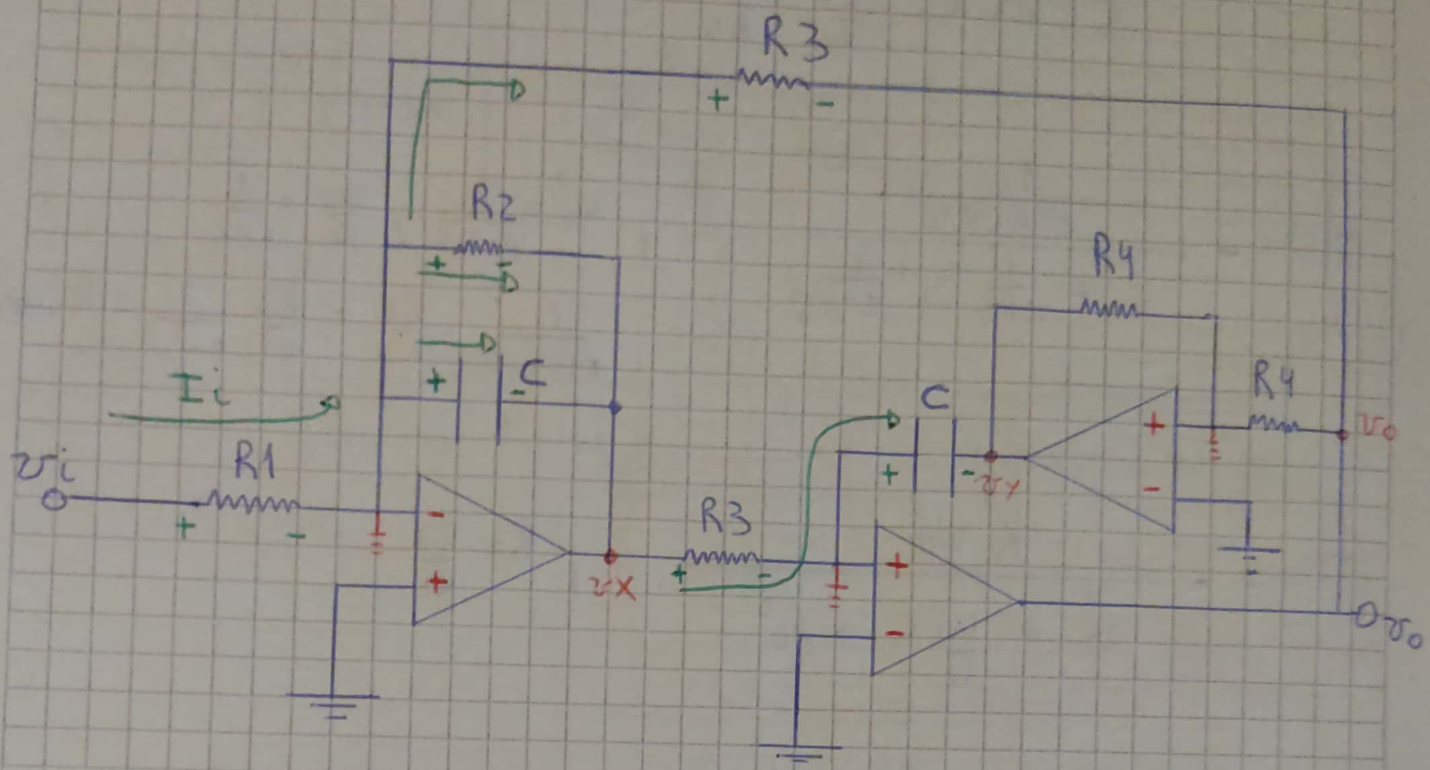
HOJA N°

FECHA

TAREA SEMANAL 2



1)

$$\frac{v_o}{R_4} = -\frac{v_y}{R_4} \rightarrow v_y = -v_o \quad (1)$$

1 en 2

$$\frac{v_x}{R_3} = -\frac{v_y}{\frac{1}{sC}} \Rightarrow v_x = sCR_3\, v_o \quad (3)$$

(2)

$$\frac{1}{R_1} v_i = -\left(v_x\left(sC + \frac{1}{R_2} \right) + v_o\left(\frac{1}{R_3} \right) \right) \quad (4)$$

3 en 4

$$\frac{1}{R_1} v_i = -\left(sCR_3 v_o \left(sC + \frac{1}{R_2} \right) + \frac{1}{R_3} v_o \right)$$

$$\frac{1}{R_1} v_i = -\left(s^2 C^2 R_3 + sC\frac{R_3}{R_2} + \frac{1}{R_3} \right) v_o$$

NOTA

$$T(S) = \frac{V_0}{V_i} = \frac{-1/R1}{S^2 C^2 R3 + S \frac{CR3}{R2} + \frac{1}{R3}}$$

$$T(S) = -\frac{\frac{1}{C^2 R1 R3}}{S^2 + \frac{1}{CR2} S + \frac{1}{C^2 R3^2}}$$

; $w_0^2 = \frac{1}{R3^2 C^2}$; $\frac{w_0}{Q} = \frac{1}{R2C}$

$$\frac{1}{R1R3C^2} \cdot \frac{R3}{R3} = \frac{R3}{R1} \frac{1}{R3^2 C^2} = K \, w_0^2$$

$$T(S) = -\frac{K w_0^2}{S^2 + \frac{w_0}{Q} S + w_0^2}$$

; $K = \frac{R3}{R1}$

2) $w0 = 1 \rightarrow 1 = \frac{1}{R3 . C} \Rightarrow R3 . C = 1$

$Q = 3$

$\rightarrow \frac{\overset{1}{w0}}{\underset{3}{Q}} = \frac{1}{R2C} \rightarrow R2 . C = 3$

