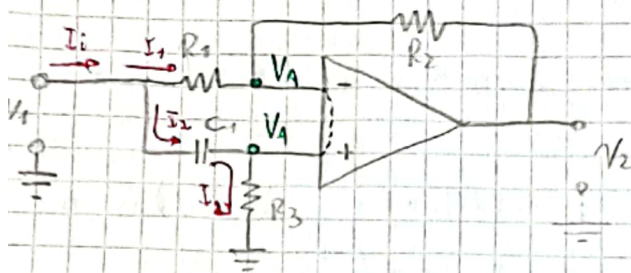


Tercer seminario (1)



$$I_1 = \frac{V_A - V_2}{R_2} = \frac{V_A - V_1}{R_1} \quad (*)$$

$$I_i = I_1 + I_2$$

$$V_A = I_2 \cdot R_3 = \frac{V_1}{\frac{1}{sC_1} + R_3} \Rightarrow V_A = V_1 \cdot \frac{sC_1 R_3}{1 + sC_1 R_3}$$

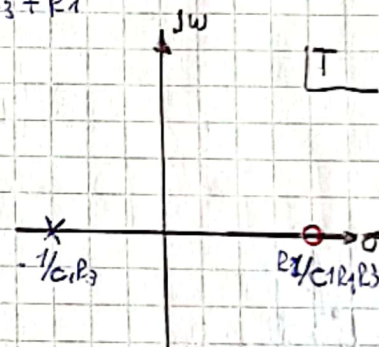
$$(*) \quad V_A \cdot \left( \frac{1}{R_1} + \frac{1}{R_2} \right) - \frac{V_1}{R_1} = \frac{V_2}{R_2}$$

$$V_1 \frac{sC_1 R_3}{1 + sC_1 R_3} \left( \frac{R_1 + R_2}{R_1} \right) - \frac{R_2 V_1}{R_1} = V_2$$

$$T(s) = \frac{V_2}{V_1} = \frac{sC_1 R_3}{1 + sC_1 R_3} \left( \frac{R_1 + R_2}{R_1} \right) - \frac{R_2}{R_1} = \frac{sC_1 R_3 (R_1 + R_2) + R_2 - sC_1 R_3 R_2}{sC_1 R_1 R_3 + R_1}$$

$$T(s) = \frac{sC_1 R_1 R_3 - R_2}{sC_1 R_1 R_3 + R_1} = \frac{s - \frac{R_2}{C_1 R_1 R_3}}{s + \frac{1}{C_1 R_3}}$$

$$\boxed{T(s) = \frac{s - \frac{R_2}{C_1 R_1 R_3}}{s + \frac{1}{C_1 R_3}}}$$



$$s|_{s=j\omega} = T(\omega) = \frac{j\omega - \frac{R_2}{C_1 R_1 R_3}}{j\omega + \frac{1}{C_1 R_3}}$$

Filtro pasa todo

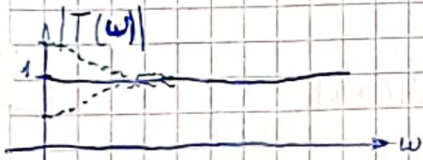
$$|T(\omega)| = \frac{\sqrt{\omega^2 + \left(\frac{R_2}{C_1 R_1 R_3}\right)^2}}{\sqrt{\omega^2 + \left(\frac{1}{C_1 R_3}\right)^2}}$$

$$\angle T(\omega) = \tan^{-1}\left(-\frac{\omega C_1 R_1 R_3}{R_2}\right) - \tan^{-1}(\omega C_1 R_3)$$

omando como norma de frecuencia al polo:  $\Omega\omega = \omega_0 = \frac{1}{C_1 R_3}$

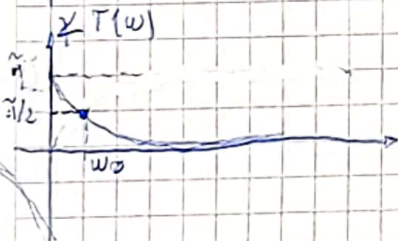
$$s = \frac{s}{\omega_0} \Rightarrow T(s) = \frac{s\omega_0 + \frac{R_2\omega_0}{R_1}}{s\omega_0 + \omega_0} \Rightarrow T(s) = \frac{s + \frac{R_2}{R_1}}{s + 1}$$

La norma de frecuencia sería la constante temporal de la rama  $C_1 R_3$



$$T(0) = \frac{R_2}{R_1} \quad \text{la forma en valores bajos}$$

de frecuencia depende del cociente de resistencias



Invierte fase a bajas frecuencias

$$\omega_0 = \frac{1}{C_1 R_3} = 1 \Rightarrow C_1 = \frac{1}{R_3}$$

Aplicando como norma de frecuencia:  $\Omega_z = R_3$

$$R_3' = \frac{R_3}{R_3} = 1 \quad C' = \frac{1}{R_3} \cdot \Omega_z = 1$$

$R_1$  y  $R_2$  No dependen de  $R_3$ , pero para simplificar los defino  $R_1 = R_2 = R_3$

$$\Rightarrow R_1' = \frac{R_1}{\Omega_z} = 1; \quad R_2' = \frac{R_2}{\Omega_z} = 1$$

