FECHA

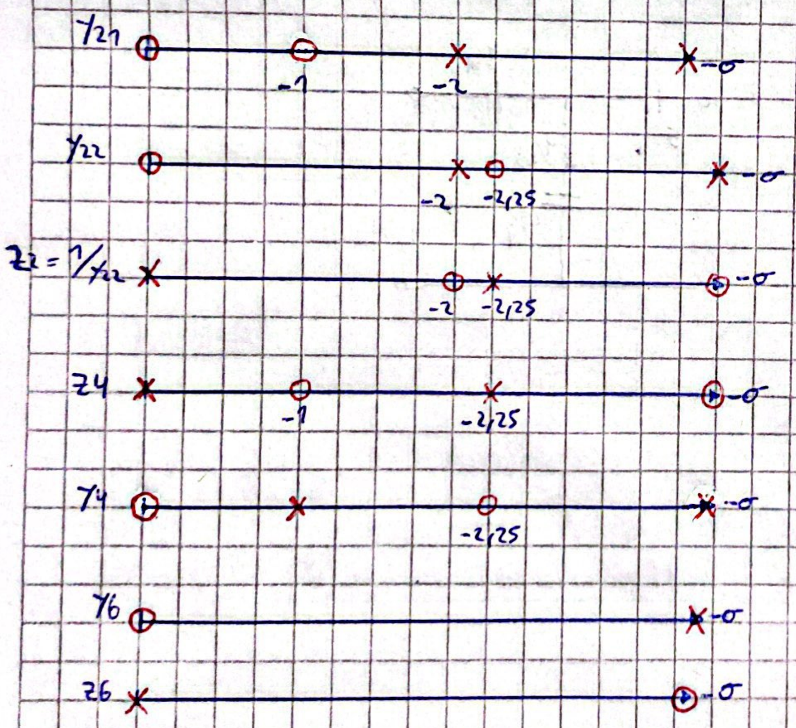
Trabajo Práctico N°7

1) a) $-Y_{21} = \dfrac{s(s+1)}{s+2}$ $\qquad Y_{22} = \dfrac{s(s+2,25)}{s+2}$

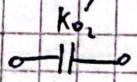
$Y_{22} = \dfrac{I_2}{V_2}\Big|_{V_1=0}$ ~> Primer componente en serie (última remoción)

$Y_{21} = \dfrac{I_2}{V_1}\Big|_{V_2=0}$ ~> Última componente en serie (primer remoción)

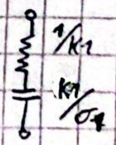
• ~~$-\dfrac{Y_{21}}{Y_{22}} = \dfrac{V_2}{V_1}\Big|_{I_2=0}$ → Última componente en derivación (1° remoción)~~



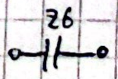
~> Remoción parcial en 0



~> Remuevo polo en -1



→ Remuevo en 0



• $Z_2 = \dfrac{s+2}{s(s+2,25)}$

• $Z_4 = Z_2 - \dfrac{K'_{0_2}}{s}$

$\lim_{s\to -1} Z_4 = 0 \Rightarrow K'_{0_2} = \lim_{s\to -1} s \cdot Z_2 = \lim_{s\to -1} \dfrac{s+2}{s+2,25} = \boxed{4/5}$ ~> $\boxed{C = 5/4}$

NOTA

$$Z_4 = \frac{s+2}{s\,(s+2{,}25)} - \frac{4}{5\cdot s} = \frac{5s^2 + 10\cdot s - 4s^2 - 9s}{5s^2\,(s+2{,}25)} = \frac{s^2+s}{5\,s^2\,(s+2{,}25)}$$

