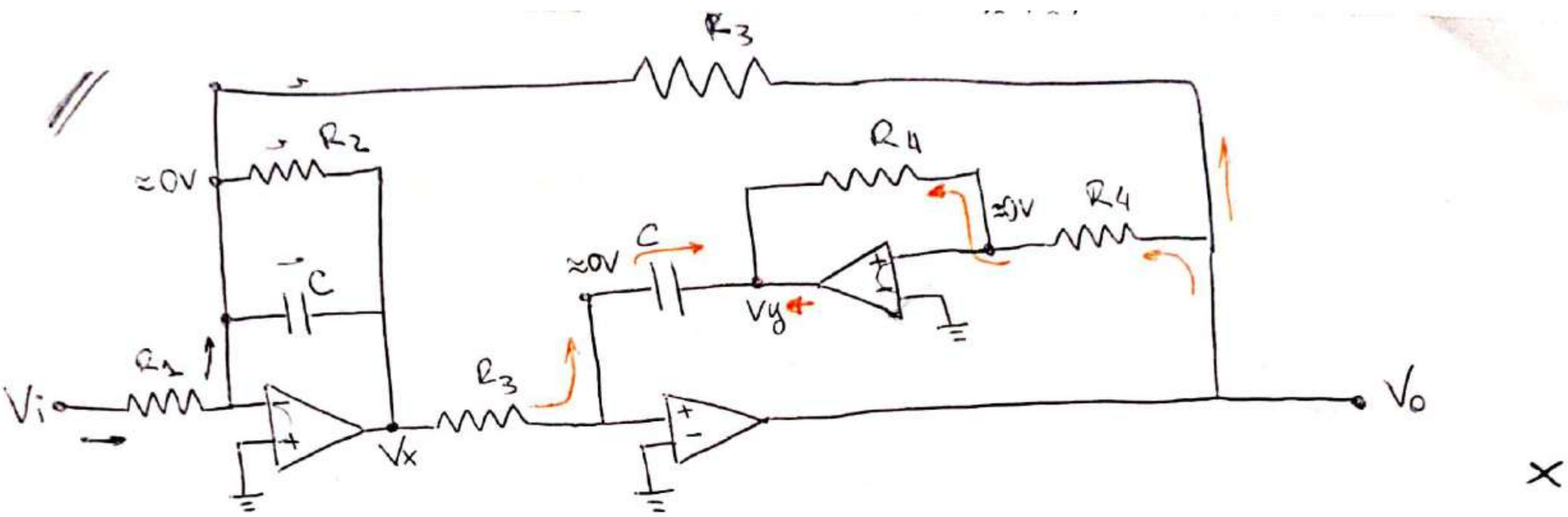


① $\underline{V_i} \cdot G_1 = V_x (G_2 + sC) + V_o G_3$

② $V_x G_3 = V_y \cdot sC \longrightarrow \boxed{V_x G_3 = V_o \cdot sC} \to \left[V_x = V_o \dfrac{sC}{G_3} \right]$

③ $V_o \cancel{G_4} = V_y \cancel{G_4} \to \boxed{V_o = V_y}$

$$V_i G_1 = V_o \frac{sC}{G_3} (G_2 + sC) + V_o G_3 = V_o \left[\frac{sC}{G_3} (G_2 + sC) + G_3 \right]$$

$$\cancel{V_i} \quad \frac{V_o}{V_i} = \frac{G_1}{\dfrac{sCG_2 + s^2C^2 + G_3^2}{G_3}} = G_1 G_3 \frac{1}{s^2C^2 + sCG_2 + G_3^2} =$$

$$\frac{V_o}{V_i} = \frac{G_1 G_3}{C^2} \cdot \frac{1}{s^2 + s\dfrac{G_2}{C} + \dfrac{G_3^2}{C^2}} \to \boxed{T(s) = \frac{V_o}{V_i} = \frac{\dfrac{1}{R_1 R_3 C^2}}{s^2 + s\dfrac{1}{R_2 C} + \dfrac{1}{R_3^2 C^2}}}$$

$$T(s) = \frac{V_o}{V_i} = \frac{\frac{1}{R_1 R_3 C^2} \cdot \frac{R_3}{R_3}}{s^2 + s\frac{1}{R_2 C} + \frac{1}{R_3^2 C^2}} = \frac{R_3}{R_1} \cdot \frac{1/R_3^2 C^2}{s^2 + s\frac{1}{R_2 C} + \frac{1}{R_3^2 C^2}}$$

