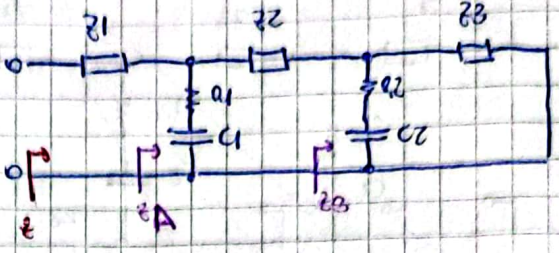
TS10

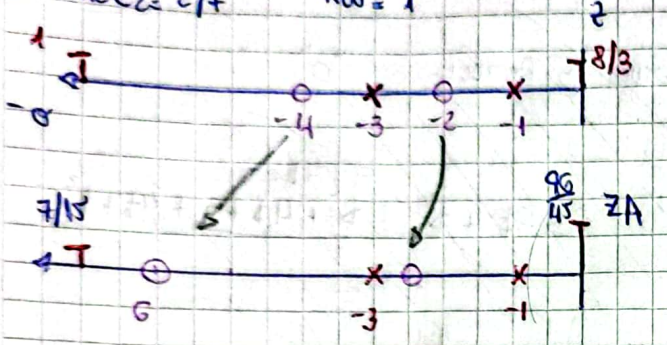
Síntesis de Funciones Existentes Dispositivos

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



$R_1 C_1 = 1/6 \qquad K_0 = 8/3$

$R_2 C_2 = 2/7 \qquad K_\infty = 1$



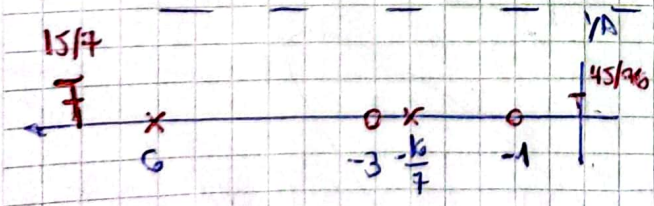
Necesito poner un "0" en 6 para que la constante de tiempo de $R_1 C_1 = 1/6$ Remuevo parcialmente en $s=\infty$ (Resistencia en serie)

$Z_A = Z - Z_1 \rightarrow Z_A(-6) = 0\,\Omega$

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

$$Z_A = \frac{s^2+6s+8}{s^2+4s+3} - \frac{8}{15} = \frac{15s^2+90s+120-8s^2-32s-24}{15(s^2+4s+3)}$$

$$Z_A = \frac{\left(s+\frac{16}{7}\right)(s+6)7}{15(s+3)(s+1)} = \frac{7s^2+58s+96}{15s^2+60s+45}$$



Saco R_1 y C_1 por ser inversa y sumando y Remuevo en $s=6$

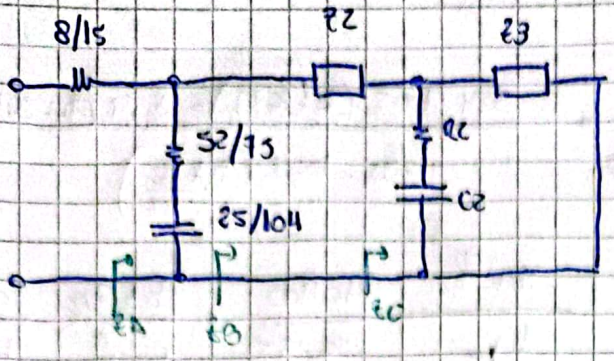
$R_1 = 1/6$

$$Y_6 = Y_A - \frac{1}{\frac{1}{1/a_1} + \frac{1}{sC_1}} = Y_A \cdot \frac{sC_1}{1+sa_1} = Y_A \cdot \frac{s \cdot 1/a_1}{\frac{1}{6}+s}$$