$$Z_4 = \frac{s+1}{5\,s\cdot(s+2{,}25)}$$

- $Y_4 = 5\,\dfrac{s\,(s+2{,}25)}{s+1}$

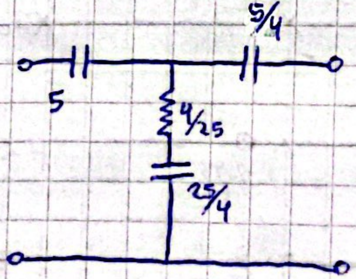
- $Y_6 = Y_4 - \dfrac{K_1\cdot s}{s+1} \Rightarrow K_1 = \lim\limits_{s\to -1} \dfrac{s+1}{s}\cdot Y_4 = \lim\limits_{s\to -1} 5\,(s+2{,}25)$

$$\boxed{K_1 = 25/4} \rightarrow R = 4/25, \quad C = 25/4$$

$$Y_6 = 5\,\frac{s\cdot(s+2{,}25)}{s+1} - \frac{25\cdot s}{4\,(s+1)} = \frac{20\,s\,(s+2{,}25) - 25s}{4\,(s+1)} = \frac{20s^2+20s}{4\,(s+1)} = \frac{20s\,(s+1)}{4\,(s+1)}$$

$$Y_6 = 5s$$

- $Z_6 = \dfrac{1}{5s} \rightarrow C = 5$



Trabajo Práctico Nº 7

1) b) $-z_{21} = \dfrac{s}{s^2+2}$ $\qquad z_{22} = \dfrac{2s^2+1}{s(s^2+2)}$

$$z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0}$$

Asumimos red pasiva

$$z_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0} \rightsquigarrow z_{21} = z_{12} = \left.\frac{V_1}{I_2}\right|_{I_1=0}$$

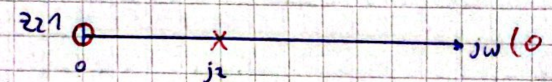
NOTA

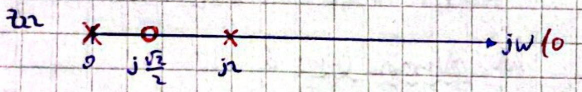
Al darnos Z_{21} y Z_{22} todo indica que es una transferencia de corriente:

$$\frac{-I_2}{I_1}\Big|_{V_2=0} = -\frac{Z_{21}}{Z_{22}}$$

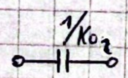
Sin embargo nuestros Z_{22} y Z_{12} son con condición de $I_1=0$. Para verificar que sea compatible con la transferencia de corriente hay que analizar cómo podría empezar y terminar ambos circuitos (con elementos en serie o en derivación).

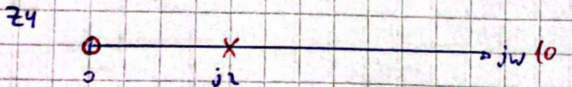
En Z_{21} están los ceros de la transferencia $\Rightarrow$ En Z_{22} tenemos que remover polos en la ubicación de los ceros de Z_{21}, de forma de asegurar esos ceros en la transferencia.

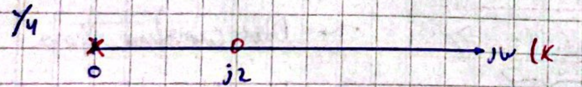




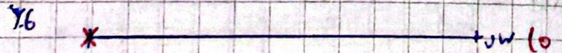
→ Remuevo polo en 0

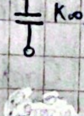




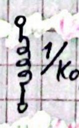


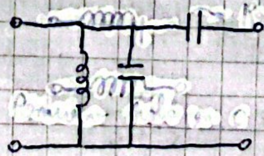
→ Remuevo polo en ∞





Remuevo polo en 0 :





Como estoy sintetizando Z_{22} el circuito se arma de derecha a izquierda $\Rightarrow$ todo OK porque del lado de $V_2=0$ estoy en serie y del lado de $I_1=0$ estoy en derivación.