Si $\omega_0^2 = \frac{1}{R_3^2 C^2}$; $\frac{\omega_0}{Q} = \frac{1}{R_2 C}$ $\qquad K = \frac{R_3}{R_1}$

Entonces:

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

NORMALIZO $\rightarrow \omega_0 = 1$

$\omega_0 = \frac{1}{R_3 C} = 1 \rightarrow \boxed{C = \frac{1}{R_3}} \cdot \omega_0$ $\quad || \quad$ $\frac{\omega_0}{Q} = \frac{1}{R_2 C} \rightarrow Q = R_2 \cdot \frac{1}{R_3}$

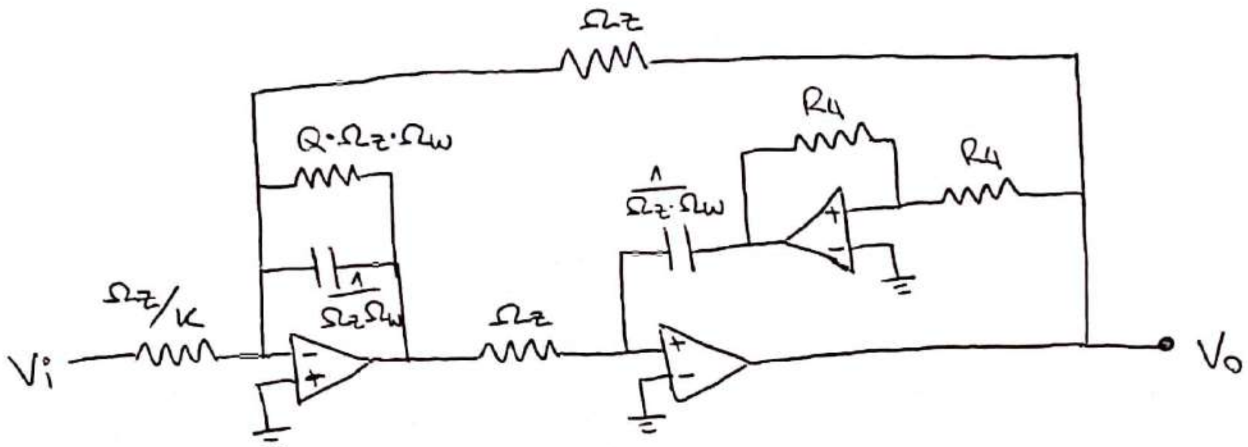
$\boxed{R_2 = Q \cdot R_3} \cdot \omega_0$

$\boxed{R_1 = \frac{R_3}{K}}$

- Tomo como $\Omega_z = R_3$
- K es la ganancia de la banda de paso en veces.

