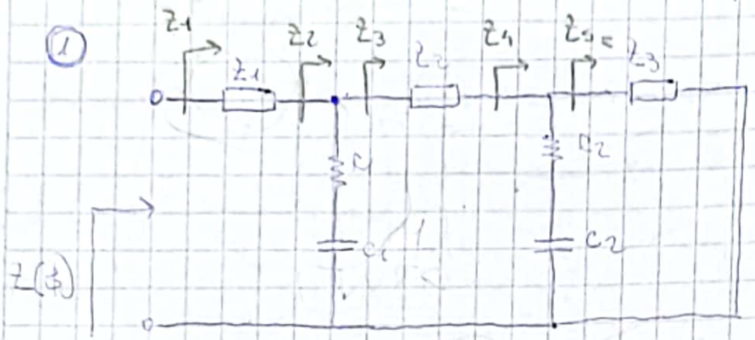
Repaso de tarea semanal funciones disipativas

(1)



Ctes tiempo

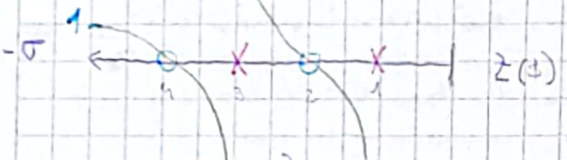
$R_1 \cdot C_1 = 1/6$

$R_2 \cdot C_2 = 2/7$

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

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

$8/3 \rightarrow Z_1 + Z_2 + Z_3$



Removiendo Z_1 me queda un circuito que a $\sigma = -6$ tiene $Z(s) = 0$

$$Z(s) - K_\infty' = Z_2(s)\Big|_{s=\sigma_1} = 0 \qquad \sigma_1 = -6$$

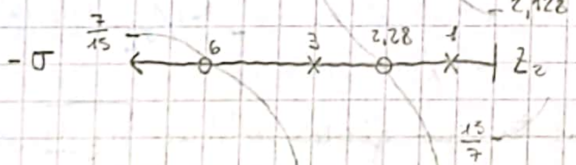
$$Z(\sigma=-6) = K_\infty' \rightarrow \left[Z_1 = R = \frac{8}{15} \right.$$

$$\frac{(-6+4)(-6+2)}{(-6+1)(-6+3)} = \frac{8}{15} = K_\infty'$$

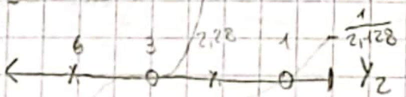
$$Z_2(s) = \frac{s^2+6s+8}{s^2+4s+3} - 8/15 = \frac{s^2+6s+8-\frac{8}{15}s^2-\frac{32}{15}s-\frac{8}{5}}{s^2+4s+3}$$

$$Z_2(s) = \frac{\frac{7}{15}s^2+\frac{58}{15}s+\frac{32}{5}}{s^2+4s+3} = \frac{\frac{7}{15}(s+2{,}28)(s+6)}{(s+1)(s+3)}$$

$2{,}122$



$$Y_2(s) = \frac{\frac{15}{7}(s+1)(s+3)}{(s+2{,}28)(s+6)}$$



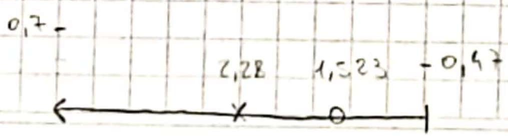
$$\lim_{s\to-6} \frac{(s+6)}{s} Y_2(s) = \frac{32{,}14}{-6(-3{,}72)} = 1{,}44 = K_1 \Longrightarrow \frac{1}{\frac{1}{K_1}+\frac{1}{s\frac{K_1}{\sigma_1}}} = \frac{1}{0{,}694+\frac{1}{s\,0{,}24}}$$

$\left[\begin{array}{l} R_1 = 0{,}694 \\ C = 0{,}24 \end{array} \right.$

Remuevo la $Y_{R_1C_1}$ del Y_2

$$Y_2(s) - Y_{R_1C_1} = \frac{\frac{15}{7}s^2+\frac{60}{7}s+\frac{45}{7}}{(s+2{,}28)(s+6)} - \frac{s\,1{,}44}{s+6} = \frac{\frac{15}{7}s^2+\frac{60}{7}s+\frac{45}{7}-s^2\cdot 1{,}44-s\cdot 3{,}28}{(s+2{,}28)(s+6)}$$

$$Y_3(s) = \frac{\frac{123}{175}s^2+\frac{926}{175}s+\frac{45}{7}}{s^2+s\,8{,}28+13{,}68} = \frac{\frac{123}{175}(s+1{,}523)(s+6)}{(s+2{,}28)(s+6)} = \frac{123}{175}\,\frac{s+1{,}523}{s+2{,}28}$$



