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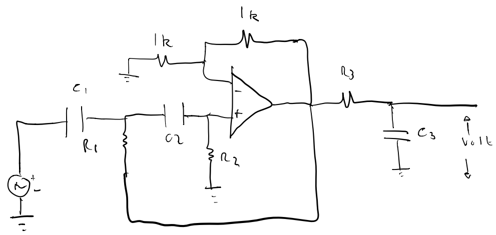
2CM18

Tarea 2.10 Filtro Pasa Banda y Rechaza Banda

1. Diseñar un filtro pasa banda ancha de 3er orden con frecuencia de corte inferior de 1 kHz y una frecuencia de corte superior de 40 kHz.



$$F_H = 1\,kHz = \frac{1}{2\pi\sqrt{R_1C_1R_2C_2}} \qquad \begin{bmatrix} R_1 = R_2 \\ C_1 = C_2 \end{bmatrix}$$

$$\frac{1}{2\pi R_1 C_1} = 1\,kHz$$

Let $\boxed{R_1 = 1\,k\Omega}$

$$\therefore C_1 = \frac{1}{2\times 3.14\times 10^3 \times 10^3} = \boxed{0.16\,\mu F}$$

$$F_L = 40\,kHz = \frac{1}{2\pi R_2 C_2}$$

Ganancia

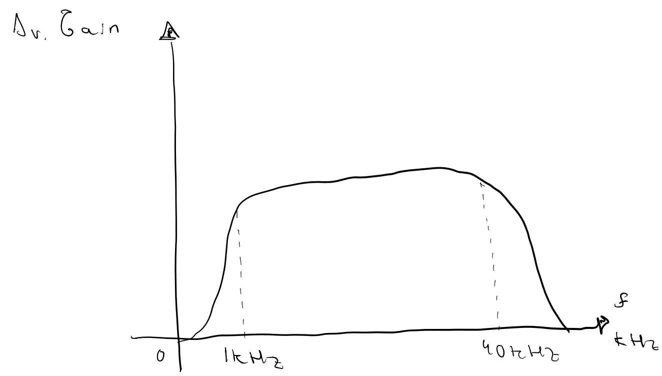
$$\boxed{A_v = 1 + \frac{1k}{1k} = 2\,V/V}$$

Dejamos $\boxed{R_3 = 1\,k\Omega}$

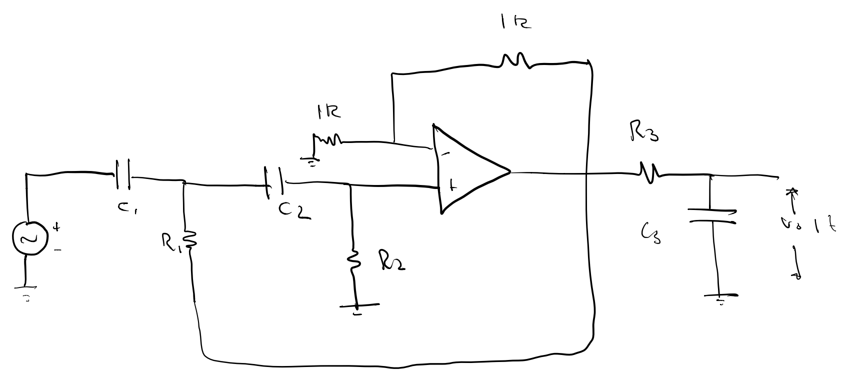
$$C_3 = \frac{1}{2\times 3.14 \times 10^3 \times 40\times 10^3}$$

$$\boxed{C_3 = 4\,nF}$$

$$\therefore \boxed{\begin{matrix} R_1 = R_2 = 1\,k\Omega \\ C_1 = C_2 = 0.16\,\mu F \end{matrix}} \qquad \boxed{\begin{matrix} R_3 = 1\,k\Omega \\ C_3 = 4\,nF \end{matrix}}$$



2. Diseñar un filtro pasa banda angosta con una frecuencia de corte inferior de 40 kHz y una frecuencia de corte superior de 42 kHz.



