FECHA

Ejercicio 7 - Guía Aprox de Funciones Transferencia

$f_{ci} = 1600\,kHz$ $f_{cs} = 2500\,kHz$

$\alpha_{max} = 3\,dB$ Max planicidad

$G_{max} = 10\,dB$

$\alpha_{min} = 20\,dB$ en $f_{s1} = 1250\,kHz$ y $3200\,kHz = f_{s2}$

$\omega_0 = \sqrt{\omega_{p1} \cdot \omega_{p2}} = 2\pi \cdot 2\,MHz$ $\omega_{p1} = 2\pi f_{ci}$ $\omega_{p2} = 2\pi f_{cs}$

$\omega_{s1} = 2\pi f_{s1}$ $\omega_{s2} = 2\pi f_{s2}$

$\Omega_w = 2\pi\, \omega_0$

normalizo por Ω_w

$\omega_0 = 1$ $\omega_{p1} = \frac{4}{5}$ $\omega_{p2} = \frac{5}{4}$ $\omega_{s1} = \frac{5}{8}$ $\omega_{s2} = \frac{8}{5}$

$\Omega_{p1} = Q \cdot \frac{\omega_{p1}^2 - \omega_0^2}{\omega_{p1}} = -1$ $Q = \frac{\omega_0}{BW}$ $BW = \omega_{p2} - \omega_{p1} = \frac{9}{20}$

$Q = \frac{20}{9}$

$\Omega_{p2} = Q \cdot \frac{\omega_{p2}^2 - \omega_0^2}{\omega_{p2}} = 1$

$|\Omega_{p1}| = \Omega_{p2} = \Omega_p$

$\Omega_{s1} = Q\, \frac{\omega_{s1}^2 - \omega_0^2}{\omega_s} = -\frac{13}{6}$ $\Omega_{s2} = \frac{13}{6}$ $|\Omega_{s1}| = \Omega_{s2} = \frac{13}{6}$

$\alpha_{max} = 10 \log (1 + \xi^2 \Omega_p^{2n}) \longrightarrow \xi^2 \cong 1 \wedge \xi = 1$

$\alpha_{min} = 10 \log (1 + \xi^2 \Omega_s^{2n}) \longrightarrow n = 3$

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

$$T_{LP}(s) = \frac{1}{(s+1)(s^2 + 2\cos\frac{\pi}{3} + 1)} = \frac{1}{(s+1)(s^2+s+1)} = \frac{1}{s^3 + 2s^2 + 2s + 1}$$

$$T_{BP}(s) = T_{LP}\left(Q \cdot \frac{s^2+1}{s}\right) = \frac{1}{\left(Q \cdot \frac{s^2+1}{s}\right)^3 + 2 \cdot \left(Q \frac{s^2+1}{s}\right)^2 + 2Q\, \frac{s^2+1}{s} + 1}$$

$$T_{BP}(s) = \frac{s^3}{Q^3 (s^2+1)^3 + 2Q^2 (s^2+1)^2 \cdot s + 2Q\,(s^2+1) s^2 + s^3}$$

$$T_{BP}(s) = s^3 \cdot \frac{1}{Q^3 (s^6 + 3s^4 + 3s^2 + 1) + 2Q^2 (s^5 + 2s^3 + s) + 2Q\,(s^4 + s^2) + s^3}$$

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$$T_{BP}(s) = \frac{Q^{-3}s^3}{s^6 + 3s^4 + 3s^2 + 1 + \frac{2s^5}{Q} + \frac{4s^3}{Q} + \frac{2s}{Q} + \frac{2s^4}{Q^2} + \frac{2s^2}{Q^2} + \frac{s^3}{Q^3}}$$

$$T_{BP}(s) = \frac{Q^{-3}s^3}{s^6 + \frac{2}{Q}s^5 + \left(\frac{2}{Q^2} + 3\right)s^4 + \left(\frac{4}{Q} + \frac{1}{Q^3}\right)s^3 + \left(3 + \frac{2}{Q^2}\right)s^2 + \frac{2}{Q}s + 1}$$