HOJA N°

FECHA

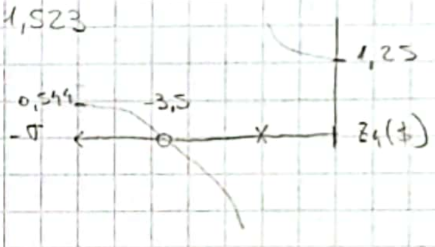
$$Z_3(\$) = \frac{175}{123}\,\frac{\$+2,28}{\$+1,523}$$

$$Z_3(\$) - Z_2 = Z_4(\$)\Big|_{\$=\sigma_2} = 0 \qquad \sigma_2 = -\frac{7}{2}$$

$$Z_2 = Z_3(\sigma=-3,5) = \frac{175}{123}\,\frac{-3,5+2,28}{-3,5+1,523} = \Big[\,0,878 \longrightarrow R = Z_2$$

$$Z_4(\$) = \frac{175}{123}\,\frac{\$+2,28}{\$+1,523} - 0,878 = \frac{1,422\$+3,244-\$0,878-1,337}{\$+1,523}$$

$$Z_4(\$) = \frac{0,544\$+1,91}{\$+1,523} = 0,544\cdot\frac{\$+3,5}{\$+1,523}$$



$$Y_4(\$) = 1,84\,\frac{\$+1,523}{\$+3,5}$$

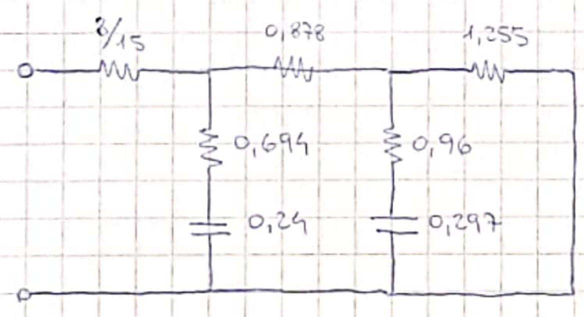
$$\lim_{\$\to-3,5} \frac{(\$+3,5)}{\$}\,Y_4(\$) = 1,04 = k_2 \Rightarrow \frac{1}{\frac{1}{k_2}+\frac{1}{\$\frac{k_1}{\sigma_1}}} = \frac{1}{0,96+\frac{1}{\$0,297}}$$

$\Big[\; R_2 = 0,96$

$\;\;\; C_2 = 0,297$

Retomo el $Z(\sigma=0) = 8/3 = Z_1 + Z_2 + Z_3$

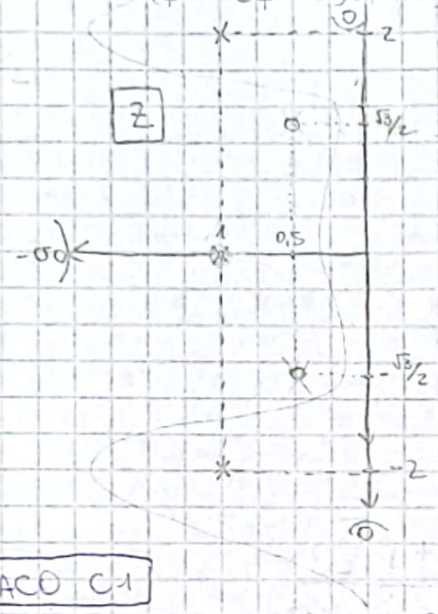
$$8/3 = \frac{8}{15} + 0,878 + Z_3 \Rightarrow \Big[\,Z_3 = 1,255$$

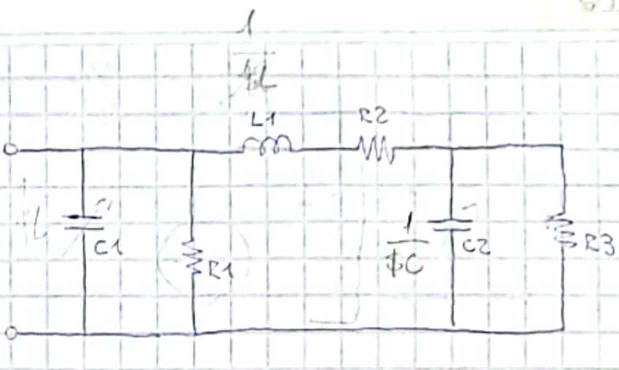


NOTA

(2)

