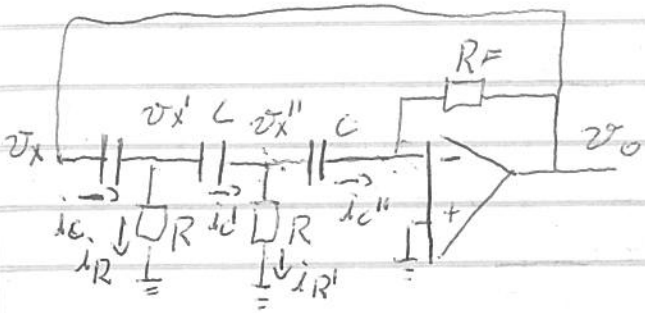
Exercício Nota -> aula 12/3



$$i_{C''} = \frac{-v_o}{R_F}$$

$$v_{x''} = \frac{1}{sC} \cdot i_{C''} \Rightarrow \boxed{v_{x''} = \frac{-v_o}{R_F C s}}$$

$$i_{C'} = i_{R'} + i_{C''} = \frac{v_{x''}}{R} + \frac{-v_o}{R_F} = \frac{-1 \cdot v_o}{R_F R C s} - \frac{v_o}{R_F} \Rightarrow$$

$$i_{C'} = -v_o \left(\frac{1}{R_F R C s} + \frac{1}{R_F} \right) \Rightarrow \boxed{i_{C'} = -v_o \frac{1 + RCs}{R_F R C s}}$$

$$v_{x'} = v_{x''} + \frac{1}{sC} \cdot i_{C'} \Rightarrow v_{x'} = \frac{-v_o}{R_F C s} + \frac{1}{sC} \cdot \frac{-v_o \, 1 + RCs}{R_F R C s}$$

$$v_{x'} = \frac{-v_o}{R_F C s} \left(1 + \frac{1 + RCs}{RCs} \right) = \frac{-v_o}{R_F C s} \left(\frac{1 + 2RCs}{RCs} \right)$$

$$\boxed{v_{x'} = -v_o \left(\frac{1 + 2RCs}{R_F R C^2 s^2} \right)}$$

$$i_C = i_R + i_{C'} = \frac{v_{x'}}{R} + \frac{-v_o \, 1 + RCs}{R_F R C s} = \frac{-v_o}{R} \left(\frac{1 + 2RCs}{R_F R C^2 s^2} \right) - v_o \left(\frac{1 + RCs}{R_F R C s} \right)$$

$$i_C = -v_o \frac{1 + 2RCs + RCs + (RC)^2 s^2}{R_F R^2 C^2 s^2} \Rightarrow \boxed{i_C = -v_o \frac{(RC)^2 s^2 + 3RCs + 1}{R_F (RC)^2 s^2}}$$

$$v_x = v_{x'} + \frac{1}{sC} \cdot i_C = -v_o \left(\frac{1 + 2RCs}{R_F R C^2 s^2} \right) + \frac{1}{sC} \cdot -v_o \cdot \frac{(RC)^2 s^2 + 3RCs + 1}{R_F (RC)^2 s^2}$$

$v_o x$

$$v_x = \frac{RCs + 2(RC)^2 s^2 + (RC)^2 s^2 + 3RCs + 1}{R_F R^2 C^3 s^3} \Rightarrow v_x = -v_o \frac{3(RC)^2 s^2 + 4RCs + 1}{R_F R^2 C^3 s^3} \div RCs$$

$$v_x = -\frac{3RCs + 4 + 1/RCs}{RFRC^2s^2}\, v_0$$

$$\frac{v_0}{v_x} = -\frac{RFRC^2s^2}{3RCs + 4 + \frac{1}{RCs}}$$

$$v_x = v_0 \Rightarrow -\frac{RFRC^2s^2}{3RCs + 4 + \frac{1}{RCs}} = 1 = L(s)$$

$$\boxed{L(j\omega_0) = \frac{RFRC^2\omega_0^2}{j3RC\omega_0 + 4 + \frac{1}{jRC\omega_0}}} = \frac{RFRC^2\omega_0^2}{j\left(3RC\omega_0 - \frac{1}{RC\omega_0}\right) + 4}$$

- $L(j\omega_0) = \phi \Rightarrow 3RC\omega_0 - \frac{1}{RC\omega_0} = \phi \Rightarrow (RC\omega_0)^2 = \frac{1}{3} \Rightarrow \omega_0 = \frac{1}{RC\sqrt{3}}$

$\Rightarrow \boxed{\omega_0 = 3608{,}4 \text{ rad/s} \Rightarrow f_0 = 574{,}3 \text{ Hz}}$ $\quad 10^4 \quad 16.10^{-9}$

- $|L(j\omega_0)| = 1 \Rightarrow \frac{RFRC^2\omega_0^2}{4} = 1 \Rightarrow RF = \frac{4}{RC^2\omega_0^2} \Rightarrow \boxed{RF = 120\,k\Omega}$