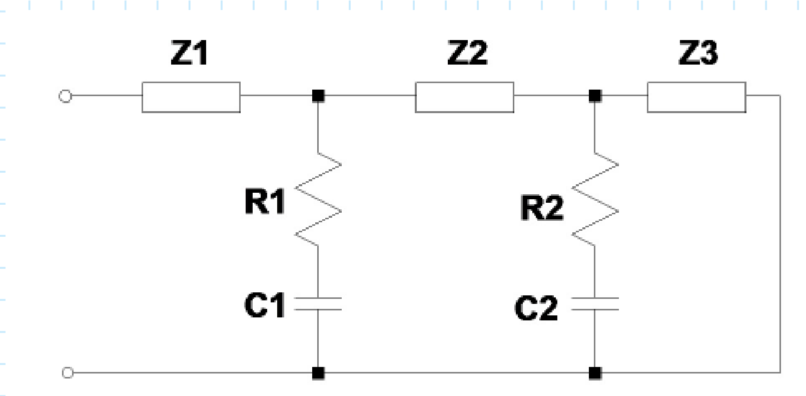
TS11

lunes, 3 de octubre de 2022 9:24 p. m.

1) Encuentre el valor de los componentes del siguiente circuito:

Sabiendo que está caracterizado por la siguiente función de excitación y constantes de tiempo:



$$R1.C1 = \frac{1}{6} \qquad R2.C2 = \frac{2}{7}$$

$$Z(s) = \frac{(s^2+6s+8)}{(s^2+4s+3)} = \frac{(s+2)(s+4)}{(s+1)(s+3)}$$

$Z(0) = 8/3$

$Z(\to\infty) = 1$

$Z(0) > Z(\to\infty)$

$\therefore$ Remover en ∞

En derivacion

Forma residuo.

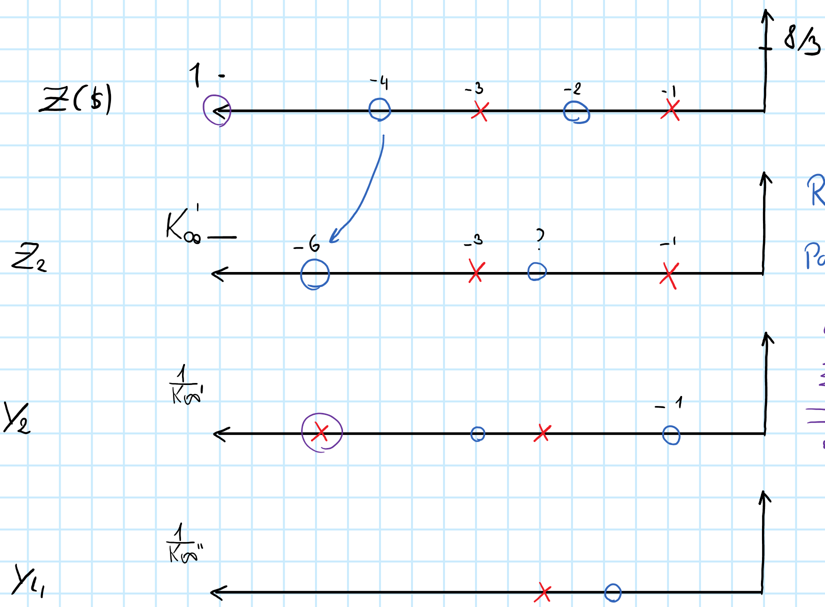
$$\frac{s\,K_i}{s+\tau}$$

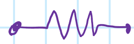
$$Y_{RC} = \frac{1}{R_i + \frac{1}{sC_i}} = \frac{sC_i}{sR_iC_i + 1} = \frac{s \cdot \frac{1}{R_i}}{s + \frac{1}{R_iC_i}}$$

$$\therefore \quad K_i = \frac{1}{R_i} \quad \wedge \quad \tau = \frac{1}{R_iC_i}$$

