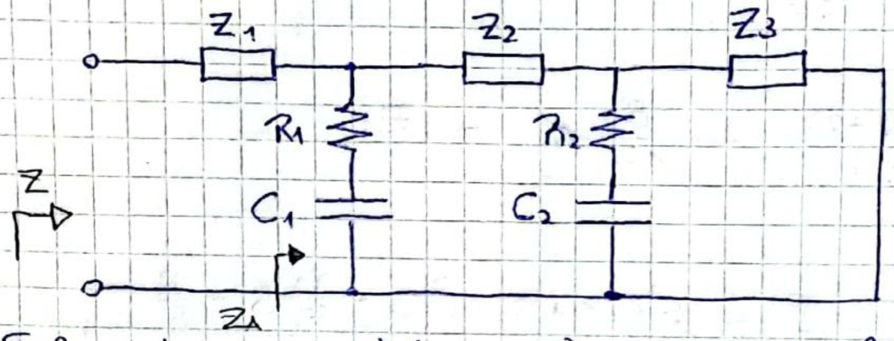
Tarea Semanal N° 6

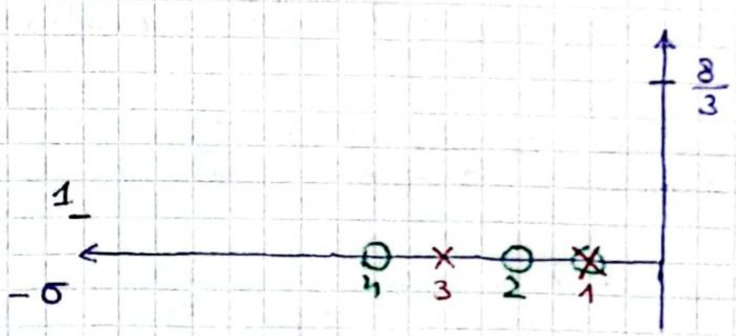
① Encuentre el valor de los componentes del siguiente circuito:



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

$R_1 C_1 = \frac{1}{6}$ $\qquad$ $R_2 C_2 = \frac{2}{7}$

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



Removemos en infinito ~~de~~ ~~[illegible]~~ con la intención de Foster con 0 en $\sigma = -6$

$$Z_A = Z - Z_1$$

$$Z_A\Big|_{s=-6} = (Z - Z_1)\Big|_{s=-6} = 0$$

$$Z_1 = \frac{(-6+4)(-6+2)}{(-6+1)(-6+3)} = \frac{8}{15} \;// = Z_1$$

$$Z_A = \frac{s^2+6s+8}{s^2+4s+3} - \frac{8}{15} = \frac{s^2+6s+8-\frac{8}{15}s^2-\frac{32}{15}s-\frac{8}{5}}{s^2+4s+3}$$

$$Z_A = \frac{\frac{7}{15}s^2+\frac{58}{15}s+\frac{32}{5}}{s^2+4s+3} = \frac{\left(s+\frac{16}{7}\right)(s+6)}{(s+1)(s+3)}\cdot\frac{7}{15}$$

$$Y_A = \frac{15}{7}\,\frac{(s+1)(s+3)}{\left(s+\frac{16}{7}\right)(s+6)}$$ → A esto le tengo que remover la rama R_1C_1

Entonces necesito conocer el residuo del polo asociado

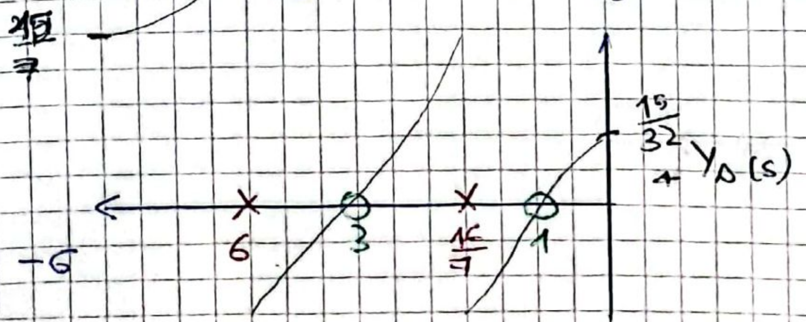
$$K_i = \lim_{s\to(-6)} \frac{\cancel{(s+6)}}{s}\cdot\frac{15}{7}\,\frac{(s+1)(s+3)}{\left(s+\frac{16}{7}\right)\cancel{(s+6)}} = \frac{15}{7}\cdot\frac{35}{52} = \frac{75}{52}$$

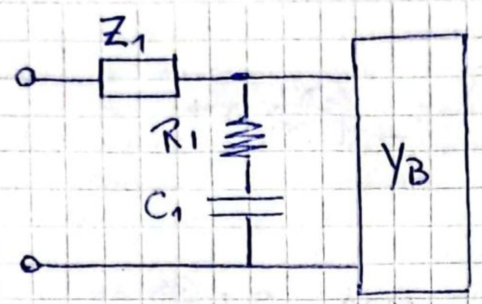
$$\frac{K_i\, s}{s+6} = \frac{1}{\frac{1}{K_i}+\frac{6}{sK_i}}$$ → Resistencia de $\frac{1}{K_1} = \frac{52}{75}$