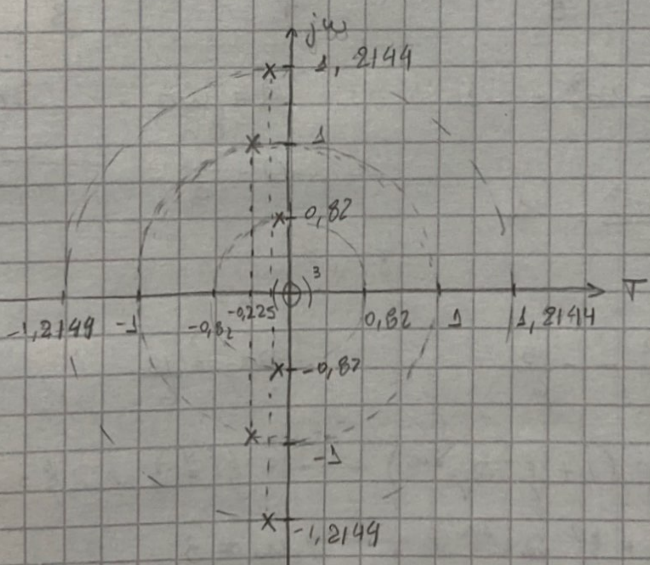
$$T_{BP}(s) = \frac{0{,}091125\, s^3}{(s^2 + 0{,}2682s + 1{,}4748)(s^2 + 0{,}45s + 1)(s^2 + 0{,}18s + 0{,}677)}$$

$\rightarrow$ para $G = 0\,dB$ tengo que encontrar k para lograr una $G = 10\,dB$

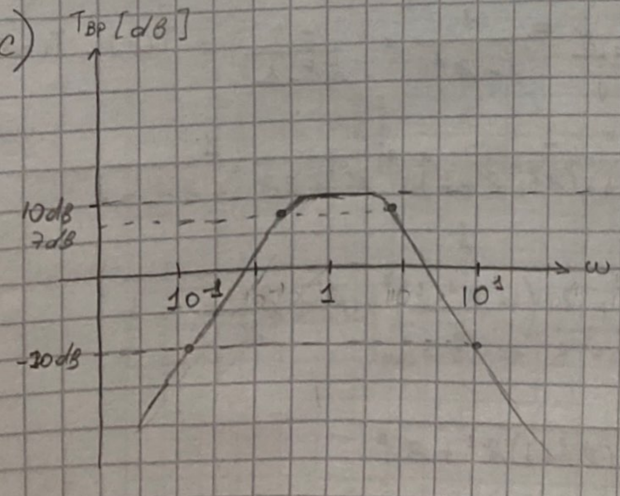
- $10\,dB = 20\log(k) \Longrightarrow k = 3{,}162$

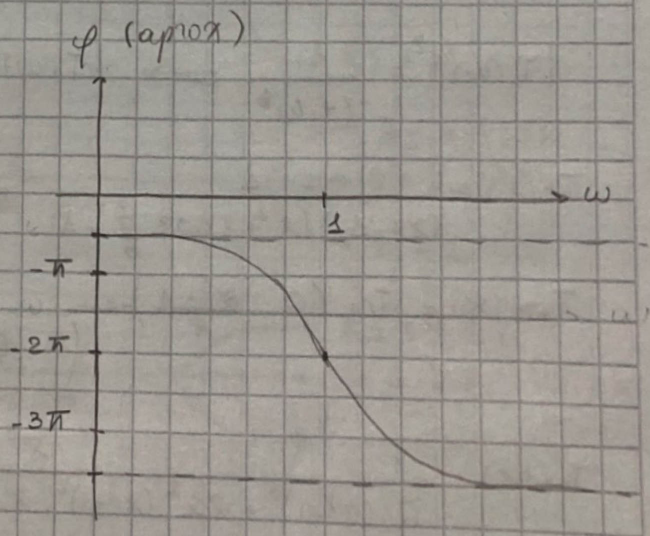
$$T_{BP}(s) = \frac{3{,}162\,(0{,}86s)(0{,}45s)(0{,}23s)}{(s^2 + 0{,}2682s + 1{,}4748)(s^2 + 0{,}45s + 1)(s^2 + 0{,}18s + 0{,}677)}$$

b)



c)





