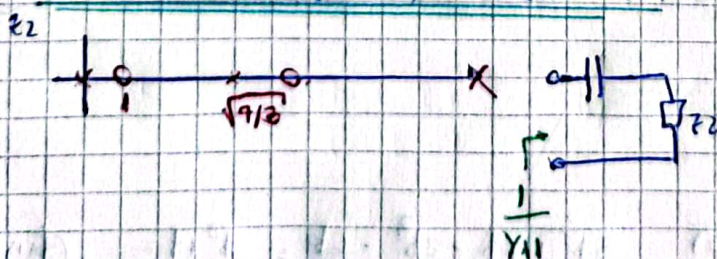
2. Síntesis $Y_{11} = \frac{3\phi(\phi^2 + 7/3)}{(\phi^2 + 2)(\phi^2 + 5)}$



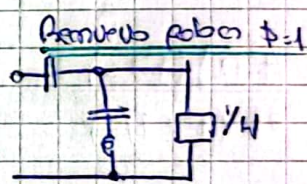
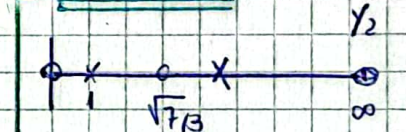
3. Invierto a Impedancia



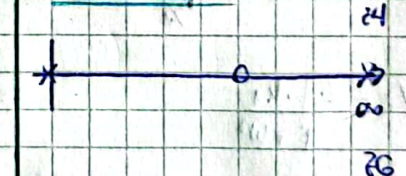
4. Remuevo polo para fijar el cero en $\phi=1$



5. Invierto a Y_2



6. Paso a Z_4



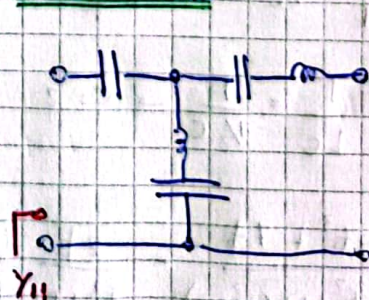
Remuevo polo en origen



Remuevo inductor



Síntesis final

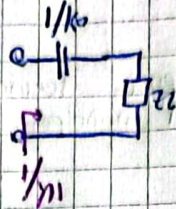


b) Síntesis Analítica

$$Y_{11} = \frac{3s(s^2 + 7/3)}{(s^2 + 2)(s^2 + 5)}$$

1) Zero Capacitor (invertido)

$$Z_2 = \frac{(s^2 + 2)(s^2 + 5)}{3s(s^2 + 7/3)} - \frac{K_0}{s}$$



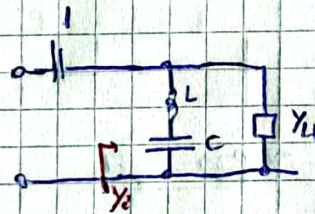
$$Z_2(1) = 0 \rightarrow \frac{1}{Y_{11}(1)} = \frac{K_0}{1} \rightarrow K_0 = \frac{(1+2)(1+5)}{3 \cdot 1(1+7/3)} \rightarrow K_0 = \frac{10}{10} = 1 \rightarrow C = 1$$

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

$$= \frac{(s^2 + 1)(s^2 + 3)}{3s(s^2 + 7/3)}$$

2) LC (invertido)

$$Y_2 = \frac{3s(s^2 + 7/3)}{(s^2 + 1)(s^2 + 3)}$$



$$Y_{LC} = \frac{1/s \cdot \frac{1}{sL}}{1/s + \frac{1}{sL}} = \frac{1}{s^2 LC + 1} = \frac{1}{s^2 + 1/LC}$$

$$Y_4 = Y_2 - Y_{LC} = Y_2 - \frac{1}{s^2 + 1/LC}$$

$$2 K_1 = \lim_{s^2 \rightarrow -1} \frac{(s^2 + 1)}{s} \frac{3s(s^2 + 7/3)}{(s^2 + 1)(s^2 + 3)} = \frac{3(-\frac{7}{3} + \frac{7}{3})}{(-1 + 3)} = \frac{4}{2} = 2$$

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

$$\omega^2 = 1 = \frac{1}{LC} = \frac{1}{1/2 C} \rightarrow C = 2$$

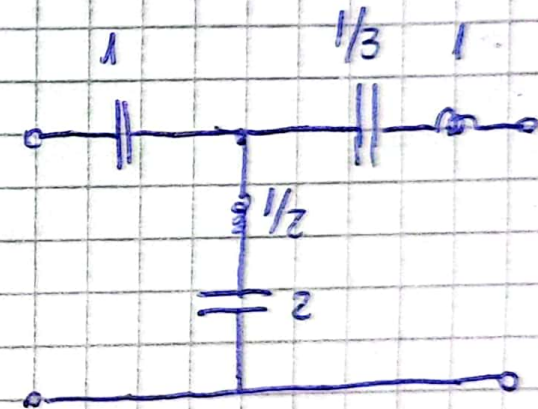
$$Y_4 = \frac{3s^3 + 7s}{(s^2 + 1)(s^2 + 3)} - \frac{2s}{s^2 + 1} \frac{(s^2 + 3)}{s^2 + 3} = \frac{3s^3 + 7s - 2s^3 - 6s}{(s^2 + 1)(s^2 + 3)} = \frac{s^3 + s}{(s^2 + 1)(s^2 + 3)} = \frac{s(s+1)}{(s^2 + 1)(s^2 + 3)}$$

NOTA $\approx \frac{s}{s^2 + 3}$

① Remover Capacitor (Inductor)

$$Z_4 = \frac{s^2}{s+3} \rightarrow Y = \lim_{s \rightarrow 0} s \frac{(s^2)}{(s+3)} = 3 \rightarrow C = 1/3$$

$$Z_6 = Z_4 - \frac{Y}{s} = \frac{s^2}{s+3} - \frac{3}{s} = \frac{s^2}{s+3}$$



② Remover Inductor

$$Z_6 = s \rightarrow L = 1$$