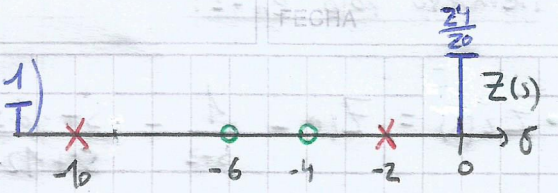
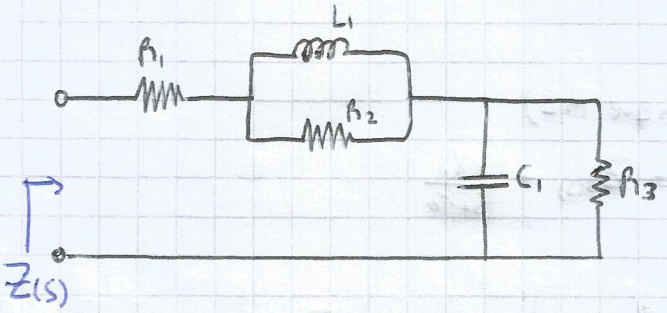
TP6

4) $Z(s) = \frac{s^2+10s+24}{s^2+12s+20} = \frac{(s+4)(s+6)}{(s+2)(s+10)}$





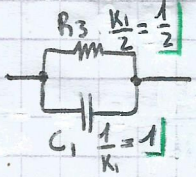
Análisis Cualitativo

- Para R_1 removeo una constante. Pero no puedo remover $Z_{(\infty)} = R_1 + R_2$ ni $Z(0) = R_1 + R_3$. ∴ No me conviene empezar removiendo R_1.
- Comienzo removiendo los Tanques R_L y R_C que están en serie.
- Los polos -10 y -2 corresponden a los Tanques R_L y R_C. La manera de saber si el Tanque es R_L o R_C es si el residuo es negativo o positivo respectivamente. ⟹ Divido en fracciones simples y Calculo los Residuos.

Análisis Algebraico

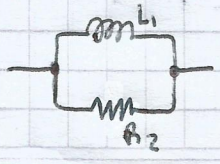
- $Z(s) = \frac{K_1}{s+2} + \frac{K_2}{s+10}$
- $\lim_{s\to-2} Z(s) = \lim_{s\to-2} \frac{K_1}{s+2} \Longrightarrow K_1 = \lim_{s\to-2} (s+2)\,Z(s) = \lim_{s\to-2} \frac{(s+4)(s+6)}{s+10} = \frac{2\cdot4}{8} = 1$

$K_1 > 0 \Longrightarrow$ Polo en -2 corresponde a Tanque R_C ⟹



- $\lim_{s\to-10} Z(s) = \lim_{s\to-10} \frac{K_2}{s+10} \Longrightarrow K_2 = \lim_{s\to-10} (s+10)\,Z(s) = \lim_{s\to-10} \frac{(s+4)(s+6)}{s+2} = \frac{(-6)\cdot(-4)}{-8} = -3$

$K_2 < 0 \Longrightarrow$ Polo en -10 corresponde a Tanque R_L ⟹



Remuevo Polo en -2:

$$Z_2(s) = Z(s) - \frac{1}{s+2} = \frac{s^2+10s+24}{s^2+12s+20} - \frac{1}{s+2} = \frac{s^2+10s+24-s-10}{(s+2)(s+10)} = \frac{s^2+9s+14}{(s+2)(s+10)}$$

$$Z_2(s) = \frac{(s+2)(s+7)}{(s+2)(s+10)} = \frac{s+7}{s+10}$$

Remuevo Polo en -10: (Calculando el Tanque RL)

$$Z_{3(s)} = Z_2(s) - \frac{s \cdot K_A}{s+10} \Longrightarrow Z_2(s) = Z_{3(s)} + \frac{sK_A}{s+10}$$

$$\therefore \lim_{s\to -10} Z_2 = \lim_{s\to -10} \frac{sKA}{s+10} \Longrightarrow K_A = \lim_{s\to -10} \frac{(s+10)}{s} \cdot Z_2 = \lim_{s\to -10} \frac{s+7}{s} = \frac{+3}{-10} = \frac{3}{10}$$

$$\therefore R_2 = K_A = \frac{3}{10}$$

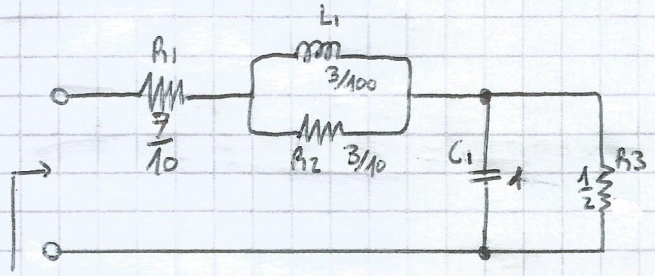
$$L_1 = \frac{K_A}{10} = \frac{3}{100}$$

$$\frac{sK_A}{s+10} = \frac{1}{\frac{1}{K_A} + \frac{10}{sK_A}} = \frac{1}{\frac{1}{K_A} + \frac{1}{\frac{sK_A}{10}}}$$

$$Z_3 = Z_2 - \frac{s \cdot \frac{3}{10}}{s+10} = \frac{s+7 - s\frac{3}{10}}{s+10} = \frac{\frac{7}{10}s+7}{s+10} = \frac{7}{10}\frac{s+10}{s+10}$$

$$\therefore R_1 = \frac{7}{10}$$

Finalmente:



$$Z(s) = \frac{s^2+10s+24}{s^2+12s+20}$$