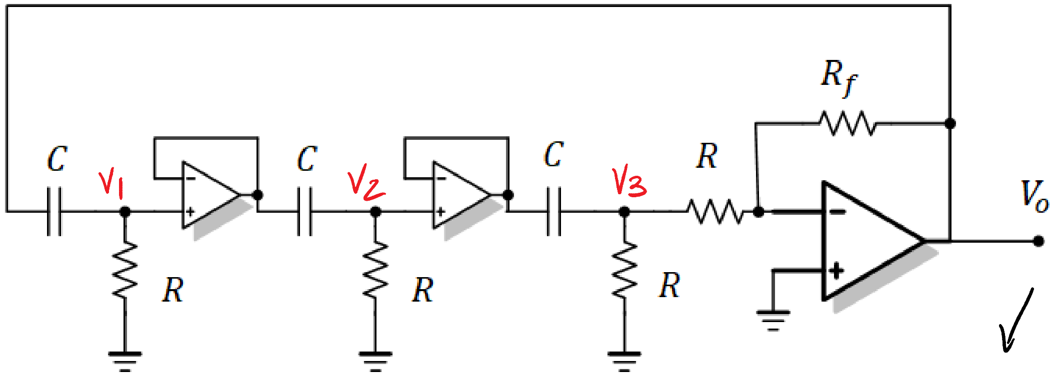
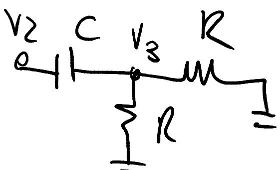
Resolução Ex 10 - CEA



a) $V_1 = \dfrac{R\,V_o}{R + 1/sC} = \dfrac{sCR}{sCR+1}\,V_o$

$V_2 = \dfrac{sCR}{sCR+1} \cdot V_1$



$V_3 = V_2 \cdot \dfrac{R/2}{1/sC + R/2} = \dfrac{sCR}{sCR+2}$

$V_o = -\dfrac{R_f}{R} \cdot V_3$

• Assim: $A\beta = \dfrac{V_1}{V_o} \cdot \dfrac{V_2}{V_1} \cdot \dfrac{V_3}{V_2} \cdot \dfrac{V_o}{V_3} = \dfrac{-R_f}{R}\,\dfrac{(sCR)^3}{(sCR+1)^2(sCR+2)}$

→ logo $A\beta = -\dfrac{R_f}{R}\,\dfrac{(sCR)^3}{(sCR)^3 + 4(sCR)^2 + 5sCR + 2}$

fazendo $s = j\omega \rightarrow L(j\omega) = A\beta(j\omega) = \dfrac{R_f/R \;\; j\omega^3C^3R^3}{-j(\omega CR)^3 - 4(\omega CR)^2 + j5\omega CR + 2}$

$L(j\omega) = \dfrac{j\,\frac{R_f}{R}(\omega CR)^3}{(2 - 4(\omega CR)^2) + j(5\omega CR - (\omega CR)^3)} \times j/j$

$$L(j\omega) = \frac{-\frac{R_f}{R}(\omega CR)^3}{-\left[5\omega CR - (\omega CR)^3\right] + j\left[1 - 4(\omega CR)^2\right]}$$

- P/ $L(j\omega_0) = 1$, tem-se que
- $1 - 4\omega_0^2 C^2 R^2 = 0 \Rightarrow \boxed{\omega_0 = \frac{1}{CR\sqrt{2}}}$ //

- $\frac{R_f}{R}\omega_0^3 C^3 R^3 = 5\omega_0 CR - \omega_0^3 C^3 R^3$

$$\frac{R_f}{R}\omega_0^2 C^2 R^2 = 5 - \omega_0^2 C^2 R^2$$

$$\frac{R_f}{R} \cdot \frac{1}{2} = 5 - \frac{1}{2} \Rightarrow \boxed{R_f = 9R}$$ //

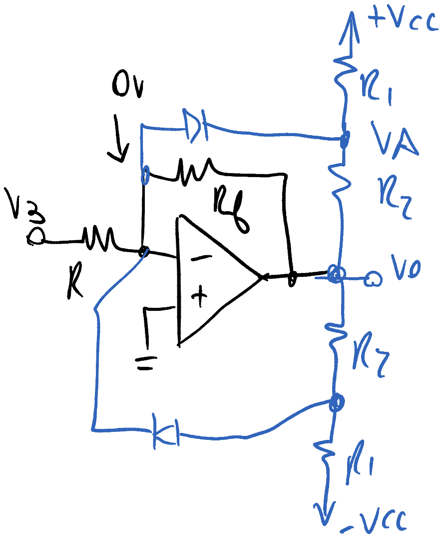
b) P/ $\omega_0 = 2\pi \cdot 10k\,Hz$

- Assumindo $R = 10k\Omega$

$R_f > 90k\Omega$

$$C = \frac{1}{R \cdot \omega_0 \sqrt{2}} = 1{,}12nF$$

c) Projetar um limitador p/ $\hat{V}_o = 8V$, sendo $V_{CC} = 15V$.



$$V_A = \frac{15 R_2}{R_1 + R_2} + \frac{V_o R_1}{R_1 + R_2}$$

Quando $\hat{V}_o = -8V \rightarrow V_A = -0{,}7\,V$

$$-0{,}7(R_1 + R_2) = 15 R_2 - 8 R_1$$

$$15{,}7 R_2 = 7{,}3 R_1$$

$$\frac{R_2}{R_1} = 0{,}465 \rightarrow R_1 = 10\,k\Omega,\quad R_2 = 4{,}65\,k\Omega$$