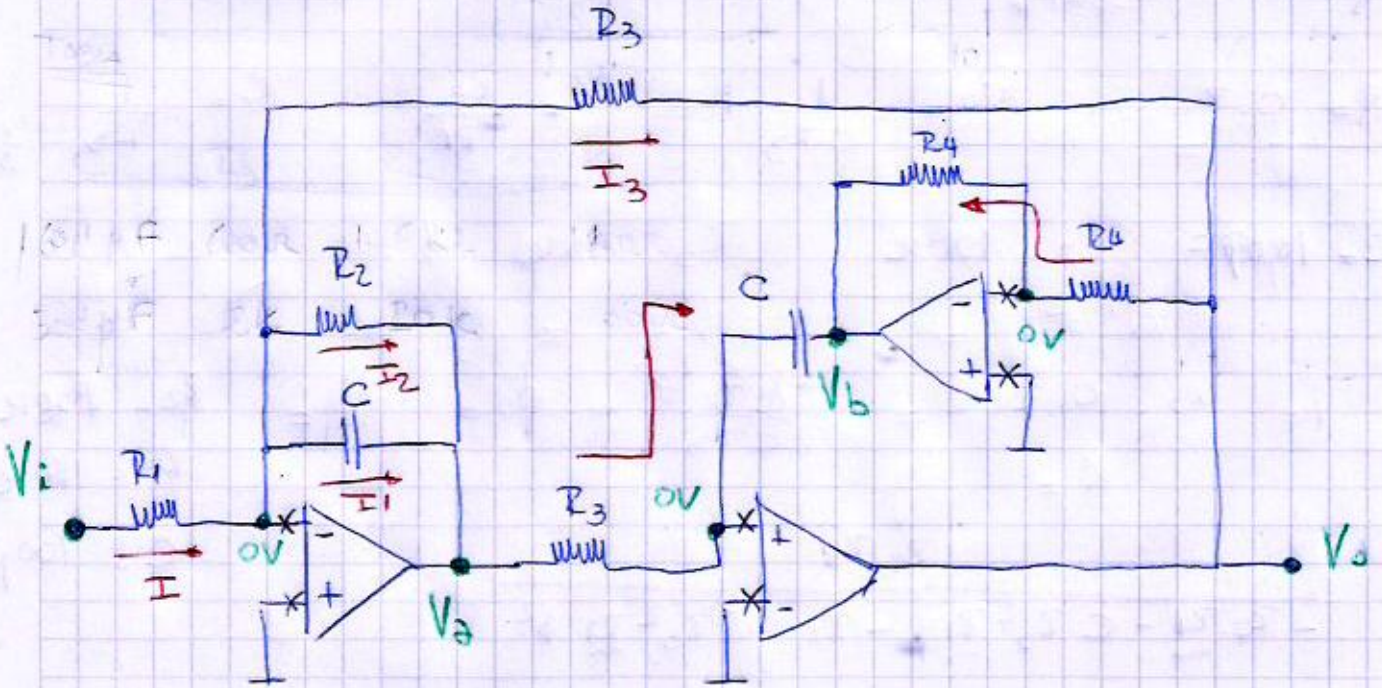
Circuito



TAREA SEMANAL 2

HOJA N°

FECHA

$$I = \frac{V_i}{R_1} \qquad I = I_1 + I_2 + I_3$$

$$I_1 = -V_A \$C \quad ; \quad I_2 = -\frac{V_A}{R_2} \quad ; \quad I_3 = -\frac{V_o}{R_3}$$

$$I_1 + I_2 = \frac{V_A}{R_3} = -V_b \$C$$

$$V_b = -V_o \frac{R_4}{R_4}$$

$$\frac{V_A}{R_3} = +V_o \$C \rightarrow V_A = V_o \$C R_3$$

$$\frac{V_i}{R_1} = -V_o \$^2 C^2 R_3 - V_o \frac{\$C R_3}{R_2} - \frac{V_o}{R_3}$$

$$\frac{V_i}{R_1} = -V_o \left(\$^2 C^2 R_3 + \frac{\$C R_3}{R_2} + \frac{1}{R_3} \right)$$

$$\frac{V_i}{R_1} = -V_o \frac{\$^2 C^2 R_2 R_3^2 + \$C R_3^2 + R_2}{R_2 R_3}$$

$$\frac{V_o}{V_i} = -\frac{R_2 R_3}{R_1} \cdot \frac{1}{\$^2 C^2 R_2 R_3^2 + \$C R_3^2 + R_2}$$

$$\frac{V_o}{V_i} = -\frac{R_2 \cdot R_3}{R_1} \cdot \frac{\frac{1}{C^2 R_2 R_3^2}}{\$^2 + \$\frac{R_3}{C^2 R_2 R_3^2} + \frac{R_2}{C^2 R_2 R_3^2}}$$

$$\boxed{\frac{V_o}{V_i} = -\frac{1}{R_3 R_1 C^2} \cdot \frac{1}{\$^2 + \$\frac{1}{C R_2} + \frac{1}{C^2 R_3^2}}}$$

NOTA

$$T(s) = -K \frac{\omega_0^2}{s^2 + s\frac{\omega_0}{Q} + \omega_0^2}$$

$$\left[\omega_0^2 = \frac{1}{C^2 R_3^2}\right] \qquad \frac{\omega_0}{Q} = \frac{1}{C \cdot R_2} \Rightarrow Q = C \cdot R_2 \cdot \omega_0$$

$$Q = \frac{C \cdot R_2}{C \cdot R_3} \rightarrow \left[Q = \frac{R_2}{R_3}\right]$$

$$K \cdot \omega_0^2 = \frac{1}{R_3 R_1 C^2} = \frac{R_3}{R_1} \cdot \frac{1}{R_3^2 \cdot C^2}$$

$$\left[K = \frac{R_3}{R_1}\right]$$

a. VALORES PARA $\omega_0 = 1$ Y $Q = 10$

R_2	R_3	C	R_1
20K	→ 2K	500pf	200

c. VALOR DE R_1

COMO ES UN PASO BAJOS $T(0) = K$

PARA 20dB $\left[K = 10 = \frac{R_3}{R_1} = 200\Omega\right]$

$$|T(j\omega)| = \frac{|K|}{\sqrt{(1-\omega^2)^2 + \frac{\omega^2}{Q^2}}} \rightarrow \left[T\Big|_{\omega=0} = K\right]$$

NOTA

HOJA N°

FECHA

- Norm. en Fcia

$$T(\$) = -K \cdot \frac{\omega_0^2}{\$^2 + \$\frac{\omega_0}{q} + \omega_0^2}$$

$$T(\$_N, \omega_0) = -K \cdot \frac{\omega_0^2}{\$_N^2 \omega_0^2 + \$_N \frac{\omega_0^2}{q} + \omega_0^2}$$

$$\left[T(\$_N) = -K \cdot \frac{1}{\$_N + \$_N 1/q + 1} \right]$$

- Norm en z

$$T(\$) = \frac{R_3}{R_1} \cdot \frac{1}{\$ + \$\frac{1}{C.R_2} + 1}$$

$C = 500pf$

Si: $R_3 = 2K$; $R_2 = 20K$; $R_1 = 200\Omega$ $\rightarrow$ $Z_N = 200$

$R_{3N} = 10\Omega$; $R_{2N} = 100\Omega$; $R_{1N} = 1$

$C_N = 0{,}1\ f$

$$\left[T(\$) = 10 \cdot \frac{1}{\$ + \$\frac{1}{10} + 1} \right]$$

NOTA

SENSIBILIDADES

$$\omega_0 = \frac{1}{C \cdot R_3}$$

a) $$S_C^{\omega_0} = \frac{\partial \omega_0 / \omega_0}{\partial C / C} = \frac{C}{\omega_0} \cdot \frac{\partial \omega_0}{\partial C}$$

$$S_C^{\omega_0} = \frac{C}{\omega_0} \cdot \frac{1}{R_3} \cdot \frac{-1}{C^2} = -\frac{1}{\omega_0 R_3 C}$$

$$\left[S_C^{\omega_0} = -1 \right]$$

b) $$S_{R_2}^{Q} = \frac{\partial Q / Q}{\partial R_2 / R_2} = \frac{R_2}{Q} \cdot \frac{\partial Q}{\partial R_2} \quad ; \quad Q = \frac{R_2}{R_3}$$

$$\left[S_{R_2}^{Q} = \frac{R_2}{Q} \cdot \frac{1}{R_3} = 1 \right]$$

c) $$S_{R_3}^{Q} = \frac{\partial Q / Q}{\partial R_3 / R_3} = \frac{R_3}{Q} \cdot \frac{\partial Q}{\partial R_3} = \frac{R_3}{Q} \cdot R_2 \cdot -\frac{1}{R_3^2}$$

$$\left[S_{R_3}^{Q} = -R_3 \right] \qquad Q = \frac{1}{3-K} \qquad K = 1 + \frac{R_B}{R}$$

NOTA

- Para Butter

$\omega_0 = 1 \rightarrow T = \frac{\sqrt{2}}{2}$

$K \quad \frac{1}{\$^2 + \$\frac{1}{10} + 1} \rightarrow |T| = \frac{K}{\sqrt{(1-\omega^2)^2 + \frac{\omega^2}{100}}}$

$|T|_{\omega=1} = \frac{K}{\sqrt{\frac{1}{100}}} = K \cdot 10$

$\frac{R_3}{R_1} \cdot 10 = \frac{\sqrt{2}}{2}$

$\frac{R_3}{R_1} = \frac{\sqrt{2}}{20} \simeq 0{,}0707$

Si: $R_1 = 10k \rightarrow \boxed{R_3 \simeq 707\ \Omega}$

$1 = \frac{1}{C \cdot R_3} \Rightarrow \boxed{C = 1414\ \mu F}$

$\varphi = \frac{R_2}{R_3} = \frac{\sqrt{2}}{2} \rightarrow \boxed{R_2 \simeq 500\Omega}$

(*) Con $R_1 = 10k \rightarrow |T(0)| = K = -23\ dB$

Reajuste $R_1 \rightarrow \frac{R_3}{R_1} = 1$

$\boxed{R_1 = R_3}$

NOTA

PARA PASA BANDA

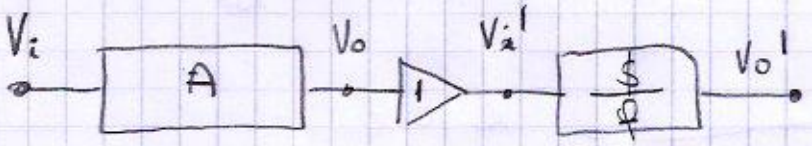
$$|T_{LP}| = \frac{K_0 \omega_0^2}{s^2 + s\frac{\omega_0}{Q} + \omega_0^2}$$

$$|T_{BP}| = \frac{\frac{\omega_0}{Q} s}{s^2 + \frac{\omega_0}{Q} s + \omega_0^2}$$

$\frac{s}{Q}$

AGREGO UN CERO EN EL ORIGEN.

1)



2) UTILIZANDO EL CIRCUITO DE ACKERBERG - MOSSBERG TOMO LA SALIDA "V_0" EN "V_2"