- Para dB: $G_{dB} = 20 \log(K)$

- Red Normalizada



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

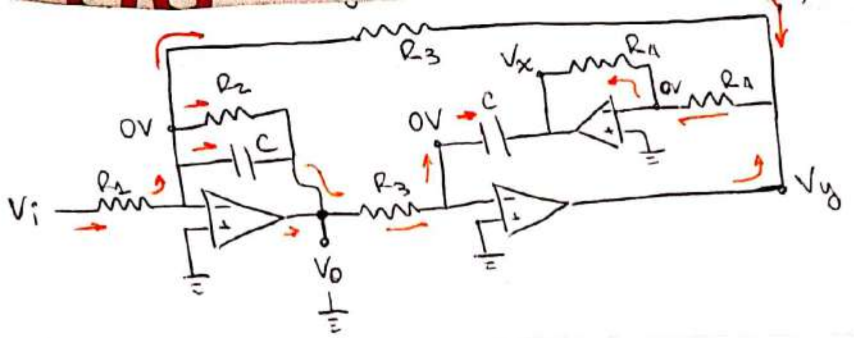
$$\omega_0 = \frac{1}{R_3 C} = 1 \quad Q = \frac{R_2}{R_3} \quad \wedge \; R_3 = 1 \quad \wedge \; C = \frac{1}{R_3}$$

$$S_C^{\omega_0} = \frac{\cancel{C}}{\underbrace{\omega_0}_{=1}} \cdot \frac{-1}{R_3 C^{\cancel{2}}} = -1 \cdot \frac{1}{\cancel{R_3} \cdot \underbrace{\frac{1}{\cancel{R_3}}}_{=C}} = \boxed{-1}$$

$$S_{R_2}^{Q} = \frac{R_2}{Q} \cdot \frac{1}{R_3} = \frac{\overbrace{Q \cdot R_3}^{=R_2}}{Q\, R_3} = \boxed{1}$$

SENSIBILIDADES

$$S_{R_3}^{Q} = \frac{\cancel{R_3}}{Q} \cdot \frac{-R_2}{R_3^{\cancel{2}}} = -\frac{\overbrace{Q R_3}^{=R_2}}{Q\, R_3} = \boxed{-1}$$



DESARROLLO PASABANDA

① $V_i G_1 = V_o (G_2 + sC) + V_y G_3$

② $V_o G_3 = V_x \, sC \rightarrow V_o G_3 = V_y sC \rightarrow \boxed{V_y = V_o \dfrac{G_3}{sC}}$

③ $V_x \cancel{G_4} = V_y \cancel{G_4} \rightarrow \boxed{V_y = V_x}$

Entonces: $V_i G_1 = V_o (G_2 + sC) + V_o \dfrac{G_3}{sC} \cdot G_3$

$$V_i G_1 = V_o \left[\frac{sCG_2 + s^2C^2 + G_3^2}{sC} \right]$$

$$\frac{V_o}{V_i} = T(s) = \frac{sCG_1}{s^2C^2 + sCG_2 + G_3^2} = \frac{\cancel{C} G_1}{C^2} \cdot \frac{s}{s^2 + s\frac{G_2}{C} + \frac{G_3^2}{C^2}}$$

$$T(s) = \frac{s \, ^1/_{R_1C}}{s^2 + s\frac{1}{R_2C} + \frac{1}{R_3^2C^2}} \cdot \frac{R_2}{R_2} = \boxed{\frac{R_2}{R_1} \cdot \frac{s\frac{1}{R_2C}}{s^2 + s\frac{1}{R_2C} + \frac{1}{R_3^2C^2}} = T(s)}$$

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

con $K = \dfrac{R_2}{R_1}$; $\omega_0 = \dfrac{1}{R_3C} = 1$; $Q = R_2 C \omega_0$

normalizada

$\boxed{C = \dfrac{1}{R_3}}\Big|_{\omega_0}$ $\quad Q = R_2 \cdot \dfrac{1}{R_3} \rightarrow \boxed{Q \cdot R_3 = R_2}\Big|_{\omega_0}$ $\quad$ Elijo $\Omega_z = R_3$

$K = \dfrac{R_2}{R_1} = \dfrac{Q R_3}{R_1} \rightarrow \boxed{R_1 = \dfrac{Q R_3}{K}} \cdot \omega_0$

Finalmente:

$$R_1 = \frac{Q \cdot \Omega_z}{K \cdot \Omega_\omega} \qquad C = \frac{1}{\Omega_z \Omega_\omega}$$

$$R_2 = \frac{Q \cdot \Omega_z}{\Omega_\omega}$$

$$R_3 = \Omega_z$$