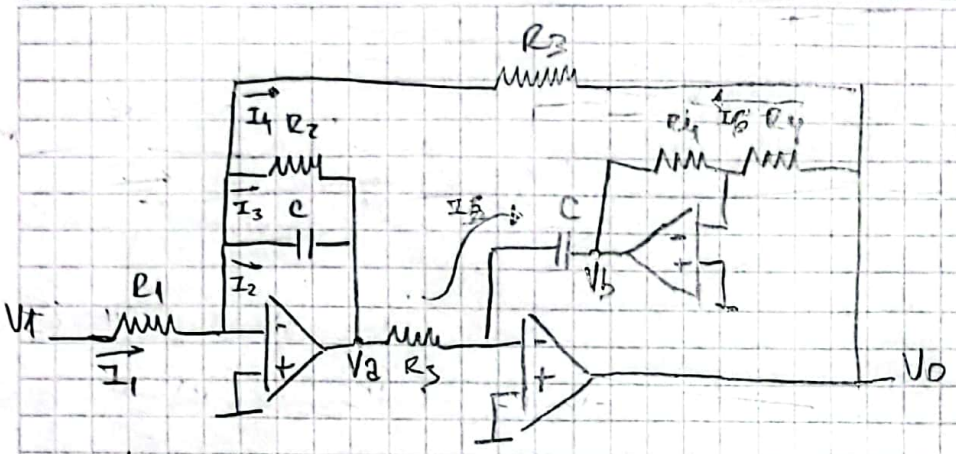

$I_1 = I_2 + I_3 + I_4$

$I_1 = \frac{V_1}{R_1}$

$I_2 = -V_a\, Sc$

$I_3 = \frac{-V_a}{R_2}$

$I_4 = \frac{-V_o}{R_3}$

$I_5 = \frac{V_a}{R_3} = -V_b Sc \Rightarrow V_b = -\frac{V_a}{SCR_3}$; $V_o = -V_b \Rightarrow V_o = \frac{V_a}{SCR_3} \rightarrow V_a = V_o\, SCR_3$

$\frac{V_1}{R_1} = -V_a Sc - \frac{V_a}{R_2} - \frac{V_o}{R_3}$

$\frac{V_1}{R_1} = -V_o\, SCR_3 \cdot Sc - \frac{V_o\, SCR_3}{R_2} - \frac{V_o}{R_3}$

$\frac{V_1}{R_1} = -V_o \left(S^2C^2R_3 + \frac{SCR_3}{R_2} + \frac{1}{R_3} \right)$

$\frac{V_o}{V_1} = -\frac{1}{R_1} \cdot \frac{1}{S^2C^2R_3 + \frac{SCR_3}{R_2} + \frac{1}{R_3}} = -\frac{1}{R_1} \cdot \frac{1}{\frac{S^2C^2R_3^2R_2 + SCR_3^2 + R_2}{R_2R_3}}$

$\frac{V_o}{V_1} = -\frac{1}{R_1} \cdot \frac{R_2R_3}{S^2C^2R_3^2R_2 + SCR_3^2 + R_2} \cdot \frac{C^2R_3^2R_2}{C^2R_3^2R_2} = \underbrace{-\frac{1}{C^2R_3^2R_2/R_1}}_{K} \cdot \frac{R_2R_3}{S^2 + S\frac{1}{CR_2} + \frac{1}{C^2R_3^2}}$

NOTA

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

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

$$\omega_0^2 = \frac{1}{C^2 R_3^2} \Rightarrow \boxed{\omega_0 = \frac{1}{CR_3}}$$

$$\frac{\omega_0}{Q} = \frac{1}{CR_2} \Rightarrow \frac{1}{CR_3} / CR_2 = Q$$

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

$\omega_0 = 1$

$Q = 3$

$$\frac{1}{CR_3} = 1 \rightarrow C = 1$$

$$3 = \frac{R_2}{R_3} \rightarrow \text{Adopto } \boxed{R_3 = 1k}$$

$$\boxed{R_2 = 3k} \qquad \boxed{C = \frac{1}{R_3} = 1mF}$$

$|T(0)| = 20\ dB$

$20\ dB = 10$

$$T(j\omega) = \frac{-K}{-\omega^2 + j\omega\frac{1}{CR_2} + \frac{1}{C^2 R_3^2}}$$

$$|T(j\omega)| = \frac{|-K|}{\sqrt{\left(\frac{1}{C^2 R_3^2} - \omega^2\right)^2 + \left(\omega\frac{1}{CR_2}\right)^2}}$$

$$|T(0)| = \frac{-K}{\frac{1}{C^2 R_3^2}} = \frac{-1}{C^2 R_3 R_1 \frac{1}{C^2 R_3^2}} = -\frac{R_3}{R_1} = 20\ dB$$

$R_3 = 1k \rightarrow 20 \log\left|-\frac{R_3}{R_1}\right| = 20\ dB \Rightarrow$

$$\frac{R_3}{R_1} = 10 \rightarrow \boxed{R_1 = \frac{1k}{10} = 100\Omega}$$

NOTA