Capacitor de $\frac{K_1}{6} = \frac{25}{104}$

Hasta ahora se tiene que

$Z_1 = \cancel{R_1}\ \frac{8}{15}$; $R_1 = \frac{52}{75}$, $C_1 = \frac{25}{104}$





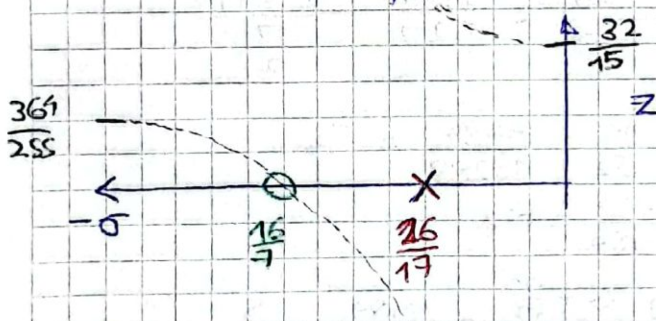
$$Y_B = Y_A - \frac{K_1 s}{(s+6)}$$

$$Y_B = \frac{15}{7}\,\frac{(s+1)(s+3)}{(s+6)\left(s+\frac{16}{7}\right)} - \frac{75}{52}\,\frac{s}{s+6}$$

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

$$Y_B = \frac{255}{364}\,\frac{s^2+\frac{128}{17}s+\frac{156}{17}}{(s+6)\left(s+\frac{16}{7}\right)} = \frac{255}{364}\,\frac{\left(s+\frac{26}{17}\right)\cancel{(s+6)}}{\left(s+\frac{16}{7}\right)\cancel{(s+6)}}$$

$$Y_B = \frac{255}{364}\,\frac{s+\frac{26}{17}}{s+\frac{16}{7}} \Rightarrow Z_B = \frac{364}{255}\,\frac{s+\frac{16}{7}}{s+\frac{26}{17}}$$



Ahora debo realizar una remoción parcial en infinito para poder fijar el cero en $\frac{7}{2}$ dado por el tanque R_2C_2.

$$\cancel{Z_B}\ Z_C = (Z_B - Z_2)$$

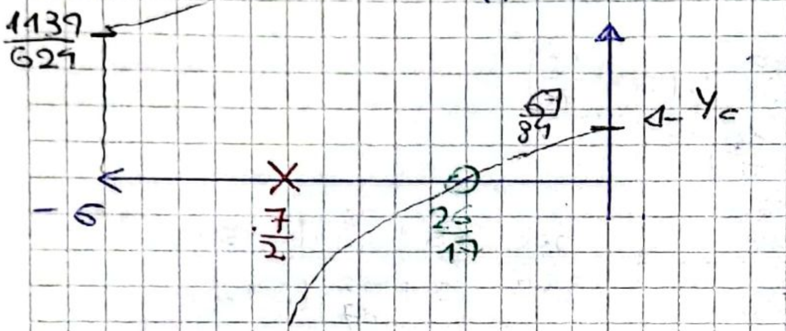
$$Z_C\Big|_{s=-\frac{7}{2}} = 0 \Rightarrow Z_2 = Z_B\Big|_{s=-\frac{7}{2}}$$

$$Z_2 = \frac{364}{255}\,\frac{-\frac{7}{2}+\frac{16}{7}}{-\frac{7}{2}+\frac{26}{17}} = \frac{884}{1005}$$

$$Z_c = \frac{364}{255}\,\frac{s+\frac{16}{7}}{s+\frac{26}{17}} - \frac{884}{1005}$$

$$Z_c = \frac{\frac{364}{255}\left(s+\frac{16}{7}\right) - \frac{884}{1005}\left(s+\frac{26}{17}\right)}{s+\frac{26}{17}} = \cancel{\frac{624}{1139}\,s+}$$

$$Z_c = \frac{624}{1139}\,\frac{\left(s+\frac{7}{2}\right)}{s+\frac{26}{17}} \quad \therefore \quad Y_c = \frac{1139}{624}\,\frac{s+\frac{26}{17}}{s+\frac{7}{2}}$$



Remuevo la rama R_2C_2 y me quedo con Z_3

$$K_2 = \lim_{s\to -\frac{7}{2}} \frac{\left(s+\frac{7}{2}\right)}{s}\,\frac{1139}{624}\,\frac{s+\frac{26}{17}}{s+\frac{7}{2}} = \frac{1139}{624}\,\frac{\left(-\frac{7}{2}+\frac{26}{17}\right)}{-\frac{7}{2}}$$

$$K_2 = \frac{4489}{1368} \rightarrow \text{capacitor de } \frac{K_2}{62} = \frac{4489}{15288} = C_2$$

$$\text{resistor de } \frac{4368}{4489} = R_2$$

$$Y_3 = Y_c - \frac{K_2\, s}{s+\frac{7}{2}} = \frac{1139}{624}\,\frac{s+\frac{26}{17}}{s+\frac{7}{2}} - \frac{4489}{1368}\,\frac{s}{s+\frac{7}{2}}$$

$$Y_3 = \frac{\frac{67}{84}s + \frac{67}{24}}{s+\frac{7}{2}} = \frac{67}{84}\,\frac{\cancel{s+\frac{7}{2}}}{\cancel{s+\frac{7}{2}}}$$

$$Y_3 = \frac{67}{84} \;//$$

Resulta entonces: