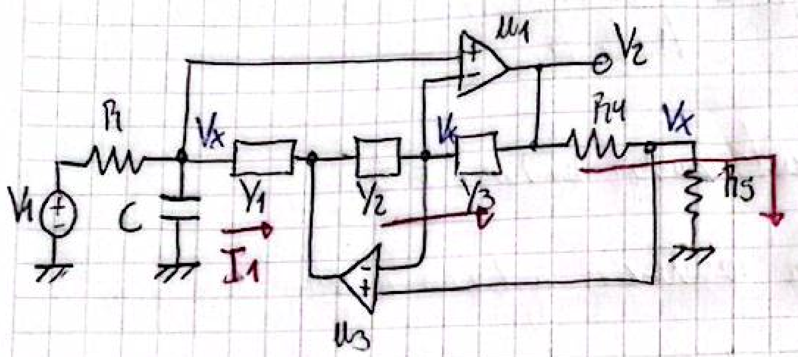
TP Semanal 2



1) si $Z_{in} = \frac{V_x}{I_1}$ →

$$Y_1 \cdot (V_x - V_A) = I_1 \rightarrow \boxed{Y_1 \cdot V_x - Y_1 \cdot V_A = I_1} \quad (2)$$

$$(V_A - V_x) \cdot Y_2 = (V_x - V_2) \cdot Y_3$$

$$V_x = V_2 \cdot \frac{R_5}{R_4 + R_5} \rightarrow \boxed{V_2 = V_x \cdot \frac{R_4 + R_5}{R_5}} \quad (1)$$

pongo (1)

$$V_A \cdot Y_2 - V_x \cdot Y_2 = V_x \cdot Y_3 - V_x \cdot \frac{R_4 + R_5}{R_5} \cdot Y_3$$

$$V_A = V_x \cdot \frac{1}{Y_2} \cdot \left(Y_3 - \frac{(R_4 + R_5)}{R_5} \cdot Y_3 + Y_2 \right)$$

$$V_A = V_x \cdot \left[\frac{Y_3}{Y_2} \cdot \left(1 - \frac{(R_4 + R_5)}{R_5} \right) + 1 \right]$$

$$\boxed{V_A = V_x \cdot \left(-\frac{Y_3}{Y_2} \cdot \frac{R_4}{R_5} + 1 \right)} \quad (3)$$

pongo 3 en 2

$$Y_1 \cdot V_x - Y_1 \cdot V_x \cdot \left(-\frac{Y_3}{Y_2} \cdot \frac{R_4}{R_5} + 1 \right) = I_1$$

$$V_x \cdot \left[Y_1 \cdot \left(\cancel{1} + \frac{Y_3}{Y_2} \cdot \frac{R_4}{R_5} - \cancel{1} \right) \right] = I_1$$

NOTA

$$Z_{en} = \frac{V_x}{I_1} = \frac{Y_2 \cdot R_5}{Y_1 \cdot Y_3 \cdot R_4}$$

$$\boxed{Z_{en} = \frac{Z_1 Z_3 Z_5}{Z_2 \cdot Z_4}} \quad y \quad \boxed{Y_{en} = \frac{Y_2 \cdot Y_4}{Y_1 \cdot Y_3 \cdot Y_5}}$$

para que se comporte como un inductor unitario $= S.[\ \ ]$

Z_1, Z_3, Z_5 y Z_4 va a ser resistencias y Z_2 va a ser

$$\boxed{Z_2 = \frac{1}{S.C_2}}$$

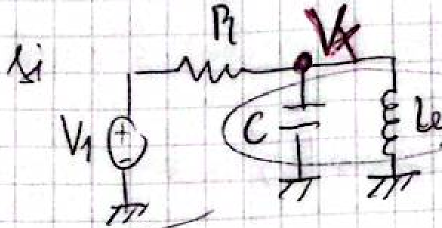
si $C_2 = \frac{1}{Z_1}$ y $Z_1 = Z_3 = Z_5 = Z_4 = 1\Omega$

$$\therefore \rightarrow \boxed{L_{en} = S. \frac{C_2 \cdot Z_1 \cdot Z_3 \cdot Z_5}{Z_4}}$$

$$\boxed{L_{en\,\text{unitario}} = S}$$

si $\quad V_x = V_2 \cdot \dfrac{Z_5}{Z_4+Z_5}$

si



$Z' = C \parallel L_{eq}$

$$Z' = \frac{S \cdot C_2 \cdot Z_1 \cdot Z_3 Z_5}{S^2 \cdot C \cdot C_2 \cdot Z_1 Z_3 Z_5 + Z_4}$$

$$V_x = V_1 \cdot \frac{Z'}{R+Z'}$$

$$V_2 \cdot \frac{Z_5}{Z_4+Z_5} = V_1 \cdot \frac{Z'}{R+Z'}$$

$$H(S) = \frac{V_2}{V_1} = \frac{Z_4+Z_5}{Z_5} \cdot \frac{Z'}{R+Z'}$$

$$H(S) = \frac{R_4+R_5}{R_5} \cdot \frac{S \cdot \frac{1}{CR}}{S^2 + S \cdot \frac{1}{CR} + \underbrace{\frac{R_4}{C \cdot C_2 \cdot R_1 R_2 R_3}}_{\omega_0^2}}$$

$$K = 1 + \frac{R_4}{R_5}$$

ganancia

$$\frac{\omega_0}{Q} = \frac{1}{RC}$$

normalización

→ no toco C por $\frac{\omega_0}{Q} = \frac{1}{RC}$ y tampoco R_4 y R_5 por $\boxed{K}$

→ tomo la menor cantidad de valores de componentes por ende $C = C_2$

→ si $K = 1 + \frac{R_4}{R_5} \rightarrow \frac{R_4}{R_5} = (K-1)$

→ tomo $R_1 = R_3 = R_5$ porque no influyen en ningun termino

→ si $\Delta_z = R_5$

→ $\boxed{R_4' = (K-1)}$

→ $\boxed{R_1' = R_3' = R_5' = 1}$

→ $\omega_0^2 = 1 = \frac{R_4'}{C'^2} \quad \boxed{C' = \sqrt{R_4'}}$ → $\boxed{C' = C_2' = \sqrt{K-1}}$

→ si $\omega_0 = 1 \rightarrow \frac{1}{Q} = \frac{1}{R' \cdot C'} \rightarrow Q = R' \cdot C' \rightarrow Q = R' \cdot \sqrt{R_4'}$

$$\boxed{R' = \frac{Q}{\sqrt{K-1}}}$$

HOJA Nº

FECHA

NOTA

$Q = 20$ y $A_V = 20\,dB = 10$ veces

$\to R' = \frac{20}{\sqrt{10-1}} \to \boxed{R = \frac{20}{3}}$

$\to C' = \sqrt{10-1} \to \boxed{C' = 3} \to \boxed{= C_2' = 3}$

$\to \boxed{R_1' = R_3' = R_5' = 1}$

$\to R_4' = \sqrt{10-1} \to \boxed{R_4' = 3}$

$\therefore$

$$H(s) = \frac{\left(s \cdot \frac{\cancel{3}}{20} \cdot \frac{1}{\cancel{3}}\right) \cdot \left(\frac{(10-1)+1}{1}\right)}{s^2 + s \cdot \frac{\cancel{3}}{20} \cdot \frac{1}{\cancel{3}} + \frac{\cancel{(10-1)}}{1 \cdot \cancel{(10-1)} \cdot 1 \cdot 1}}$$

$= \frac{1}{2}$

$$\boxed{H(s) = \frac{\left(s \cdot \frac{1}{20}\right) \cdot 10}{s^2 + s \cdot \frac{1}{20} + 1}}$$

$\to$ ganancia

$\to$ Pasabanda de 0 dB

$\to$ esta normalizado en A_Z