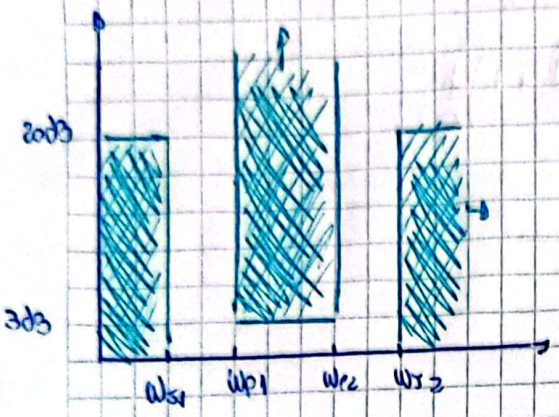
HOJA Nº

FECHA

Tarea Semanal 4 Bis

Normalizo $\Omega(w) = w_0$

① Plantilla a diseñar



$w_{s1} = 1250 \cdot 2\pi\ Hz \longrightarrow 0,625$

$w_{p1} = 1000 \cdot 2\pi\ Hz \longrightarrow 0,8$

$w_{p2} = 2500 \cdot 2\pi\ Hz \longrightarrow 1,25$

$w_{s2} = 3200 \cdot 2\pi\ Hz \longrightarrow 1,6$

$w_0 = \sqrt{w_{p1} \cdot w_{p2}} = 2000 \cdot 2\pi\ Hz \rightarrow 1$

$Q = \frac{w_0}{BW} = \frac{20}{9} = 2,2222$

② Aplico Kamell y Obtengo Plantilla PB

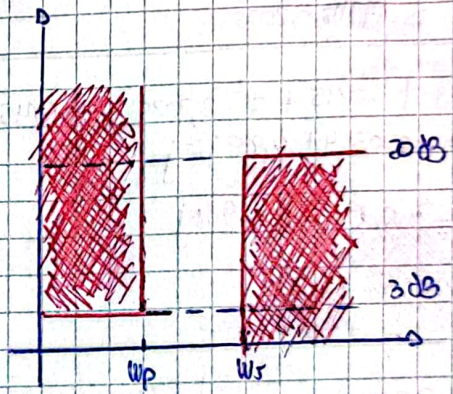
$w_{PB} = Q \cdot \frac{w^2 - 1}{w}$

$w_{s1_{PB}} = 2,2222 \cdot \frac{0,625^2 - 1}{0,625} = -2,1666$ → $w_s = 2,1666$

$w_{p1_{PB}} = 2,2222 \cdot \frac{0,8^2 - 1}{0,8} = 2,1666$

$w_{p2_{PB}} = 2,2222 \cdot \frac{1,25^2 - 1}{1,25} = 1$ → $w_p = 1$

$w_{s2_{PB}} = 2,2222 \cdot \frac{1,6^2 - 1}{1,6} = -1$



③ Diseño Plantilla PB como Filtro Max Plan

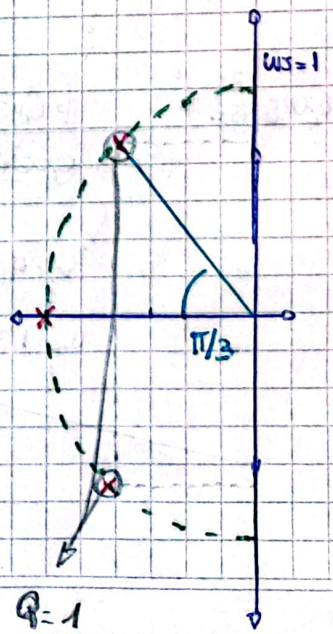
$\varepsilon^2 = 10^{0,1\ dmin} - 1 = 1 \rightarrow$ Butter

$\alpha_{min} < 10 \log\left(1 + \varepsilon^2 w_r^{2n}\right)$

Iteración

n	α_{min}
1	7,95 ✗
2	13,62 ✗
3	20,18 ✓

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



NOTA

④ Aplico Kornell para pasar a Pasa Bandas

$$\phi_{new} = Q\cdot\frac{\phi^2+1}{\phi}$$

$$H(\phi) = \frac{1\cdot\phi^2/Q^2}{\left[\left(Q\frac{\phi^2+1}{\phi}\right)^2 + Q\frac{\phi^2+1}{\phi}+1\right]\frac{\phi^2}{Q^2}}\cdot\frac{1\cdot\phi/Q}{\left(Q\frac{\phi^2+1}{\phi}+1\right)\frac{\phi}{Q}}$$

$$H(\phi) = \frac{\phi^2/Q^2}{\phi^4+2\phi^2+1+\frac{\phi^3}{Q}+\frac{\phi}{Q}+\frac{\phi^2}{Q^2}}\cdot\frac{\phi/Q}{\phi^2+1+\frac{\phi}{Q}}$$

$$H(\phi) = \frac{\phi^2/Q}{\phi^4+\phi^3\cdot\frac{1}{Q}+\phi^2\left(2+\frac{1}{Q^2}\right)+\phi\left(\frac{1}{Q}\right)+1}\cdot\frac{\phi/Q}{\phi^2+\frac{\phi}{Q}+1}$$

$$H(\phi) = \frac{\phi\cdot 0{,}2025}{\phi^4+\phi^3\cdot 0{,}45+\phi^2\,2{,}2025+\phi\,0{,}45+1}\cdot\frac{\phi\,0{,}45}{\phi^2+\phi\cdot 0{,}45+1}$$