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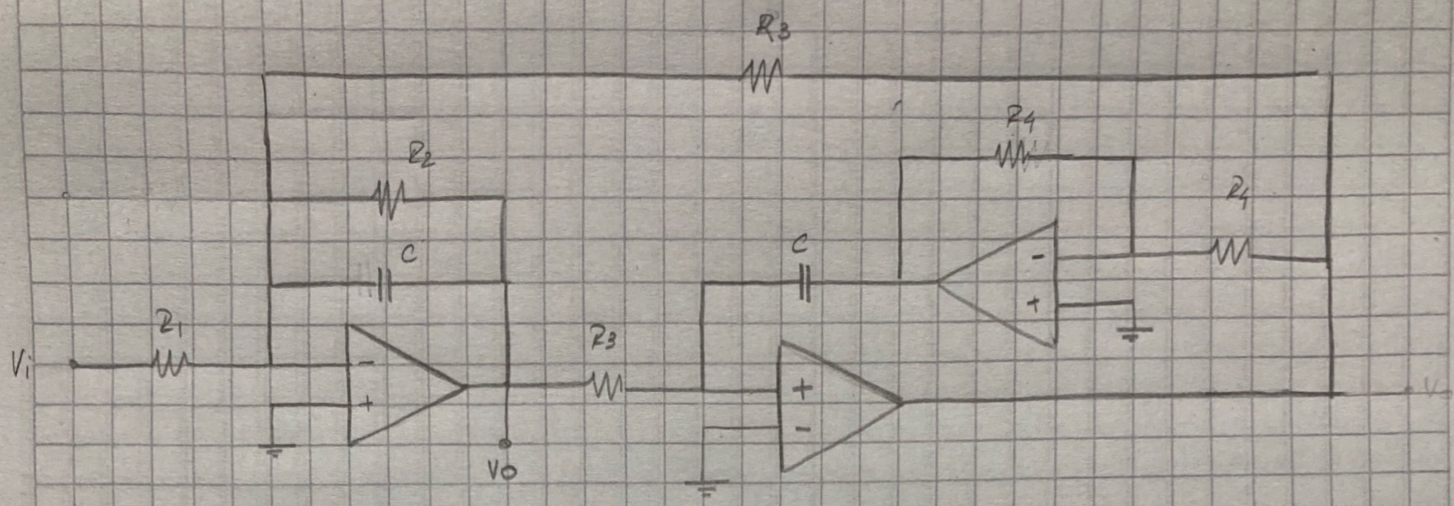

De la TS2:

$$T_{AM}(s) = k \frac{s \cdot 1/CR_2}{s^2 + \frac{1}{C R_2} s + \left(\frac{1}{CR_3}\right)^2} \quad \text{con} \quad k = -\frac{R_2}{R_1}$$

Normalizo $\Omega_z = R_3$

$$|T_{AM}(s)| = \frac{1}{R_1} \frac{1/C \; s}{s^2 + \frac{1}{CR_2} s + \left(\frac{1}{C}\right)^2}$$

Para lograr el pasabanda tengo que poner 3 Ackerberg Mossberg en serie

$$|T_{AM}(s)|\Big|_{\omega_0^2 = 1} = 3,162 \cdot \frac{0,45 s}{s^2 + 0,45 s + 1}$$

$R_1 = 0,702$

$C = 1$

$R_2 = 2,222$

$\frac{1}{R_1} \cdot 0,26 = 0,86$

$$|T_{AM}(s)|\Big|_{\omega_0^2 = 1,4748} = \frac{0,86 s}{s^2 + 0,2682 s + 1,4748}$$

$R_2 = 4,56$

$C = 0,823$

$R_1 = 1,412$

$$|T_{AM}(s)|\Big|_{\omega_0^2 = 0,677} = \frac{0,23 s}{s^2 + 0,18 s + 0,677}$$

$R_2 = 4,57$

$C = 1,215$

$R_1 = 3,578$

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