$\Big\}$ $R3 \cdot \frac{3}{R2} = 1$; $R2 = 3 R3$

SUPONGO $R3 = 1K\Omega \rightarrow R2 = 3K\Omega$; $C = 1000 \mu F$

ó $R3 = 100K\Omega \rightarrow R2 = 300 K\Omega$; $C = 10 \mu F$

3) $|T(0)| = 20\,dB \rightarrow 10$ VECES

$$T(w) = T(S)\Big|_{S=jw} = \left[-\frac{K w_0^2}{S^2 + \frac{w_0}{Q} S + w_0^2} \right]\Bigg|_{S=jw}$$

$$T(w) = \frac{-K w_0^2}{(w_0^2 - w^2) + \frac{w_0 \cdot w}{Q}} \quad ; \quad |T(w)| = \frac{K w_0^2}{\sqrt{(w_0^2 - w^2)^2 + w^2 \frac{w_0^2}{Q^2}}}$$

↳ FILTRO PASA BAJOS

$$|T(w=0)| = K = \frac{R3}{R1} = 10 \quad ; \quad R1 = R3/10$$

$R1 = 1K\Omega / 10 = 100$ ó $R1 = 100K\Omega / 10 = 10K\Omega$

BONUS

1) $\Omega w = w_0$; $\$ = S/\Omega w = S/w_0 \rightarrow S = \$. w_0$

$$T(S) = \frac{-K w_0^2}{\$^2 w_0^2 + \frac{w_0^2}{Q}\$ + w_0^2} \rightarrow T(S) = \frac{-K}{S^2 + \frac{1}{Q} S + 1}$$

NORMALIZACIÓN EN IMPEDANCIA

$\Omega z = R_3 = 1$; $\Omega w_0 = w_0 = 1$

$Q = \frac{R_2}{R_3} \rightarrow R_2 = Q$; $w_0 = \frac{1}{R_3 C} \Rightarrow C = 1$

$\frac{R_1}{R_3} = \frac{1}{K}$; $R_1 = 1/K$; $R_3 = 1$

Si $\Omega z = 1K\Omega$; $R_3 = 1K\Omega$; $C = \frac{1}{\underbrace{\Omega z \cdot \Omega w_0}_{1K\Omega}} = 1mF$

$Q = 3$; $w_0 = 1$

$R_2 = \overbrace{3}^{Q} \cdot \Omega z = 3K\Omega$; $R_1 = \frac{1}{\underbrace{K}_{10}} \cdot \Omega z = 100\Omega$

OTRO CASO

$\Omega z = R_2 = 1$; $R_3 = \frac{1}{Q}$; $\overbrace{w_0}^{1} = \frac{1}{R_3 C}$; $R_3 C = 1$; $C = Q$

$R_2 = 1$; $K = \frac{R_3}{R_1}$; $R_1 = \frac{1}{K \cdot Q}$

NOTA

$$S_C^{w_0} = \frac{C}{w_0} \frac{\partial w_0}{\partial C} = \frac{C}{\frac{1}{R_3 C}} \cdot \left(-\frac{1}{R_3}\right) \frac{1}{C^2} = -1$$

$$w_0 = \frac{1}{R_3 C} = \frac{1}{R_3} C^{-1}$$

VERIFICA QUE : $S_C^{w_0} = 2 \to S_y^x = 2$

$x = y^2$

EN ESTE CASO $S_C^{w_0} = -1$, YA QUE $w_0 = \frac{1}{R_3} C^{-1}$ $\wedge 2$

$$S_C^{w_0} = -1$$

$$S_{R_2}^{Q} = \frac{R_2}{Q} \cdot \frac{\partial Q}{\partial R_2} = \frac{R_2}{\frac{R_2}{R_3}} \cdot \frac{1}{R_3} = 1$$

$Q = ?$; $\frac{w_0}{Q} = \frac{1}{CR_2}$; $Q = CR_2 . w_0 = R_2 C . \frac{1}{R_3 C} = \frac{R_2}{R_3} = R_2^{1} . R_3^{-1}$

$$S_{R_2}^{Q} = 1$$

$$S_{R_3}^{Q} = \frac{R_3}{Q} \frac{\partial Q}{\partial R_3} = \frac{R_3}{\frac{R_2}{R_3}} \cdot \left(-R_2 \frac{1}{R_3^2}\right) = -1$$

$$S_{R_3}^{Q} = -1$$

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FECHA

NOTA

BUTTERWORTH

PARA QUE SEA BUTTERWORTH, $Q = \frac{\sqrt{2}}{2}$, $w_0 = 1$.

$\Omega Z = R_3 = 1$

$R_2 = Q$; $C = 1$; $R_1 = \frac{1}{K}$

DESNORMALIZACIÓN:

$$R_2 = \frac{\sqrt{2}}{2} \cdot \underbrace{\Omega Z}_{1K\Omega} \simeq 707{,}11\,\Omega$$

$R_3 = 1K\Omega$; $C = \frac{1}{\Omega Z\, \Omega w_0}$; $C = 1mF$; $R_1 = \frac{1 \cdot 1K\Omega}{10} = 100\,\Omega$