

# TAREA SEMANAL 4



$$\alpha_{\min} = 30 \text{ dB}$$

$$f_p = 40 \text{ kHz}$$

$$\alpha_{\max} = 1 \text{ dB}$$

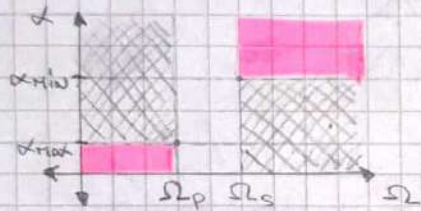
$$f_s = 10 \text{ kHz}$$

PASA ALTOS

- Normaliza plantilla por  $w = w_p$

$$w_{pN} = 1 ; w_{sN} = 0,25$$

- Aplica transformación de frecuencia para llevarlo a plantilla prototipo.



$$\Omega_p = \frac{1}{w_{pN}} = 1 ; \Omega_s = \frac{1}{w_{sN}} = 4$$

- Ahora diseño para Máxima Planicidad

$$\epsilon^2 = 10^{\frac{\alpha_{\max}}{10}} - 1 \rightarrow \epsilon^2 = 0,2589 \quad | \quad \epsilon = 0,508$$

$$\alpha_{\min} = 10 \log(1 + \epsilon^2 w_s^{2m}) \text{ con } \Omega_s = 4$$

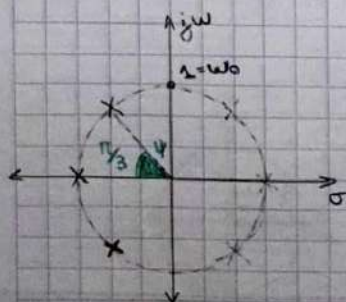
Para  $m=3$ ,  $\alpha_{\min} = 30,259 > 30 \text{ dB} \rightarrow \text{cumple}$

Entonces,  $\epsilon^2 = 0,2589$  y  $m=3$

$$M.P. \rightarrow |T(w)|^2 = \frac{1}{1 + w_N^{2m}}$$

con  $w_N = \frac{w}{w_p \cdot \epsilon^{-1/3}}$  } serán  $\Omega$  en vez de  $w$  porque estoy en el prototipo P.B.

$$|T(s)|^2 = |T(w)|^2 \Big|_{w=\frac{s}{\delta}} = \frac{1}{1 + (-j)^6 s^6} = \frac{1}{1 - s^6}$$



$$Q = \frac{1}{2 \cos \psi} = 1$$

$$T(s) = \frac{w_0}{s + w_0} \cdot \frac{w_0^2}{s^2 + s \frac{w_0}{Q} + w_0^2}$$

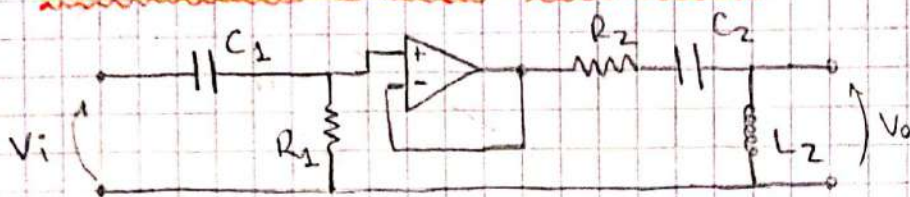
$$T(s) = \frac{1}{s+1} \cdot \frac{1}{s^2 + s + 1}$$

con  $Q=1$  ;  $w_0=1$



## Circulo del filtro PASA-ALTOS pasivo

### TRANSFORMACIÓN A NIVEL COMPONENTES



- Componentes Parabajas (2º orden)

$$L_{PB} = \frac{Q \cdot R}{\omega_0} \quad C_{PB} = \frac{1}{L_{PB} \cdot \omega_0^2}$$

- Transformación a Pasa Alto.

$$\left. \begin{aligned} L_{PA} &= \frac{1}{C_{PB}} = L_{PB} \cdot \omega_0^2 \rightarrow \left[ L_{PA} = \frac{\omega_0^2}{C_{PA}} \right] \\ C_{PA} &= \frac{1}{L_{PB}} \rightarrow \left[ C_{PA} = \frac{\omega_0}{Q \cdot R} \right] \end{aligned} \right\} 2^\circ \text{ orden}$$

• Con  $\omega_0 = 1 \cdot \Omega_{\text{buffer}} = \omega_{pi} \cdot \epsilon^{-1/3} = 1,25327 \text{ rad/s}$

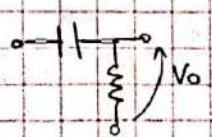
- Sección de primer orden

$$C_{PB} = \frac{1}{R \omega_0} \rightarrow C_{PA} \approx L_{PA} = S \cdot R \omega_0 \quad \left. \begin{aligned} & \text{Eso convierte al capacitor en una} \\ & \text{bobina equivalente} \end{aligned} \right\}$$

$$T_1(s) = \frac{1}{s+1} \rightarrow \text{aplica } k(s) = \frac{1}{s}$$

$$T_{HP1}(s) = \frac{1}{\frac{1}{s} + 1} = \frac{s}{1+s} \quad \parallel \text{ Generar } T_2 = \frac{\omega_0}{s + \omega_0} \rightarrow \text{Hp: } \frac{s \omega_0}{1 + \omega_0 s}$$

$$T_{2HP}(s) = \frac{s}{s + \frac{1}{\omega_0}}$$



$$\frac{V_o}{V_i} = \frac{R}{R + \frac{1}{sC}} = \frac{sCR}{sCR + 1} = \frac{s}{s + \frac{1}{RC}}$$

$$\frac{1}{RC} = \frac{1}{\omega_0} \rightarrow \left[ C = \frac{\omega_0}{R} \right] \text{ Pasa Alto de } 1^\circ \text{ orden}$$



## TRANSFORMACIÓN ~ PASA ALTOS

$$T_{LP}(s) = \frac{\omega_0}{s + \omega_0} \cdot \frac{\omega_0^2}{s^2 + s \frac{\omega_0}{Q} + \omega_0^2}$$

con  $Q = 1$  y  $\omega_0 = \omega_{PN} \cdot \Omega_{Bulke}$

$$T_{HP}(s) = T_{LP}(b/s) \Big|_{b=1/s} = \frac{\omega_0}{\frac{1}{s} + \omega_0} \cdot \frac{\omega_0^2}{\frac{1}{s^2} + \frac{1}{s} \frac{\omega_0}{Q} + \omega_0^2} \quad \left\{ \text{Aplicar } k(s) = \frac{1}{s} \right.$$

$$T_{HP}(s) = \frac{s \omega_0}{1 + s \omega_0} \cdot \frac{s \omega_0^2}{1 + s \frac{\omega_0}{Q} + s^2 \omega_0^2}$$

$$T_{HP}(s) = \frac{s^2}{s^2 + s \frac{1}{\omega_0 Q} + \frac{1}{\omega_0^2}} \cdot \frac{s}{s + \frac{1}{\omega_0}}$$

• Ceros: triple en el origen

• Polos:  $p_0 = -\frac{1}{\omega_0} = -0,798$  ( $s + \frac{1}{\omega_0} = 0$ )

$$\textcircled{2} \quad s^2 + s \frac{1}{\omega_0 Q} + \frac{1}{\omega_0^2} = 0 \quad \left\{ \begin{array}{l} p_1 = -0,398 + j 0,691 \\ p_2 = -0,398 - j 0,691 \end{array} \right.$$

