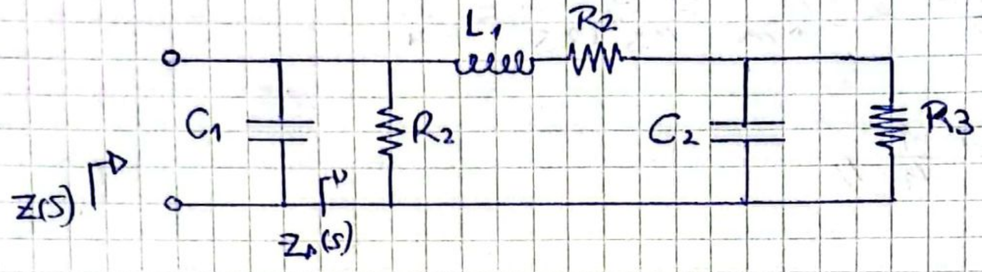
TS 10

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

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



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

Saco un polo de infinito para hallar el valor de C_1

Calculo residuo en infinito

$$k_\infty = \lim_{s\to\infty} \frac{Y(s)}{s} = \lim_{s\to\infty} \frac{s^3+3s^2+7s+5}{s^3+s^2+s} = 1$$

$$k_\infty = 1 \quad \rightarrow \quad \boxed{C_1 = k_\infty = 1}$$

$$Y_A(s) = Y(s) - k_\infty s = \frac{s^3+3s^2+7s+5}{s^2+s+1} - s$$

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

$$Y_A(s) = \frac{2s^2+6s+5}{s^2+s+1}$$

Puedo extraer un valor de 2 $\rightarrow G_2 = 2 \rightarrow \boxed{R_2 = \frac{1}{2}}$

$$Y_B(s) = Y_A(s) - 2 = \frac{2s^2+6s+5}{s^2+s+1} - 2$$

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

$$Z_B = \frac{s^2+s+1}{4s+3}$$

Extraigo un polo en infinito para obtener L_2
Calculo residuo

$$K_\infty = \lim_{s\to\infty} \frac{Z_B(s)}{s} = \lim_{s\to\infty} \frac{s^2+s+1}{4s^2+3s} = \frac{1}{4}$$

$$L_2 = K_\infty = \frac{1}{4} \;//$$

$$Z_C = Z_B - K_\infty s = \frac{s^2+s+1}{4s+3} - \frac{1}{4}s$$

$$Z_C(s) = \frac{s^2+s+1-\frac{1}{4}s(4s+3)}{4s+3} = \frac{\cancel{s^2}+s+1-\cancel{s^2}-\frac{3}{4}s}{4s+3}$$

$$Z_C(s) = \frac{\frac{1}{4}s+1}{4s+3} = \frac{\frac{1}{16}s+\frac{1}{4}}{s+\frac{3}{4}}$$

Remuevo una valor constante para obtener el valor de R_2

$$\boxed{R_2 = \frac{1}{16}} \;//$$

$$Z_D(s) = Z_C(s) - \frac{1}{16} = \frac{\frac{1}{16}s+\frac{1}{4}}{s+\frac{3}{4}} - \frac{\frac{1}{16}\left(s+\frac{3}{4}\right)}{s+\frac{3}{4}}$$

$$Z_D(s) = \frac{\frac{1}{4}-\frac{1}{16}\cdot\frac{3}{4}}{s+\frac{3}{4}} = \frac{\frac{13}{64}}{s+\frac{3}{4}}$$

$$Y_D(s) = \frac{s+\frac{3}{4}}{\frac{13}{64}} = \frac{s\cdot 64}{13} + \frac{48}{13}$$

Entonces $C_2 = \frac{64}{13}$ y $R_3 = \frac{13}{48}$

Resulta