Usando datos del ejercicio:

$$\therefore \quad \tau_1 = \frac{1}{R_1C_1} = 6 \quad \wedge \quad \tau_2 = \frac{1}{R_2C_2} = \frac{7}{2} = 3{,}5$$





Realizo una remoción Parcial en ∞

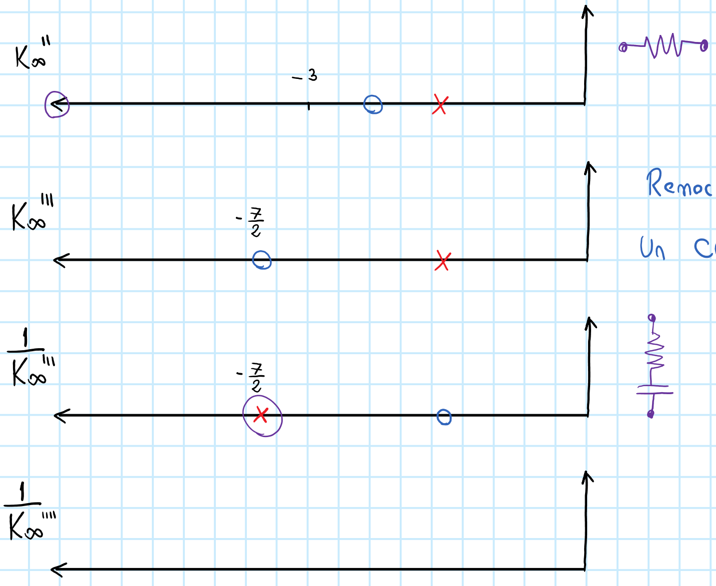
Para tener el tanque RC en $\tau = -6$

Z_4 K_∞''

Z_6 K_∞'''

Y_6 $\frac{1}{K_\infty'''}$

Y_8 $\frac{1}{K_\infty''''}$



Remoción Parcial en ∞ para imponer Un CERO en $\sigma = -3{,}5$

Algebra

$$Z_2 = Z(s) - K_\infty' = 0 \rightarrow K_\infty = \lim_{s\to -6} \frac{(s+2)(s+4)}{(s+1)(s+3)} = \frac{(-4)(-2)}{(-5)(-3)} = \frac{8}{15}$$

$$Z_2 = \frac{(s+2)(s+4)}{(s+1)(s+3)} - \frac{8}{15} = \frac{(s^2+6s+8)15 - 8(s^2+4s+3)}{15(s+1)(s+3)} = \frac{7s^2+58s+96}{15s^2+60s+45}$$

$Z(0) = \frac{32}{15}$

$Z(\to\infty) = \frac{7}{15}$

$$Z_2 = \frac{7}{15} \cdot \frac{\left(s+\overset{\cong 2{,}286}{\frac{16}{7}}\right)(s+6)}{(s+1)(s+3)}$$

$$Y_4 = Y_2 - \frac{sK_1}{s+6} = 0 \rightarrow K_1 = \lim_{s\to -6} Y_2 \cdot \frac{(s+6)}{s} = \lim_{s\to -6} \frac{15}{7}\frac{(s+1)(s+3)}{\left(s+\frac{16}{7}\right)\cancel{(s+6)}} \frac{\cancel{(s+6)}}{s}$$

$$K_1 = \frac{15}{7} \cdot \frac{(-5)(-3)}{\left(-\frac{26}{7}\right)\cdot(-6)} = \frac{75}{52}$$

$$Y_4 = \frac{15}{7}\frac{(s+1)(s+3)}{\left(s+\frac{16}{7}\right)(s+6)} - \frac{75}{52}\frac{s}{(s+6)} = \frac{\frac{15}{7}(s^2+4s+3) - \frac{75}{52}s\left(s+\frac{16}{7}\right)}{\left(s+\frac{16}{7}\right)(s+6)}$$

$$Y_4 = \frac{\frac{255}{364}s^2 + \frac{480}{91}s + \frac{45}{7}}{\left(s+\frac{16}{7}\right)(s+6)} = \frac{255}{364}\cdot\frac{\left(s+\frac{26}{17}\right)\cancel{(s+6)}}{\left(s+\frac{16}{7}\right)\cancel{(s+6)}} \rightarrow Y_4 = \frac{255}{364}\cdot\frac{\left(s+\frac{26}{17}\right)}{\left(s+\frac{16}{7}\right)}$$