- $Z_4 = Z_{22} - \frac{K_{02}}{s} \Rightarrow Z_{22} = Z_4 + \frac{K_{02}}{s}$

$$\lim_{s\to 0} Z_{22} = \lim_{s\to\infty} [\underbrace{Z_4}_{\text{Se desprecia}} + \frac{K_{02}}{s}] \Rightarrow K_{02} = \lim_{s\to\infty} s \cdot Z_{22} = \lim_{s\to\infty} \frac{2s^2+1}{s^2+2}$$

$$\boxed{K_{02} = 1/2}$$

- $Z_4 = \frac{2s^2+1}{s(s^2+2)} - \frac{1}{2s} = \frac{4s^2+2-s^2-2}{2s(s^2+2)} = \frac{3s^2}{2\cdot s(s^2+2)} = \frac{3}{2}\,\frac{s}{s^2+2}$

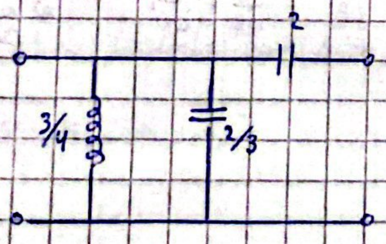
- $Y_4 = \frac{2}{3}\,\frac{s^2+2}{s}$

- $Y_6 = Y_4 - K_{\infty 4}\cdot s \Rightarrow Y_4 = Y_6 + K_{\infty 4}\cdot s$

$$\lim_{s\to\infty} Y_4 = \lim_{s\to\infty} [\underbrace{Y_6}_{\text{Se desprecia}} + K_{\infty 4} s] \Rightarrow K_{\infty 4} = \lim_{s\to\infty} \frac{1}{s} Y_4 = \lim_{s\to\infty} \frac{2}{3}\,\frac{s^2+2}{s^2}$$

$$\boxed{K_{\infty 4} = 2/3}$$

- $Y_6 = \frac{2}{3}\frac{s^2+2}{s} - \frac{2}{3}s = \frac{2}{3}\left(\frac{s^2+2-s^2}{s}\right) = \frac{4}{3}\cdot\frac{1}{s} \rightsquigarrow \boxed{K_{06} = \frac{4}{3}}$



$$Z_{21} = \frac{V_2}{I_1}\Big|_{I_1=0} = \frac{1}{\frac{1}{sL_1} + s\,C_1}$$

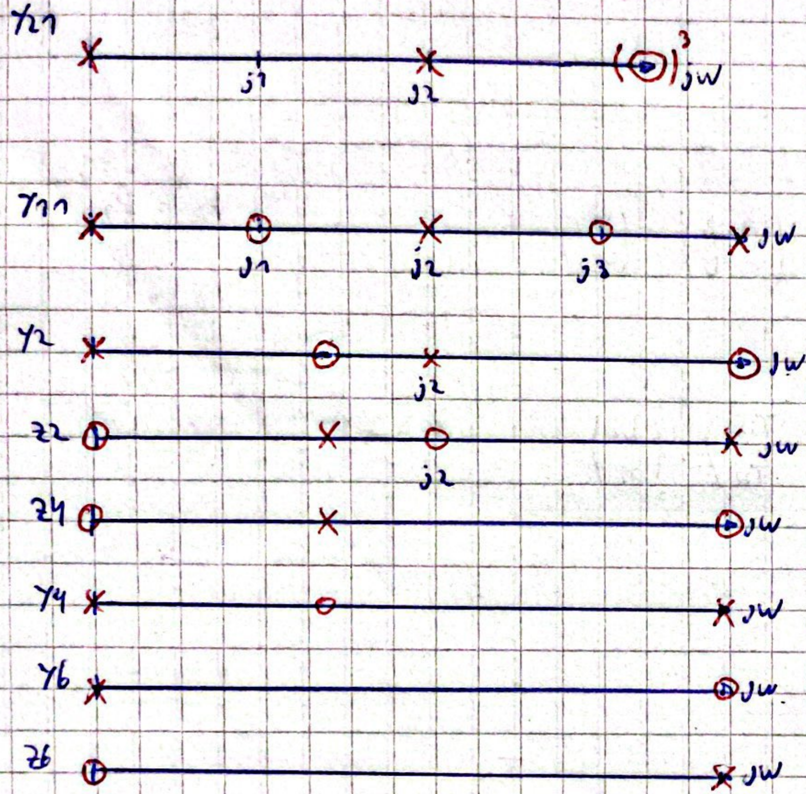
$$Z_{21} = \frac{sL_1}{s^2 C_1 L_1 + 1} = \frac{3/4 \cdot s}{0{,}5\, s^2 + 1}$$