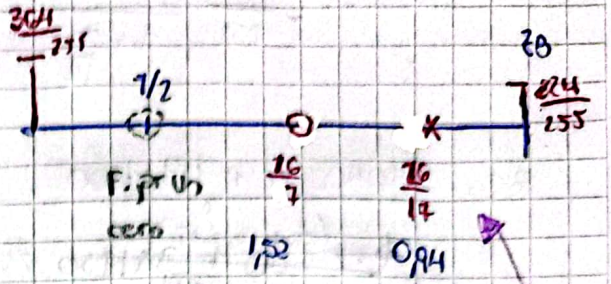
$$1/a_1 = \lim_{s\to -6} \frac{(s+6)\,15(s+3)(s+1)}{s\,7(s+6)\left(s+\frac{16}{7}\right)} \Rightarrow a_1 = \frac{56}{75} \Rightarrow C_1 = \frac{75}{56 \cdot 6} = \frac{25}{104}$$

$$Y_6 = \frac{15s^2+60s+45}{7s^2+58s+96} - \frac{s\,235/57}{s+1/6} = \frac{15s^3+\frac{15}{6}s^2+60s^2+10s+45s+45}{7s^3+\frac{7}{6}s^2+58s^2+\frac{58}{6}s+96s+16} - \frac{s\,\frac{235}{57}}{s+\frac{1}{6}}$$

NOTA



Invierto a z y agrupo para sacar el cero en -7/2



$$Y_B = Y_A - Y_{BC}$$

$$Y_{BC} = \frac{1}{\frac{1}{sC_2} + \frac{1}{sC_3}} = \frac{sC_2}{1 + s \cdot C_2 C_3} = \frac{s \cdot \frac{25}{104}}{1 + s\left(\frac{1}{16}\right)} = \frac{s \cdot \frac{25}{32}}{s + 6}$$

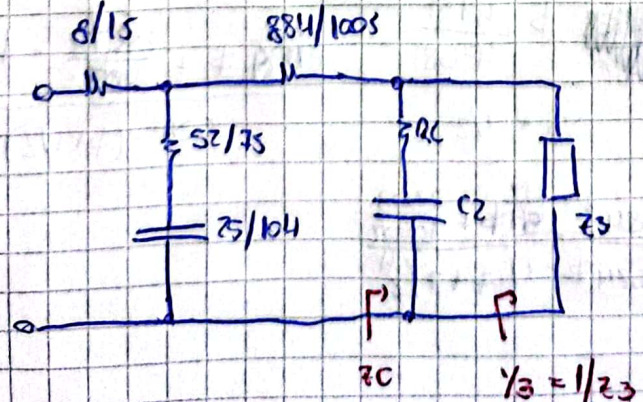
$$Y_B = \frac{15(s+3)(s+1)}{7(s+6)\left(s+\frac{16}{7}\right)} - \frac{s\frac{75}{32}}{(s+6)} = \frac{15(s+3)(s+1) - s\frac{75}{32}\left(s+\frac{16}{7}\right)\cdot 7}{7(s+6)\left(s+\frac{16}{7}\right)}$$

$$Y_B = \frac{15\left(s^2+4s+3\right) - 7\left(s^2\frac{75}{32} + s\cdot\frac{339}{91}\right)}{7(s+6)\left(s+\frac{16}{7}\right)} = \frac{s^2\cdot\frac{255}{32} + s\frac{480}{13} + 45}{7(s+6)\left(s+\frac{16}{7}\right)}$$

$$Y_B = \frac{\frac{255}{32}\left(s+\frac{26}{17}\right)(s+6)}{7(s+6)\left(s+\frac{16}{7}\right)} = \frac{255}{364}\,\frac{s+\frac{26}{17}}{s+\frac{16}{7}} \rightarrow z_B = \frac{364}{255}\,\frac{s+16/7}{s+26/17}$$

$$Z_C = z_B - z_2 \rightarrow z_C(-7/2) = 0 \rightarrow z_B(-7/2) = z_2$$

$$z_B(-7/2) = z_2 = \frac{364}{255}\cdot\frac{-7/2+16/7}{-7/2+26/17} = \frac{884}{1005}\cdot$$