$Y_4(0) = \frac{15}{32} \cong 0{,}46875$

$Y_4(\to\infty) = \frac{255}{364} \cong 0{,}70055$

$$Z_6 = Z_4 - K_\infty'' = 0 \rightarrow K_\infty'' = \lim_{s\to -3{,}5} \frac{364}{255}\cdot\frac{\left(s+\frac{16}{7}\right)}{\left(s+\frac{26}{17}\right)} = \frac{884}{1005}$$

$$Z_6 = \frac{364}{255}\frac{\left(s+\frac{16}{7}\right)}{\left(s+\frac{26}{17}\right)} - \frac{884}{1005} = \frac{364.1005\left(s+\frac{16}{7}\right) - 884.255\left(s+\frac{26}{17}\right)}{255.1005\left(s+\frac{26}{17}\right)}$$

$\downarrow$

$$Z_6 = \frac{140400\,s + 491400}{256275\left(s + \frac{26}{17}\right)} \rightarrow Z_6 = \frac{624}{1139}\,\frac{(s+3{,}5)}{\left(s+\frac{26}{17}\right)}$$

$$Z_6(0) = \frac{84}{67} \cong 1{,}25373$$

$$Z(\infty) = \frac{624}{1139} \cong 0{,}54785$$

$$Y_8 = Y_6 - \frac{s\,K_2}{(s+3{,}5)} = 0 \rightarrow K_2 = \lim_{s\to -3{,}5} \frac{Y_6 \cdot (s+3{,}5)}{s} = \lim_{s\to -3{,}5} \frac{1139}{624}\,\frac{\left(s+\frac{26}{17}\right)}{\cancel{(s+3{,}5)}} \cdot \frac{\cancel{(s+3{,}5)}}{s}$$

$$K_2 = \frac{1139}{624}\,\frac{\left(-3{,}5 + \frac{26}{17}\right)}{(-3{,}5)} = \frac{1139}{624}\cdot\frac{67}{119} \rightarrow K_2 = \frac{4489}{4368}$$

$$Y_8 = \frac{1139}{624}\cdot\frac{\left(s+\frac{26}{17}\right)}{(s+3{,}5)} - \frac{4489}{4368}\cdot\frac{s}{(s+3{,}5)} = \frac{\left(\frac{1139}{624} - \frac{4489}{4368}\right)s + \frac{67}{24}}{s+3{,}5} = \frac{\frac{67}{84}\,s + \frac{67}{24}}{s+3{,}5}$$