$$\boxed{Z_{21} = 1{,}5\,\frac{s}{s^2+2}}$$

K

Guía de ej N°7

① c) $-Y_{21} = \dfrac{1}{s(s^2+4)}$ $Y_{11} = \dfrac{(s^2+1)(s^2+9)}{s(s^2+4)}$



Y11 ⟶ Remuevo en ∞ — K_∞ (capacitor)

Z2 ⟶ Remuevo en ∞ — K_∞ (inductor)

Y4 ⟶ Remuevo en ∞ — K_∞ (capacitor)

Z6 ⟶ Remuevo en ∞ — K_∞ (inductor)

La ultima remoción no afecta ya que la condición de medición de Y_{21} e Y_{11} es $V_2 = 0$.

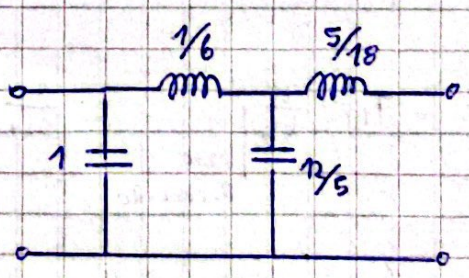
$$\frac{s^4+10s^2+9}{s^3+4s} \quad - (s^4+4s^2) \Rightarrow \boxed{s} \quad 1$$

$$\frac{s^3+4s}{6s^2+9} \quad - \left(s^3+\tfrac{9}{6}s\right) \Rightarrow \boxed{\tfrac{1}{6}\cdot s} \quad 1/6$$

$$\frac{6s^2+9}{\tfrac{5}{2}s} \quad - 6s^2 \Rightarrow \boxed{\tfrac{12}{5}\cdot s} \quad \tfrac{12}{5}$$

$$\frac{\tfrac{5}{2}\cdot s}{9} \quad - \tfrac{5}{2}s \Rightarrow \boxed{\tfrac{5}{18}\cdot s} \quad 5/18$$

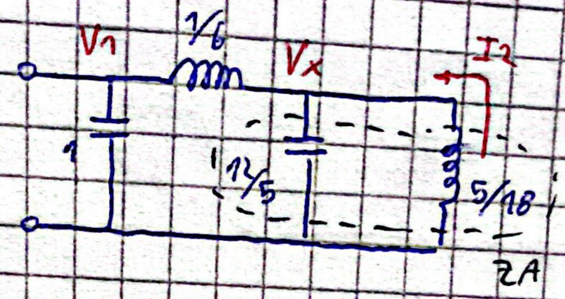
$$0$$



NOTA

FECHA

$$Y_{21} = -\frac{I_2}{V_1}\Big|_{V_2=0}$$



- $$Z_A = \frac{1}{s\cdot\frac{12}{5} + \frac{18}{5\cdot s}} = \frac{5\cdot s}{12s^2+18}$$

- $$V_x = V_1 \cdot \frac{\frac{5s}{12\cdot s^2+18}}{\frac{5\cdot s}{12\cdot s^2+18} + \frac{s}{6}} = \frac{30\cdot s}{30\cdot s + 12s^3 + 18s} = \frac{30s}{12s^3+48s}$$

- $$\frac{V_x}{-I_2} = s\cdot\frac{5}{18} \Rightarrow -\frac{I_2}{V_x} = \frac{18}{5\cdot s} \Rightarrow -\frac{I_2}{V_1} = \frac{108}{12s^3+48s}$$

$$\boxed{Y_{21} = \frac{1}{s\cdot(s^2+4)}\cdot \underbrace{9}_{K}}$$

Scanned with CamScanner