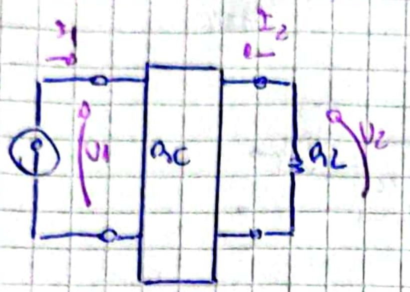
HOJA Nº

FECHA

Tarea Semana 12

1)



$-\frac{I_2}{I_1} = H \cdot \frac{s^2+5s+4}{s^2+8s+12}$

a) Síntesis Gráfica

b) Síntesis analítica

c) Hallar H y verificar

$Z_{21} = GH$

$Z_{21} = \frac{V_2}{I_1}\Big|_{I_2=0}$

$V_2 = -R_L \cdot I_2$

Param Y → $I_1 = V_1 Y_{11} + V_2 Y_{12}$ ×

$I_2 = V_1 Y_{21} + V_2 \cdot Y_{22}$ ×

Param Z → $V_1 = I_1 \cdot Z_{11} + I_2 \cdot Z_{12}$ ×

Más adecuado para este caso ← $\boxed{V_2 = I_1 \cdot Z_{21} + I_2 Z_{22}}$ ✓

① Excitado por generador de corriente

→ $-R_L \cdot I_2 = I_1 Z_{21} + I_2 \cdot Z_{22}$ → $I_2(-R_L - Z_{22}) = I_1 \cdot Z_{21}$

$\Rightarrow -\frac{I_2}{I_1} = \frac{\overset{\to GH}{Z_{21}}}{Z_{22}+R_L} = H \cdot \frac{s^2+5s+4}{s^2+8s+12}$

$\frac{6}{Z_{22}+R_L} = \frac{s^2+5s+4}{s^2+8s+12}$ → normalización $R_L = \Omega$

$Z_{22} = \frac{6(s^2+8s+12)}{s^2+5s+4} - 1 = \frac{(6s^2+48s+72)-(s^2+5s+4)}{(s+1)(s+4)}$

$Z_{22} = \frac{5s^2+42s+68}{(s+1)(s+4)} = \frac{5(s+2)(s+6{,}8)}{(s+1)(s+4)}$

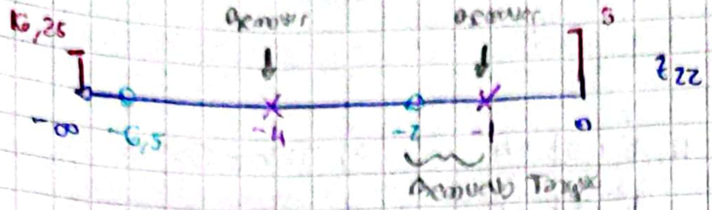
Red RC → $Z_{RC}(\infty) = 5$

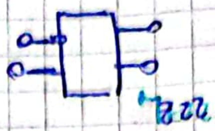
$Z_{RC}(0) = \frac{65}{4} = 16{,}25$

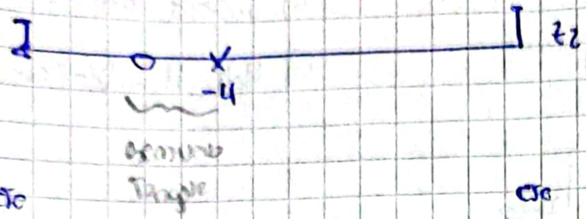
$Z_{RC}(0) > Z_{RC}(\infty)$ ✓

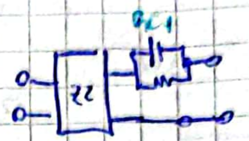
NOTA

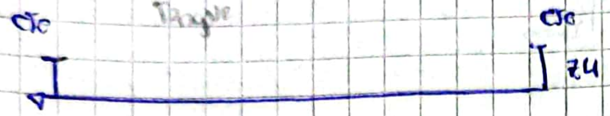
Lo Transferencia tiene cero en: $s=-1$ y $s=-4$



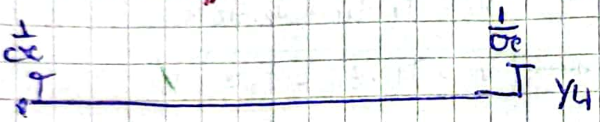








Resistencia pero tengo que terminar en //



Remover RC_1 → Análisis nodo

$$Z_{22}=\frac{5(s+2)(s+6,5)}{(s+4)(s+1)}=Z_{RC_1}+Z_2$$

$$Z_{RC_1}=\frac{K_1}{s+\sigma}\rightarrow K_1=\lim_{s\to -1} Z_{22}\cdot(s+1)=\frac{5(-1+2)(-1+6,5)}{-1+4}=\frac{55}{6}$$

$$=\frac{1}{\frac{1}{\frac{1}{sC}}+\frac{1}{R}}\rightarrow R=\frac{K_1}{\sigma}\qquad C=1/K_1$$

$$R=\frac{55}{6}\qquad C=\frac{6}{55}$$

Remover RC_2 →

$$Z_2=\frac{5(s+2)(s+6,5)}{(s+4)(s+1)}-\frac{55/6\,(s+4)}{(s+1)(s+4)}=\frac{5s^2+\frac{100}{3}s+\frac{85}{3}}{(s+1)(s+4)}=\frac{\cancel{(s+1)}(s+17/3)5}{\cancel{(s+1)}(s+4)}$$

$$Z_2=\frac{\left(s+\frac{17}{3}\right)5}{s+4}=Z_4+Z_{RC_2}$$

$$Z_{RC_2}=\lim_{s\to -4}(s+4)Z_2=\left(-4+\frac{17}{3}\right)5=25/3\begin{cases}C_2=3/25\\ R_2=\frac{25/3}{4}=\frac{25}{12}\end{cases}$$

NOTA

Escaneado con CamScanner

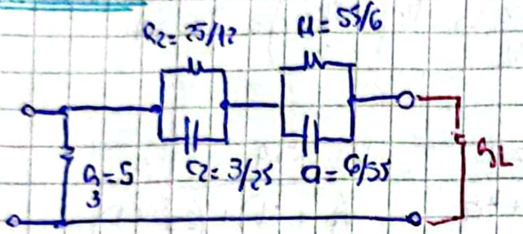
HOJA N°

FECHA

$$Z_4 = Z_2 - Z_{eq_2} = \frac{(p+\frac{17}{3})5}{p+4} - \frac{25/3}{p+4} = \frac{5p+\overset{60/3}{\frac{85}{3}-\frac{25}{3}}}{p+4} = \frac{5p+20}{p+4} = 5$$

$\rightarrow G_3 = 1/5$

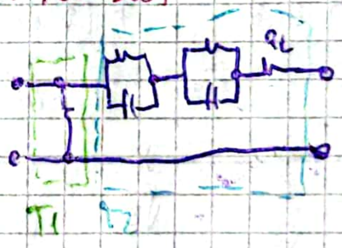
④ Síntesis final



⑤ Verificación por parámetros T

$A = \left.\frac{V_1}{V_2}\right|_{I_2=0}$ $\qquad B = \left.\frac{V_1}{-I_2}\right|_{V_2=0}$

$C = \left.\frac{I_1}{V_2}\right|_{I_2=0}$ $\qquad D = \left.\frac{I_1}{-I_2}\right|_{V_2=0}$ → $V_2=0$ anula RL → Modificación



$$T_1 = \begin{pmatrix} 1 & 0 \\ 1/R_3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 1/5 & 1 \end{pmatrix}$$

$$T_2 = \begin{pmatrix} 1 & R_L + Z_{RC_1} + Z_{RC_2} \\ 0 & 1 \end{pmatrix}$$

$$T = T_1 \cdot T_2 = \begin{pmatrix} 1 & 0 \\ 1/5 & 1 \end{pmatrix}\begin{pmatrix} 1 & (R_L + Z_{RC_1} + Z_{RC_2}) \\ 0 & 1 \end{pmatrix}$$

$$D = \frac{1}{5}\cdot(R_L + Z_{RC_1} + Z_{RC_2}) + 1\cdot 1 = \frac{1}{5}\left(R_L + \frac{55/6\,(p+4)}{(p+1)(p+4)} + \frac{25/3\,(p+1)}{(p+4)(p+1)}\right) + \frac{5}{5}\,\frac{(p+1)(p+4)}{(p+1)(p+4)}$$

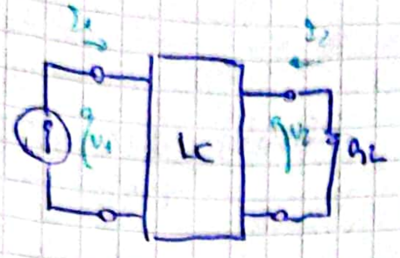
$$D = \frac{6(p+1)(p+4) + \frac{55}{6}(p+4) + \frac{25}{3}(p+1)}{5(p+1)(p+4)} = \frac{6p^2 + 30p + 24 + \frac{55}{6}p + \frac{220}{6} + \frac{25}{3}p + \frac{25}{3}}{5(p+1)(p+4)}$$

$$D = \frac{6}{5}\cdot\frac{(p+1{,}91)(p+6)}{(p+1)(p+4)} = -\frac{I_1}{I_2} \rightarrow \frac{I_2}{I_1} = \frac{5}{6}\,\frac{(p+1)(p+4)}{(p+1{,}91)(p+6)} \;//$$

$H = 5/6$

NOTA

2)



$$T(p) = \frac{K\cdot(p^2+9)}{p^3+2p^2+2p+1} = \frac{V_2}{I_1}$$

$$V_2 = -R_L \cdot I_2 \qquad I_2 = \frac{-V_2}{R_L}$$

$$V_1 = I_1 \cdot z_{11} + I_2 \cdot z_{12}$$

$$V_2 = I_1 \cdot z_{21} + I_2 \cdot z_{22} \rightarrow V_2 = I_1 z_{21} - V_2 \cdot \frac{z_{22}}{R_L} \rightarrow V_2\left(1+\frac{z_{22}}{R_L}\right) = I_1 \cdot z_{21}$$

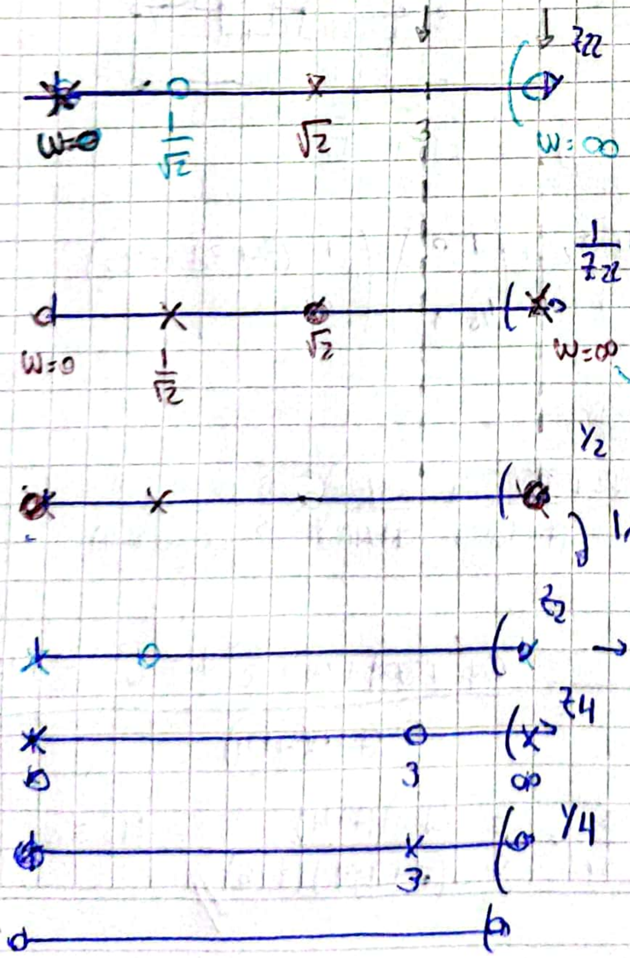
$$\rightarrow \frac{V_2}{I_1} = \frac{z_{21}}{1+\frac{z_{22}}{R_L}}$$ → Normalizo $R_g = R_L$ $$\frac{V_2}{I_1} = \frac{z_{21}}{1+z_{22}} = \frac{K\cdot (p^2+9)}{(p^3+2p)+(2p^2+1)}$$

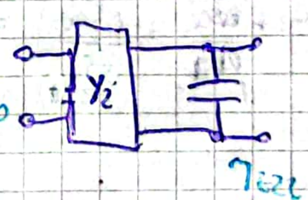
$z_{12} = \frac{par}{impar}$ ó $\frac{impar}{par}$ → $$\frac{K\cdot\frac{p^2+9}{p^3+2p}}{1+\frac{2p^2+1}{p^3+2p}} = T(p)$$ → z_{22}

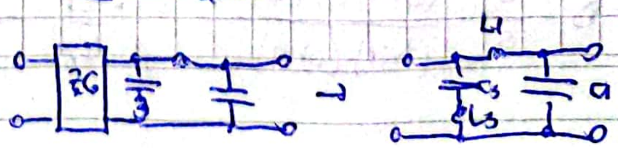
$$z_{22} = \frac{2p^2+1}{p^3+2p} = \frac{2\cdot(p^2+1/2)}{p\,(p^2+2)}$$

① La transferencia tiene un cero en 3 y otro en ∞

② último elemento en derivación







NOTA

Analizando:

$$z_{22} = \frac{2(p^2+1/2)}{p(p^2+2)} \Rightarrow \frac{1}{z_{22}} = \frac{p(p^2+2)}{2(p^2+1/2)} = Y_2 + p\,a$$

$$a = \lim_{p\to\infty} \frac{1}{z_{22}}\frac{1}{p} = 1/2$$

$$Y_2 = \frac{p^3+2p}{2(p^2+1/2)} - \frac{1/2\,p}{2(p^2+1/2)} \cdot 2(p^2+1/2) = \frac{p^3+2p-p^3-p/2}{2(p^2+1/2)} = \frac{3/2\,p}{2(p^2+1/2)}$$

Invierto

$$Z_2 = \frac{2(p^2+1/2)}{3/2\,p} \rightarrow Z_2 - pL_2 = Z_4 \rightarrow Z_4(p^2=-9)=0$$

$$\frac{2\cdot(-9)+1/2}{\frac{3}{2}j3} - j3\cdot L_2 = 0 \rightarrow L_2 = 34/27$$

$$Z_4 = Z_2 - pL_2 = \frac{2(p^2+1/2)}{3/2\,p} - p\cdot\frac{34}{27} = \frac{4(p^2+1/2)}{3p} - \frac{p^2\cdot 34/9}{3p} = \frac{2}{27}\,\frac{p^2+9}{p}$$

Invierto

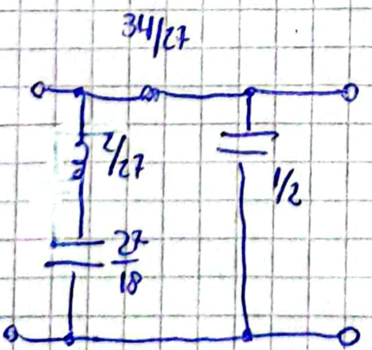
$$Y_4 = \frac{27}{2}\,\frac{p}{p^2+9} = \frac{\frac{1}{pL}\cdot pC}{pC+\frac{1}{pL}} = \frac{\frac{C}{L}\cdot p}{p^2 C+1/L} = \frac{\frac{p}{L}}{p^2+\frac{1}{LC}}$$

$$\frac{1}{L} = \frac{27}{2} \rightarrow L = \frac{2}{27}$$

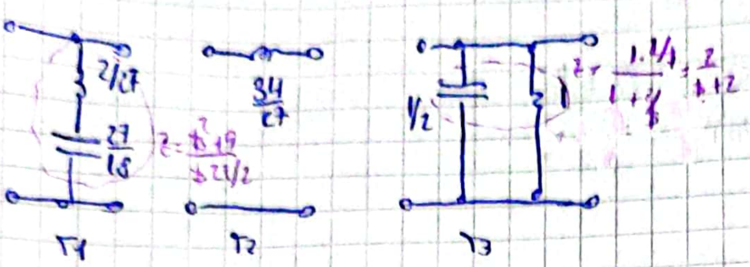
$$LC = 1/9$$

$$C = \frac{1}{9L}$$

$$C = \frac{27}{18}$$



Verificación con parámetros T → $T(s) = \frac{V_2}{I_1}$ → Uso parámetro $C = \frac{I_1}{V_2}\Big|_{I_2=0}$



$$A = \frac{V_1}{V_2}\Big|_{I_2=0} \qquad B = \frac{V_1}{-I_2}\Big|_{V_2=0}$$

$$C = \frac{I_1}{V_2}\Big|_{I_2=0} \qquad D = \frac{I_1}{-I_2}\Big|_{V_2=0}$$

$$T_1 = \begin{pmatrix} 1 & 0 \\ \frac{s\,27/2}{s^2+9} & 1 \end{pmatrix} \qquad T_2 = \begin{pmatrix} 1 & s\cdot\frac{34}{27} \\ 0 & 1 \end{pmatrix} \qquad T_3 = \begin{pmatrix} 1 & 0 \\ \frac{s+2}{2} & 1 \end{pmatrix}$$

$$T_1 \cdot T_2 = \begin{pmatrix} x & x \\ \frac{s\,27/2}{s^2+9} & \frac{s^2 \cdot \frac{34}{27}\cdot\frac{27}{2}}{s^2+9} + 1 = \frac{s^2 \cdot 17 + s^2 + 9}{s^2+9} = \frac{s^2 \cdot 18 + 9}{s^2+9} \end{pmatrix}$$

$$C_{Tot} = \frac{s\,27/2}{s^2+9} + \frac{s^2\,18+9}{s^2+9} \cdot \frac{s+2}{2} = \frac{s\cdot 27 + 36 s^2 + 18 + s^3 \cdot 18 + 9s}{(s^2+9)\cdot 2}$$

$$C_{Tot} = \frac{9}{2} \cdot 2\,\frac{\left(2s + \frac{4}{2}s^2 + \frac{2}{2} + \frac{2}{2}s^3 + \frac{s}{2}\right)}{s^2+9} = 9\,\frac{s^3 + s^2 \cdot 2 + s\,2 + 1}{s^2+9}$$

$$T(s) = \frac{1}{C_{Tot}} = \frac{1}{9}\,\frac{s^2+9}{s^3+2s^2+2s+1} \rightarrow k = 1$$