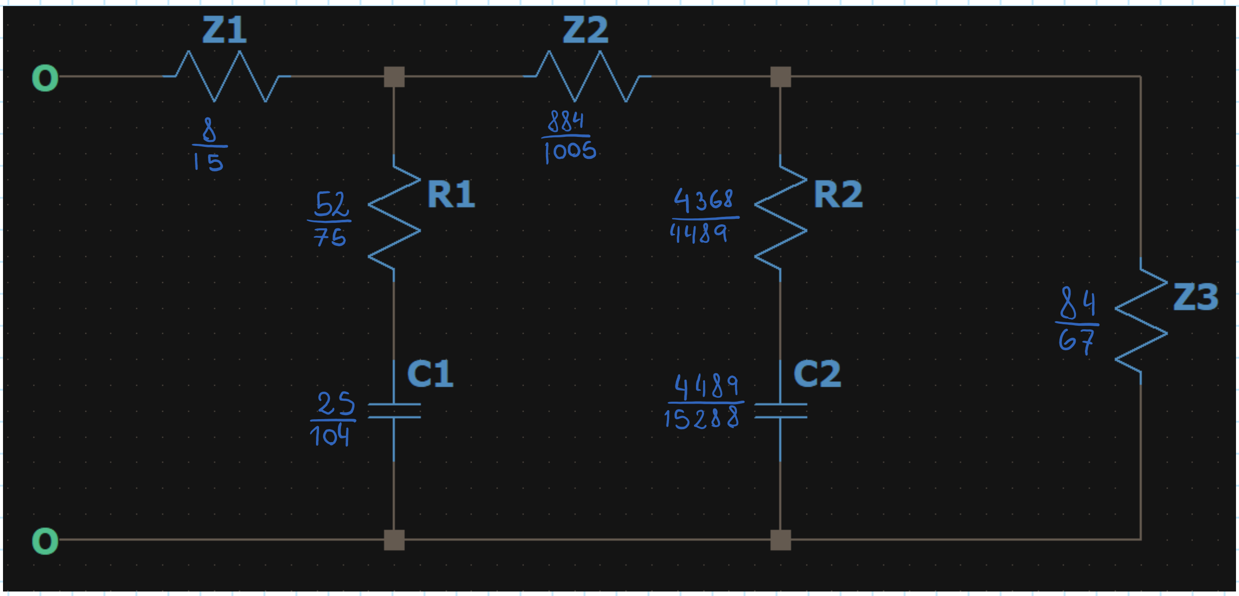
$$Y_8 = \frac{67}{84}\,\frac{\cancel{(s+3{,}5)}}{\cancel{(s+3{,}5)}} \rightarrow Y_8 = \frac{67}{84} = G \longrightarrow R = \frac{84}{67}$$

$$K_i = \frac{1}{R_i} \quad \wedge \quad \tau = \frac{1}{R_i C_i}$$

$$K_1 = \frac{1}{R_1} = \frac{75}{52} \rightarrow R_1 = \frac{52}{75} \qquad \tau_1 = \frac{1}{R_1 C_1} = 6 \rightarrow C_1 = \frac{1}{R_1 \cdot 6} = \frac{25}{104}$$

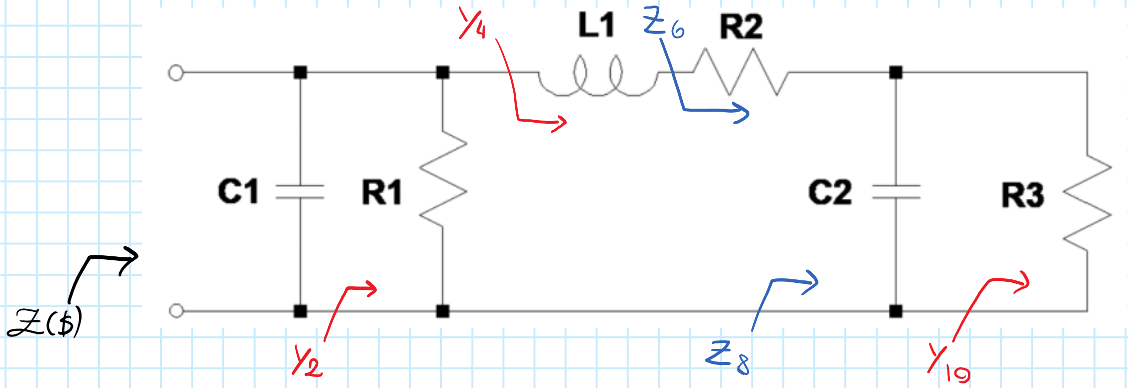
$$K_2 = \frac{1}{R_2} = \frac{4489}{4368} \rightarrow R_2 = \frac{4368}{4489} \qquad \tau_2 = \frac{1}{R_2 C_2} = 3{,}5 \rightarrow C_2 = \frac{1}{R_2 \cdot 3{,}5} = \frac{4489}{15288}$$

Valores Finales



2) Determine el valor de los componentes que integran el siguiente dipolo, sabiendo que satisface la impedancia propuesta:

$$Z(s) = \frac{(s^2+s+1)}{(s^2+2s+5)(s+1)} = \frac{s^2+s+1}{s^3+3s^2+7s+5}$$



No puedo usar el metodo gráfico porque tengo una estructura RLC, pero sabiendo su forma ya se si tengo que extraer en serie o derivación