NOTA

Invierto a admitancia y calculo C2 y R2

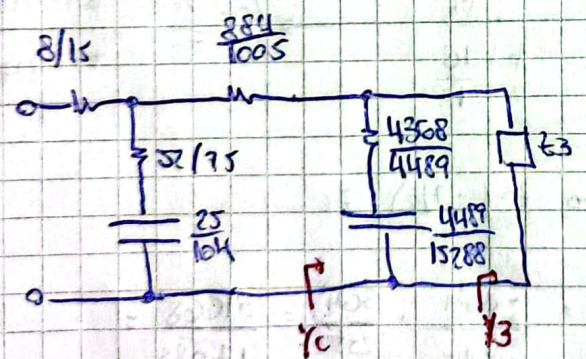
$$Z_C = Z_3 - Z_2 = \frac{384}{255}\,\frac{s+16/7}{s+\frac{26}{17}} - \frac{884}{1005} = \frac{384\cdot 1005\,(s+16/7) - 884\,(s+26/17)\,255}{255\cdot 1005\,(s+\frac{26}{17})}$$

$$Z_C = \frac{140400\,s + 491400}{(s+26/17)\,256275} = \frac{s+7/2}{s+\frac{20}{17}}\,\frac{140400}{256275} = \frac{s+7/2}{s+\frac{26}{17}}\cdot\frac{624}{1139}$$

$$Y_C = \frac{s+\frac{26}{17}}{s+7/2}\,\frac{1139}{624} \rightarrow Y_3 = Y_C - \frac{s\cdot K}{s+7/2}$$

$$K = \lim_{s\to -7/2} Y_C\cdot\frac{s+7/2}{s} = (-7/2+26/17)\frac{1139}{624}\cdot\frac{1}{(-7/2)} = \frac{4489}{4368}$$

$$R_2 = 1/K = \frac{4368}{4489} \rightarrow C = \frac{4489}{15288} \qquad R_C = \frac{2}{7} \rightarrow C = \frac{2}{7R}$$



$$Y_3 = Y_C - Y_{RC}$$

$$Y_3 = \frac{1139}{624}\cdot\frac{s+26/17}{s+7/2} - \frac{s\cdot\frac{4489}{4368}}{s+7/2} = \frac{\frac{1139}{624}s + \frac{67}{24} - s\cdot\frac{4489}{4368}}{\cdot(s+7/2)}$$

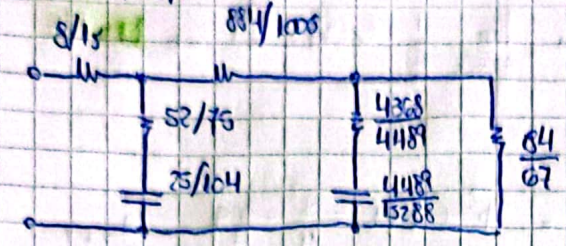
$$Y_3 = \frac{s\cdot\frac{67}{84} + \frac{67}{24}}{(s+7/2)} = \frac{67}{84}\cdot\frac{s+7/2}{s+7/2} = \frac{67}{84}$$

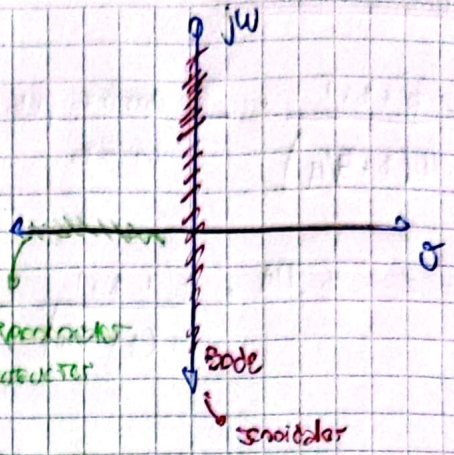
NOTA

HOJA N°

FECHA

Síntesis Final:





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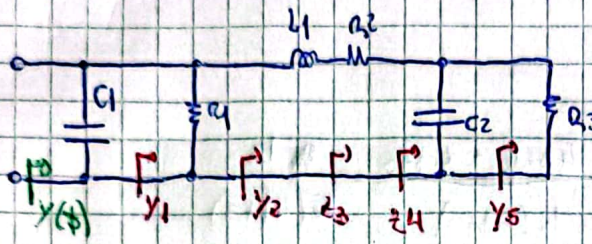
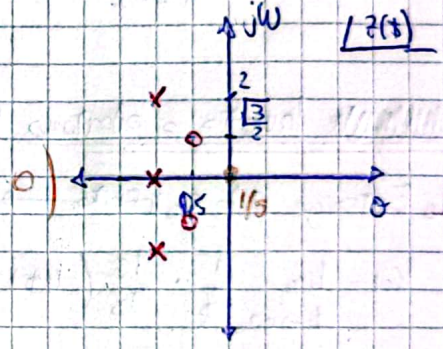


$$Z(s) = \frac{s^2+s+1}{(s^2+2s+5)(s+1)}$$



① Paso a admitancia:

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

② Remuevo polo en infinito → (Cap)

$$K_\infty = \lim_{s\to\infty} \frac{Y}{s} = \frac{1}{s}\cdot\frac{(s^2+2s+5)(s+1)}{s^2+s+1} = 1 \rightarrow C_F = 1$$

③ Remuevo brazo del resistor

$$Y_1 = Y(s) - sC_1 = \frac{(s^2+2s+5)(s+1)}{s^2+s+1} - s = \frac{s^3+2s^2+5s+s^2+2s+5-s^3-s^2-s}{s^2+s+1}$$

$$Y_1 = \frac{2s^2+6s+5}{s^2+s+1} \rightarrow K_\infty = 2$$

$$K_0 = 5$$

Remuevo resistor en ∞ → $Q = 1/2$

$$Y_2 = Y_1 - K_\infty = \frac{2s^2+6s+5}{s^2+s+1} - 2 = \frac{2s^2+6s+5-2s^2-2s-2}{s^2+s+1} = \frac{4s+3}{s^2+s+1}$$

NOTA

④ Cambio a impedancia

$$Z_2 = \frac{s^2+s+1}{4(s+3/4)} \rightarrow \text{Remuevo polo en infinito} \rightarrow L_1 \rightarrow \lim_{s\to\infty} \frac{1}{s}\cdot Z_2(s) = 1/4 \rightarrow \boxed{L_1 = 1/4}$$

$$Z_3 = Z_2 - s\cdot 1/4 = \frac{s^2+s+1}{4(s+3/4)} - s\cdot 1/4 = \frac{s^2+s+1-s^2-\frac{3}{4}s}{4(s+3/4)} = \frac{\frac{s}{4}+1}{4(s+3/4)}$$

$K_0 = 1/3$

$K_\infty = 1/16$

Removo Polo en $\infty \rightarrow \boxed{R_2 = 1/16}$

$$Z_4 = Z_3 - \frac{1}{16} = \frac{\frac{s}{4}+1}{4s+3} - \frac{1}{16} = \frac{4s+16-4s-3}{16(4s+3)} = \frac{13}{16(4s+3)}$$

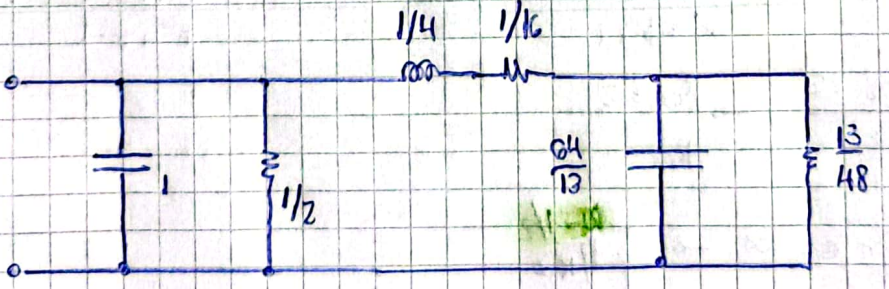
⑤ Invirto a admitancia $Y_4 = \frac{16}{13}(4s+3)$

Extraigo polo en infinito $\rightarrow C_2$

$$K_\infty = \lim_{s\to\infty} \frac{1}{s}\cdot\frac{16}{13}(4s+3) = \frac{64}{13} \rightarrow \boxed{C_2 = \frac{64}{13}}$$

$$Y_5 = Y_4 - sC_2 = \frac{16}{13}(4s+3) - s\cdot\frac{64}{13} = \frac{48}{13} \rightarrow \boxed{R_3 = \frac{13}{48}}$$

⑥ Síntesis Final



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