Ω_w Ω_w

$B = 1$

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2) | α_{MAX} [dB] | α_{min} [dB] | F_p | F_s |
|---|---|---|---|
| 0,5 | 20 | 1K | 2K |

$$|T(\omega)|^2 = \frac{1}{1+\varepsilon^2 \omega^{2n}}$$

$\Omega_{\omega_1} = 2\pi\, 1KHz \Rightarrow \omega_p' = 1$ y $\omega_s = 2$

$$\alpha_{MAX} = 10 \log(1+\varepsilon^2 \omega_p^{2n})$$

$$\varepsilon = \sqrt{\frac{10^{\frac{\alpha_{MAX}}{10}} - 1}{\omega_p^{n}}} \quad \text{como } \omega_p = 1 \Rightarrow \varepsilon = \sqrt{10^{\frac{\alpha_{min}}{10}} - 1}$$

$\varepsilon = 0,349 \qquad \varepsilon^2 = 0,122$

$$\alpha_{min} = 10 \log(1+\varepsilon^2 \omega_s^{2n})$$

$$\frac{10^{\frac{\alpha_{min}}{10}} - 1}{\varepsilon^2} = \omega_s^{2N} \Rightarrow \log\left(\frac{10^{\frac{\alpha_{min}}{10}} - 1}{\varepsilon^2}\right) = 2N \log \omega_s$$

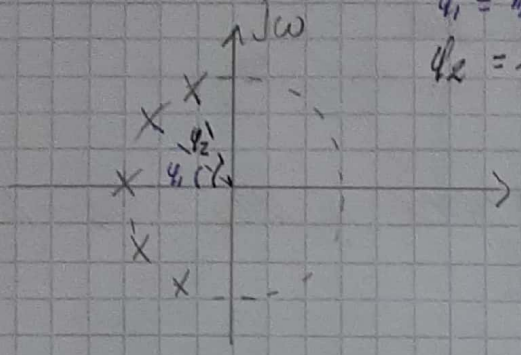
a) $$N = \frac{1}{2} \frac{\log\left(\frac{10^{\frac{\alpha_{min}}{10}} - 1}{\varepsilon^2}\right)}{\log \omega_s} = 4,89 \Rightarrow N = 5$$

Frecuencia de Butter $\Omega_w' = \omega_B = \omega_p \cdot \varepsilon^{-1/N} = 1 \cdot \varepsilon^{-1/5} = 1,23$ rad/s

$$|T(\omega)|^2 = \frac{1}{1+\Omega_N^{2N}}$$

NOTA

$$T(s) = \frac{1}{(s+1)(s^2+s.2\cos(\pi/5)+1)(s^2+s2\cos(2\pi/5)+1)}$$



$\varphi_1 = \pi/5$

$\varphi_2 = 2\pi/5$

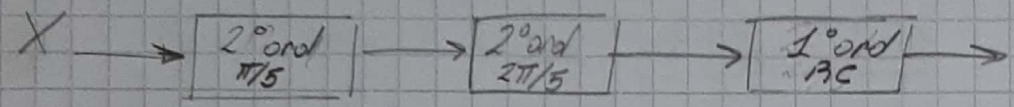
$Q_0 = 1/2$

$Q_1 = \frac{1}{2\cos \pi/5} = 0,618$

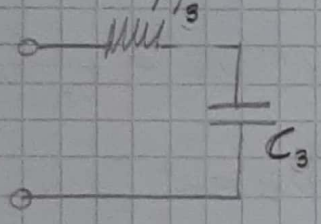
$Q_2 = \frac{1}{2\cos 2\pi/5} = 1,618$

c)

