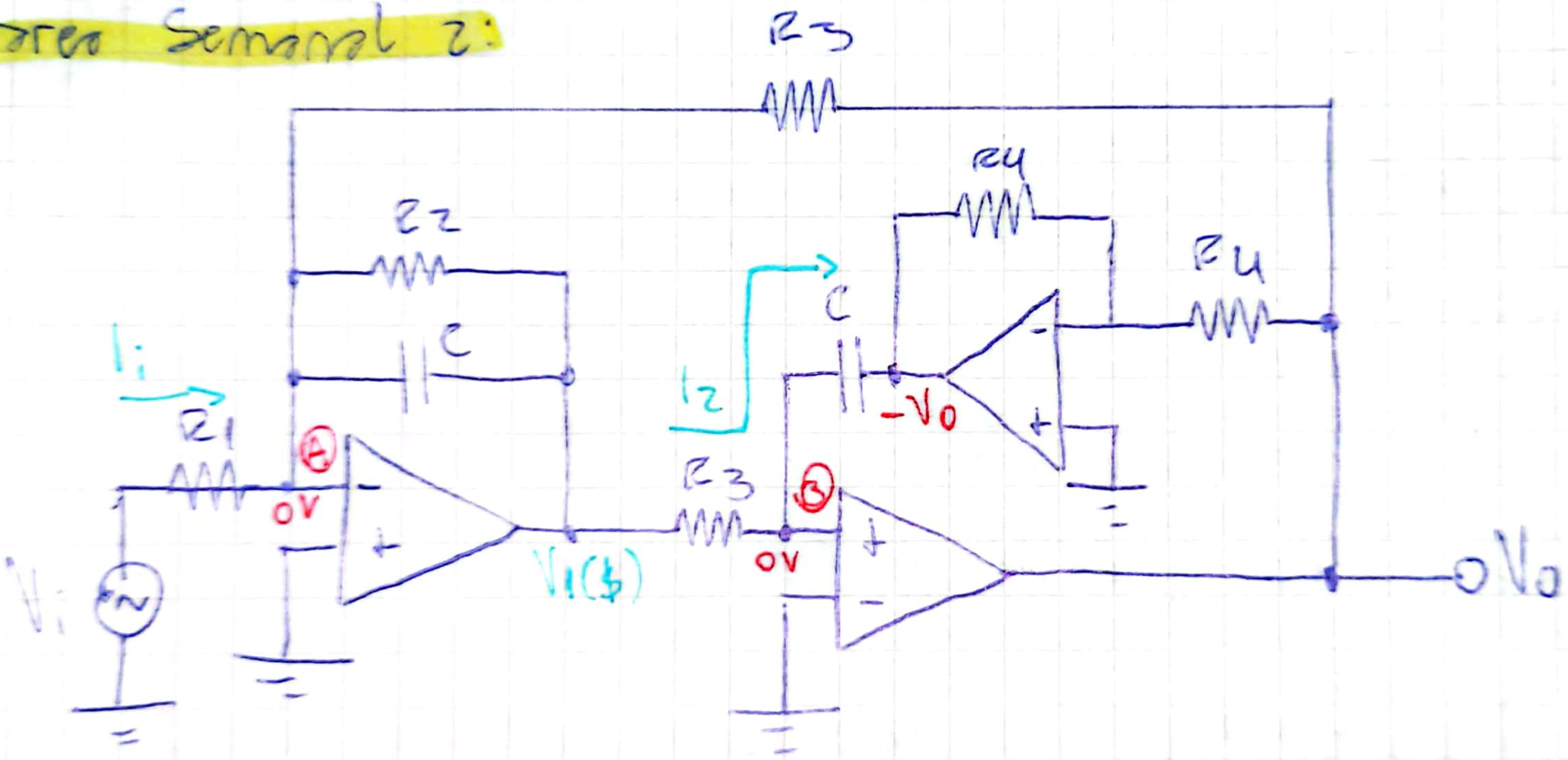
Tarea Semanal 2:



Escaneado con CamScanner

• Planteo corrientes:

• $I_i = I_{C3} + I_{R2} + I_C = -\frac{V_o(s)}{R_3} - \frac{V_1(s)}{R_2} - \frac{V_1(s)}{1/sC}$