$p_{1,2} = -0{,}0908 \pm 0{,}8179j$

$p_{3,4} = -0{,}1341 \pm 1{,}2076j$

$$H(\phi) = \frac{\phi^2\cdot 0{,}2025}{\left|\left(\phi+0{,}0908\right)^2+0{,}8179^2\right|\left|\left(\phi+0{,}1341\right)^2+1{,}2076^2\right|}\cdot\frac{\cdots}{\cdots}$$

$$= 4{,}157\cdot\frac{\phi\,0{,}2682}{\phi^2+\phi\cdot 0{,}2682+1{,}4762}\cdot\frac{\phi\,0{,}186}{\phi^2+\phi\cdot 0{,}186+0{,}0772}\cdot\frac{\phi\,0{,}45}{\phi^2+\phi\cdot 0{,}45+1}$$

$Q_1 = 4{,}5302$ $\quad W_{0_1} = 1{,}215$

$Q_2 = 4{,}5315$ $\quad W_{0_2} = 0{,}8229$

$Q_3 = 2{,}2222$ $\quad W_{0_3} = 1$

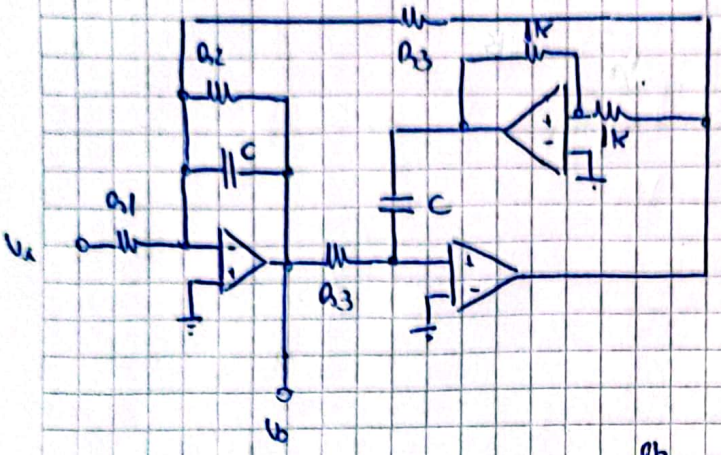
NOTA

HOJA Nº

FECHA

Ackerberg-Hassberg

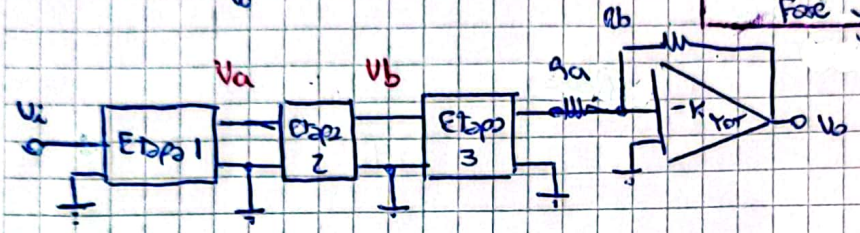
Sintetizo con etapa Ackberg-Harberg



$$\frac{V_b}{V_i} = \frac{-(R_2/R_1)\cdot\frac{1}{R_2C}}{\phi^2 + \phi\frac{1}{R_2C} + \frac{1}{R_3^2C^2}}$$

$Q = \frac{R_2}{R_3}$ $\omega_b = \frac{1}{R_3C}$ $K = -\frac{R_2}{R_1}$

Hay que tener las etapas ganan -1 y ajusto con etapa final que corrige Fase y ganancia



$K_{TOT} = 4,157 \cdot 10^{00}$

$K_{TOT} = 4,157 \cdot 3,16227$

$K_{TOT} =$

$K_{TOT} = -\frac{R_b}{R_a} \rightarrow R_b = 13,15\,K$ $R_a = 10K$

Diseño Etapa 1

$\omega_b = 1,215$ $Q = 4,5302$ $K = 1$ → $R_3 = 1$

$R_2 = 4,5302 = R_1$

$C = \frac{1}{1,215} = 0,823$

$R_2 = R_3 = 100\,\Omega$

Diseño Etapa 2

$\omega_b = 0,8229$ $Q = 4,5315$ $K = 1$ → $R_3 = 1$

$R_2 = R_1 = 4,5315$

$C = \frac{1}{0,8229} = 1,215$

Diseño Etapa 3

$\omega_b = 1$ $Q = 0,45$ $K = 1$ → $R_3 = C = 1$

$R_2 = R_1 = 2,2222$

Calculo comparador

$R_{PARAL} = R_2 \cdot R_1$

$C_{PARAL} = \frac{C}{2\omega \cdot R_2}$

Etapa 1

$R_3 = 100\,\Omega$ $R_1 = R_1 = 453\,\Omega$ $C = 635\,nF$

Etapa 2

$R_3 = 100\,\Omega$ $R_2 = R_1 = 4532\,\Omega$ $C = 967\,nF$

Etapa 3

$R_3 = 100\,\Omega$ $R_2 = R_1 = 222\,\Omega$ $C = 796\,nF$

NOTA