Remuevo C_1 en DERIVACIÓN $\therefore$ $Z(s) \longrightarrow Y(s) = \dfrac{s^3+3s^2+7s+5}{s^2+s+1}$

$$Y_2 = Y(s) - sK_1^{\infty} = 0 \rightarrow K_1^{\infty} = \lim_{s\to\infty} \frac{Y(s)}{s} = \lim_{s\to\infty} \frac{s^3+3s^2+7s+5}{s^3+s^2+s} \rightarrow \boxed{K_1^{\infty} = 1}$$

$$Y_2 = \frac{s^3+3s^2+7s+5}{s^2+s+1} - s = \frac{\cancel{s^3}+3s^2+7s+5-\cancel{s^3}-s^2-s}{s^2+s+1} \rightarrow Y_2(s) = \frac{2s^2+6s+5}{s^2+s+1}$$

Remuevo R_1 en derivación

Remuevo K_0 o K_∞? EL MENOR DE ELLOS

K_0

$$Y_4 = Y_2 - K_0 = 0 \rightarrow K_0 = \lim_{s\to 0} Y_2(s) = 5 \ \times$$

K_∞

$$Y_4 = Y_2 - K_2^{\infty} = 0 \rightarrow K_2^{\infty} = \lim_{s\to\infty} Y_2(s) = \boxed{2} \ \checkmark$$

$$Y_4 = \frac{2s^2+6s+5}{s^2+s+1} - 2 = \frac{\cancel{2s^2}+6s+5-\cancel{2s^2}-2s-2}{s^2+s+1} \rightarrow Y_4(s) = \frac{4s+3}{s^2+s+1}$$

Remuevo L_1 en Serie

$$Z_6 = Z_4 - sK_3^{\infty} = 0 \rightarrow K_3^{\infty} = \lim_{s\to\infty} \frac{Z_4(s)}{s} = \lim_{s\to\infty} \frac{s^2+s+1}{4s^2+3s} \rightarrow \boxed{K_3^{\infty} = \frac{1}{4}}$$

$$Z_6(s) = \frac{s^2+s+1}{4s+3} - \frac{s}{4} = \frac{\cancel{4s^2}+4s+4-\cancel{4s^2}-3s}{16s+12} \rightarrow Z_6(s) = \frac{s+4}{16s+12}$$

Remuevo R_2 en serie: Elijo $\min(K_0\ ;\ K_\infty)$

K_0

$$Z_8 = Z_6 - K_0 = 0 \rightarrow K_0 = \lim_{s\to 0} Z_6(s) = \frac{1}{3} \quad ✗$$

K_∞

$$Z_8 = Z_6 - K_4^\infty = 0 \rightarrow K_4^\infty = \lim_{s\to \infty} Z_6(s) = \boxed{\frac{1}{16}} \quad ✓$$

$$Z_8(s) = \frac{s+4}{16s+12} - \frac{1}{16} = \frac{\cancel{16s} + 64 - \cancel{16s} - 12}{256s + 192} \rightarrow Z_8(s) = \frac{52}{256s+192}$$

$$Y_{10}(s) = Y_8(s) - s\,K_5^\infty = 0 \rightarrow K_5^\infty = \lim_{s\to\infty} \frac{Y_{10}(s)}{s} = \lim_{s\to\infty} \frac{256s+192}{52s} \rightarrow \boxed{K_5^\infty = \frac{64}{13}}$$

$$Y_{10}(s) = \frac{256s+192}{52} - \frac{256s}{52} = \frac{192}{52} = G_3 \longrightarrow \boxed{R_3 = \frac{13}{48}}$$

Componentes

$\boxed{C_1 = K_1^\infty = 1}$ $\boxed{R_2 = \frac{1}{K_2^\infty} = \frac{1}{2}}$ $\boxed{L_1 = K_3^\infty = \frac{1}{4}}$ $\boxed{R_2 = K_4^\infty = \frac{1}{16}}$ $\boxed{C_5 = K_5^\infty = \frac{64}{13}}$