$I_i = \frac{V_i}{R_1} \Rightarrow \frac{V_i}{R_1} = -\frac{V_o(s)}{R_3} - V_1(s)\left(\frac{1}{R_2} + sC\right)$ ①

• $I_2 = \frac{V_1(s)}{R_3} = (0 - V_o(s))\, sC \rightarrow V_1(s) = V_o(s).sCR_3$ ②

② en ①: $\frac{V_i}{R_1} = -\frac{V_o(s)}{R_3} - V_o(s).sCR_3\left(\frac{1}{R_2} + sC\right) \rightarrow \frac{sCR_2+1}{R_2}$

$$\frac{V_i}{R_1} = -V_o(s)\left(\frac{1}{R_3} + sCR_3 . \frac{sCR_2+1}{R_2}\right)$$

$$\frac{V_o(s)}{V_i(s)} = \frac{-1}{R_1.\left(\frac{1}{R_3} + \frac{s^2C^2R_3R_2 + sCR_3}{R_2}\right)}$$

$$= \frac{-1}{R_1.\left(\frac{s^2C^2R_3R_2 + sCR_3 + R_2/R_3}{R_2}\right)}$$

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

$$= \frac{-1/C^2}{R_1R_3.\left(s^2 + s\frac{1}{CR_2} + \frac{1}{C^2R_3^2}\right)}$$

$$T(s) = \frac{V_o(s)}{V_i(s)} = -\frac{R_3}{R_1} . \frac{+\frac{1}{C^2R_3^2}}{s^2 + s\frac{1}{CR_2} + \frac{1}{C^2R_3^2}}$$

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

$\frac{\omega_0}{Q} = \frac{1}{CR_2}$; $\omega_0^2 = \frac{1}{C^2R_3^2}$; $K = -\frac{R_3}{R_1}$

• Fijo $C = 100nF$ → $\omega_0 = 1$ → $\frac{1}{C^2R_3^2} = 1$ → $R_3 = 1M\Omega$
$C = 1\mu F$

$Q = 3 \Rightarrow \frac{1}{3} = \frac{1}{CR_2} \Rightarrow R_2 = \frac{3}{C} = 3M\Omega$

Escaneado con CamScanner

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

  $-\frac{R_3}{R_1} = -10$, $R_3 = 1M\Omega \Rightarrow R_1 = 100\,k\Omega$

- Normalización:

  $\Omega_w = w_0 \qquad R_z = R_3$

  $R_1' = 0{,}1 \qquad R_3' = 1 \qquad R_4' = 3 \qquad C' = 1 \;;\; C\,w_0\,R_3 = C\,.\,R_w\,.\,R_z$

- Sensibilidades: $w_0 = \frac{1}{CR_3} \qquad Q = w_0 . C . R_2 = \frac{1}{CR_3} C R_2 = \frac{R_2}{R_3}$

$$S^{w_0}_{C} = \frac{C}{w_0}\left(\frac{1}{R_3}(-1)\frac{1}{C^2}\right) = \frac{-1}{w_0 R_3 C} = \frac{-1}{\frac{1}{CR_3} . R_3 C} = -1$$

$$S^{Q}_{R_2} = \frac{R_2}{Q} . w_0 C = \frac{w_0 C R_2}{w_0 C R_2} = 1$$

$$S^{Q}_{R_3} = \frac{R_3}{Q}\left(R_2 . (-1) . \frac{1}{R_3^2}\right) = \frac{1}{Q} . \left(\frac{-R_2}{R_3}\right) = \frac{1}{\frac{R_2}{R_3}} \; \frac{-R_2}{R_3} = -1$$

- Butterworth:

  Orden 2: $\frac{w_0}{Q} = \sqrt{2}$; Si $w_0 = 1 \Rightarrow Q = \frac{1}{\sqrt{2}} = 0{,}707$

  $Q = 0{,}707 \Rightarrow \frac{1}{0{,}707} = \frac{1}{CR_2}$; $C = 1\mu F \Rightarrow R_2 = \frac{0{,}707}{C} = 707\,k\Omega$