$$F_H = 40\,kHz = \frac{1}{2\pi\sqrt{R_1 C_1 R_2 C_2}}$$

$$40\,kHz = \frac{1}{2\pi R_1 C_1}$$

$R_1 = 1k\Omega$,

$$C_1 = \frac{1}{2\times 3.14\times 40\times 10^3\times 10^3}$$

$$\boxed{C_1 = 4nF}$$

$$\boxed{\begin{array}{l} R_1 = R_2 = 1k\Omega \\ C_1 = C_2 = 4nF \end{array}}$$

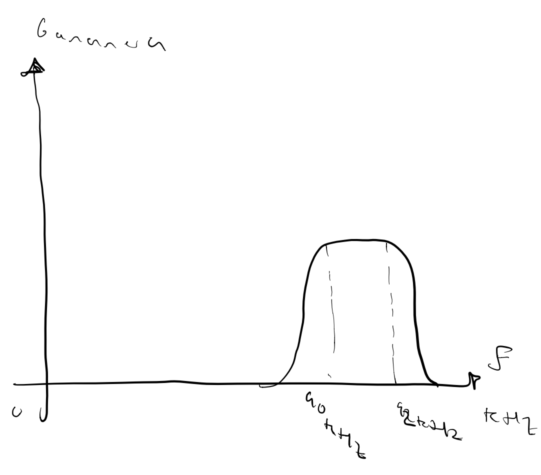
$$\boxed{A_v = 1 + \frac{1k}{1k} = 2\ V/V}$$

$$F_c = 42\,kHz = \frac{1}{2\pi R_3 C_3}$$

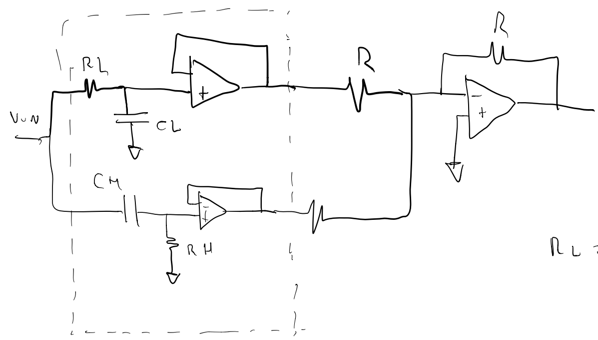
$$\boxed{R_3 = 1k}$$

$$C_3 = \frac{1}{2\times 3.14\times 10^3\times 42\times 10^3}$$

$$\boxed{C_3 = 3.8\,nF}$$



3. Diseñar un filtro rechaza banda de 2o orden con una frecuencia de corte inferior de 2.5 kHz y una frecuencia de corte superior de 37 kHz, y graficar su función.



volt

dado $f_L = 2.5 kHz$

$f_H = 37 kHz$

$$f_L = \frac{1}{2\pi R_L C_L} = 2.5 kHz$$

considerando, $C = 0.1 \mu F$

$$R_L = \frac{1}{2} \pi f L C = \frac{1}{2\pi \times 2.5 \times 10^3 \times 0.1 \times 10^{-6}}$$

$= 636.6 \Omega$

$f_H = 37 kHz$

$$f_H = \frac{1}{2\pi R_H C_H} = 37 kHz$$

Considerando $C_H = 0.1 \mu F$

$$R_H = \frac{1}{2\pi \times f_H \times C_H}$$

$$= \frac{1}{2\pi \times 37 \times 10^3 \times 0.1 \times 10^{-6}}$$

$= 43 \Omega$

$$f_c = \sqrt{f_L \times f_H} = \sqrt{37 \times 10^3 \times 2.5 \times 10^3}$$

$$f_c = 9.6\ kHz$$

$$f_{BW} = f_H - f_L = 37\ kHz - 2.5\ kHz$$

$$= 34.5\ kHz$$

$$Q = \frac{f_c}{f_{BW}} = \frac{9.6}{34.5} = 0.27$$

$R_H = 43\ \Omega$

$R_L = 636.6\ \Omega$

$C_H = C_L = 0.1$

$f_c = 9.6\ \cancel{k}Hz$

$f_{BW} = 34.5\ kHz$

$Q = 0.27$

$R = 10\ k\Omega$