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





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

$$Z(0) = \frac{1}{5} = (R_2+R_3) /\!/ R_1$$

$$\lim_{s\to\infty} Y(s) = \lim_{s\to\infty} sC_1 + \cancel{\frac{1}{R_1}} \Rightarrow \lim_{s\to\infty} \frac{Y(s)}{s} = \boxed{C_1 = 1}$$

SACO C1

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

$$Z_2(s) = \frac{s^2+s+1}{2s^2+6s+5}$$

$$\lim_{s\to\infty} Z_2(s) = \boxed{\frac{1}{2} = R_1} \Rightarrow Y_{R_1} = 2$$

SACO R1

$$Y_3(s) = Y_2(s) - 2 = \frac{2s^2+6s+5-2s^2-2s-2}{s^2+s+1} = \frac{4s+3}{s^2+s+1}$$

$$Z_3(s) = \frac{s^2+s+1}{4s+3} \qquad \lim_{s\to\infty} Z_3(s) = \lim_{s\to\infty} sL_1 + \cancel{R/2} \Rightarrow \lim_{s\to\infty}\frac{Z_3(s)}{s} = \boxed{\frac{1}{4} = L_1}$$

SACO L1

$$Z_4(s) = Z_3(s) - \frac{1}{4}s = \frac{s^2+s+1-s^2-\frac{3}{4}s}{4s+3} = \frac{\frac{1}{4}s+1}{4s+3}$$

$$\lim_{s\to\infty} Z_4(s) = \boxed{R_2 = \frac{1}{16}}$$

SACO R2

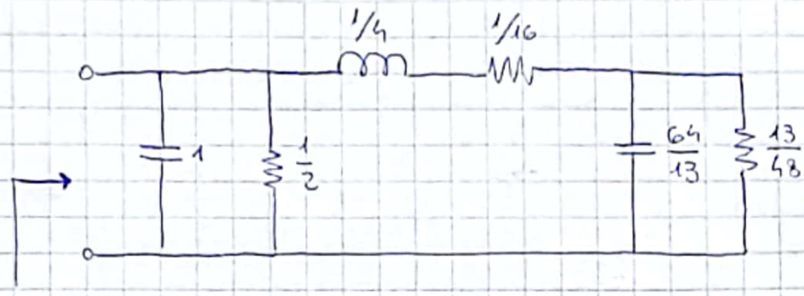
$$Z_5(s) = Z_4(s) - \frac{1}{16} = \frac{\frac{1}{4}s+1-\frac{1}{4}s-\frac{3}{16}}{4s+3} = \frac{13/16}{4s+3} \qquad Y_5(s) = \frac{4s+3}{13/16}$$

$$\lim_{s\to 0} Y_5(s) = \frac{48}{13} = Y_{R_3} \Rightarrow \boxed{R_3 = \frac{13}{48} = 0{,}271}$$

$$\lim_{s\to\infty} \frac{Y_5(s)}{s} = \boxed{\frac{64}{13} = C_2}$$

Escaneado con CamScanner

CIRCUITO



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

Para simulación en LT Spice:

$$Z(0) = \frac{1}{5} \Rightarrow -13,97 \text{ dB}$$

$$Z\left(\omega = \frac{\sqrt{3}}{2}\right) = \frac{-\frac{3}{4} + 1 + j\frac{\sqrt{3}}{2}}{\left(-\frac{3}{4} + 5 + j\sqrt{3}\right)\left(j\frac{\sqrt{3}}{2} + 1\right)} = \frac{\frac{1}{4} + j\frac{\sqrt{3}}{2}}{\frac{11}{4} + j\,6,7117}$$

$$\left|Z\left(\omega = \frac{\sqrt{3}}{2}\right)\right| = \frac{\sqrt{\left(\frac{1}{4}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2}}{\sqrt{\left(\frac{11}{4}\right)^2 + (6,711)^2}} = \frac{0,9354}{7,253} = 0,129 \Rightarrow -17,8 \text{ dB}$$

$$Z(\omega = 2) = \frac{1 - 4 + j2}{-7 + j6}$$

$$|Z(\omega = 2)| = 0,391 \Longrightarrow -8,15 \text{ dB}$$