HOJA Nº

FECHA

Trabajo semanal 2

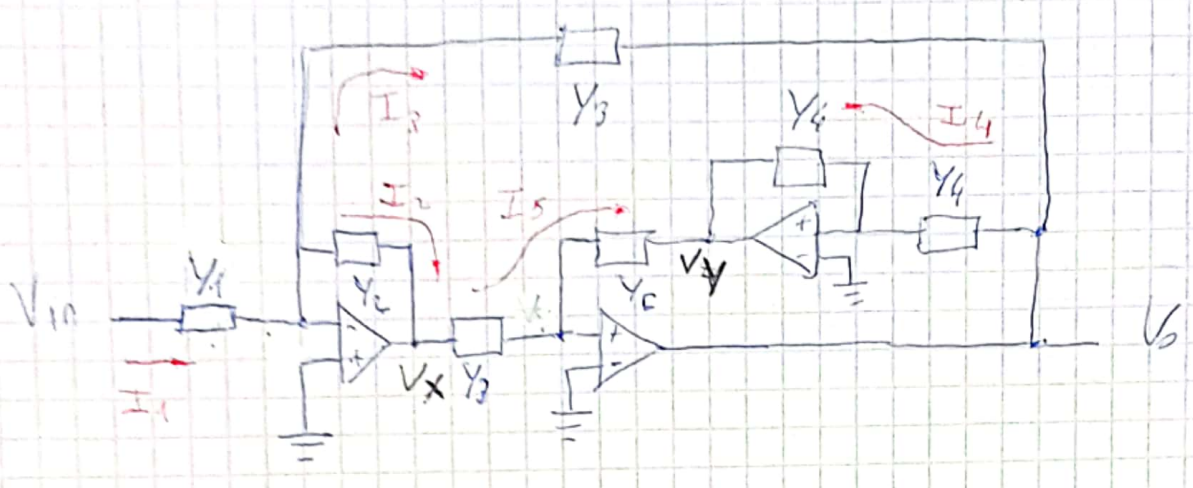
$Y_1 = 1/R_1$

$Y_2 = \frac{1}{R_2} + sC$

$Y_3 = 1/R_3$

$Y_4 = 1/R_4$

$Y_C = sC$



$I_1 = I_2 + I_3$

$V_{in} \cdot Y_1 = -V_X Y_2 - V_o Y_3 \quad (1)$

$I_5 = V_X Y_3 = -V_Y Y_C \Rightarrow V_X = -V_Y \frac{Y_C}{Y_3} \quad (2)$

$I_4 = V_o Y_4 = -V_Y Y_4 \Rightarrow V_Y = -V_o \quad (3)$

de (3) en (2) $V_X = V_o \frac{Y_C}{Y_3} \quad (4)$

de (4) en (1)

$V_{in} \cdot Y_1 = -V_o \frac{Y_C Y_2}{Y_3} - V_o Y_3 = -V_o \left(\frac{Y_C Y_2}{Y_3} + Y_3 \right)$

$$\frac{V_o}{V_{in}} = -\frac{Y_1}{\frac{Y_C Y_2}{Y_3} + Y_3} = -\frac{Y_3 Y_1}{Y_C Y_2 + Y_3^2}$$

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

$$\frac{V_o}{V_{in}} = -\frac{\frac{R_3}{R_1 R_2 C^2}}{s^2 + s\frac{1}{R_2 C} + \frac{1}{R_3^2 C^2}} \Rightarrow \boxed{\frac{V_o}{V_{in}} = -\frac{R_3}{R_1} \frac{\frac{1}{R_3^2 C^2}}{s^2 + s\frac{1}{R_2 C} + \frac{1}{R_3^2 C^2}}}$$

1

$$\frac{\omega_0}{Q} = \frac{1}{R_2 C} \qquad \omega_0^2 = \frac{1}{R_3^2 C^2} \Rightarrow \omega_0 = \frac{1}{R_3 C}$$

$$Q = \frac{R_2 C}{R_3 C} = \frac{R_2}{R_3}$$

$$\boxed{\frac{V_0}{V_{in}} = -K \cdot \frac{\omega_0^2}{s^2 + \frac{\omega_0}{Q} s + \omega_0^2}}$$

$$\boxed{\omega_0 = \frac{1}{R_3 C}} \qquad \boxed{Q = \frac{R_2}{R_3}} \qquad \boxed{K = \frac{R_3}{R_1}}$$

(2)

- $\omega_0 = 1 = \frac{1}{R_3 C} \Rightarrow R_3 = \frac{1}{C}$
- $Q = 3 = \frac{R_2}{R_3} \Rightarrow R_2 = 3 R_3$

$|T(0)| = 20\ dB \Rightarrow 20\ dB = 20 \log K \Rightarrow K = 10$

- $K = 10 = \frac{R_3}{R_1} \Rightarrow R_3 = 10 R_1$

Adoptando: $R_3 = 10\ k\Omega$
$R_2 = 30\ k\Omega$
$R_1 = 1\ k\Omega$
$C = 100\ \mu F$