Aprovecho la salida del OPAMP



1° ord



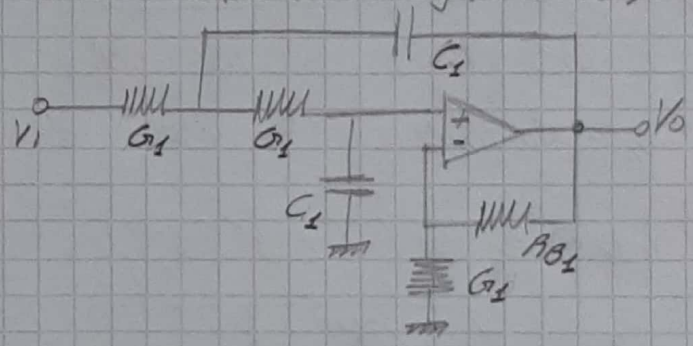
$T_1(s) = \frac{1/RC}{s + 1/RC}$

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

Propongo $R_2 = R$

$\Rightarrow R' = 1$ y $C' = 1$

2° ord (Sallen-Key) (π/5)



$H_1(s) = \frac{K_1 \omega_0^2}{s^2 + s\frac{\omega_0}{Q_1} + \omega_0^2}$

$\omega_0 = 1/R_1C_1 = 1$

$Q_1 = \frac{1}{3 - K_1} = 0,618$

$K_1 = 1 + R_B/R_1$

$R_1 = 1$ y $C_1 = 1$; para $Q = 0,618 \rightarrow K_1 = 1,38$

$K_1 = 1 + \frac{R_B}{R_1} = 1 + R_{B_1} = 1,38 \Rightarrow R_{B_1} = 0,38$

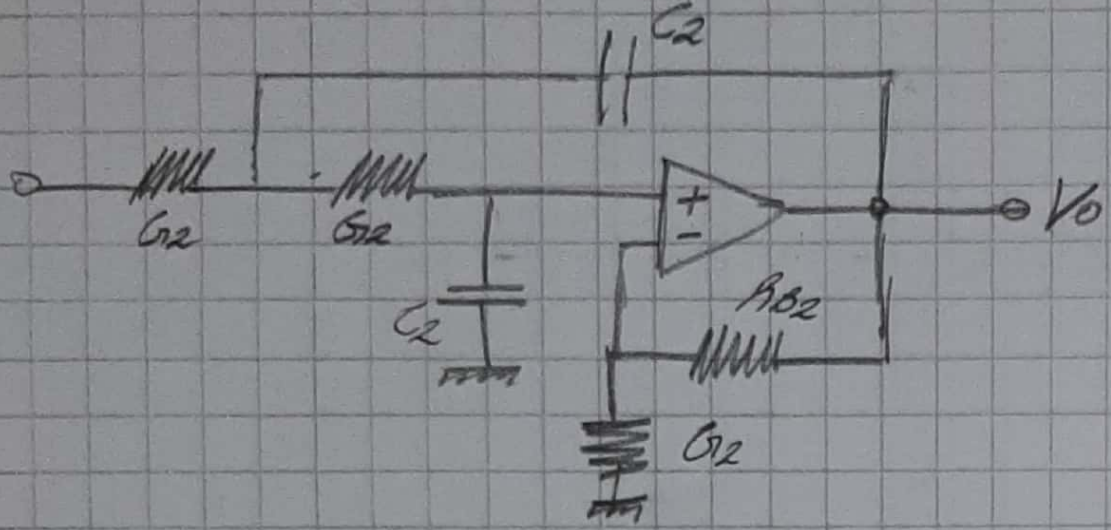
$\Rightarrow \boxed{R_1 = 1 \; ; \; C_1 = 1 \text{ y } R_{B_1} = 0,38}$

NOTA +10 min

HOJA Nº 6

FECHA

2° ord (Sallen - Key) (2π/5)



$$H_2(s) = \frac{K_2 \omega_0^2}{s^2 + s\frac{\omega_0}{Q_2} + \omega_0^2}$$

$$\begin{cases} \omega_0 = \dfrac{1}{R_2 C_2} = 1 \\ Q_2 = \dfrac{1}{3 - K_2} = 1{,}618 \\ K_2 = 1 + \dfrac{R_{B2}}{R_2} \end{cases}$$

$$\boxed{R_2' = 1 \text{ y } C_2' = 1}$$

Para $Q_2 = 1{,}618 \rightarrow K_2 = 2{,}38$

$K_2 = 2{,}38 = 1 + R_{B2} \Rightarrow \boxed{R_{B2} = 1{,}38}$