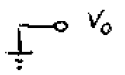
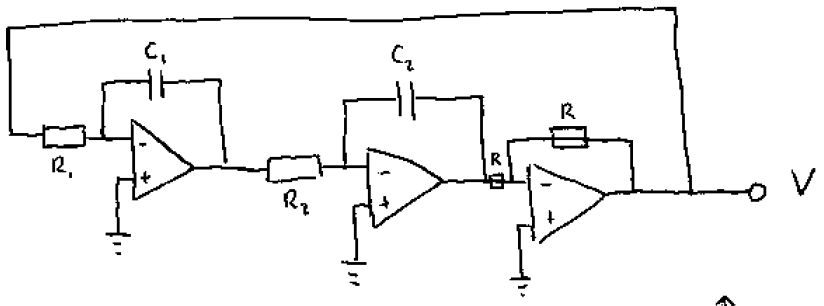
1) Solução 1 : 

Solução 2 : $A \frac{d^2V(t)}{dt^2} = -BV(t)$

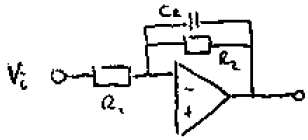
$$V = -\frac{B}{A} \iint V(t)\, dt^2$$



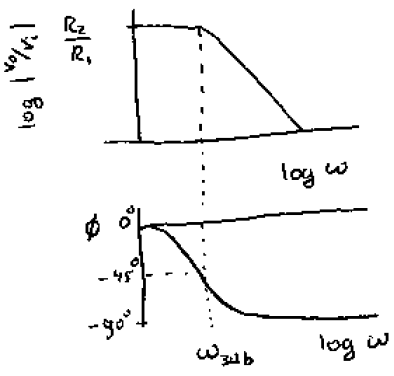
Veja também p. 3

V ↑ $-\frac{1}{R_1C_1}\int V\,dt$ ↑ $\frac{1}{R_1C_1R_2C_2}\iint V\,dt^2$ ↑ $-\frac{1}{R_1C_1R_2C_2}\iint V\,dt^2$

$$R_1C_1R_2C_2 = \frac{A}{B} = 3.6\ 10^7\ s^2$$

2) 

$$\left|\frac{V_o}{V_i}\right| = \frac{R_2}{R_1}\frac{1}{\sqrt{1+\omega^2(R_2C_2)^2}} = 100 \quad (DC)\ \omega=0$$



ω_{3db} : $\omega^2(R_2C_2)^2 = 1$

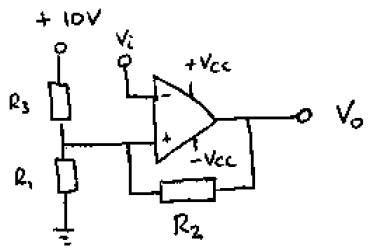
f_{3d} : $f = \frac{1}{2\pi R_2C_2} = \frac{1}{2\pi\ 10^5 \cdot 10^{-10}}$

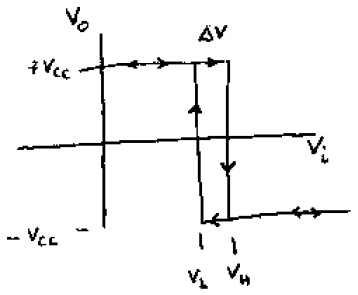
$= 15.9$ kHz
$(= 10^5$ rad/s)

V_i	ω	$\left\|\frac{V_o}{V_i}\right\|$	ϕ
sin ωt	10^4	99.50	$-5.7°$
	10^5	70.71	$-45°$
	10^6	9.95	$-84.3°$

$$\phi = \text{arc tg}\,(-\omega R_2C_2)$$

3)





$+V_{cc} = +10\,V$

$-V_{cc} = -10\,V$

$$V_H = \frac{R_1}{R_1+R_3}(+10V) \simeq +5V \Rightarrow R_1 = R_3 = 1\,k\Omega$$

$$\Delta V = 2V_{cc} \cdot \frac{R_1 /\!/ R_3}{R_2 + R_1 /\!/ R_3} \simeq 2V$$

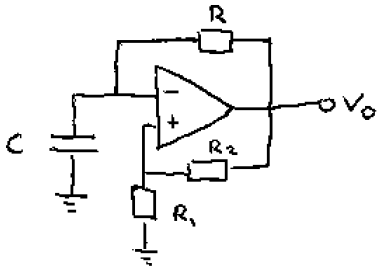
Veja também p. 3

$$\frac{R_1 /\!/ R_3}{R_2 + R_1 /\!/ R_3} \simeq 0.1 \Rightarrow \frac{0.5\,k}{R_2 + 0.5\,k} = 0.1$$

$$\Rightarrow R_2 = 4.5\,k\Omega$$

(p. 231 of Horowitz & Hill)

4)



(p. 695 of Bogart)

$$\beta = \frac{R_1}{R_1+R_2}$$

$$T = 2RC \ln\left(\frac{1+\beta}{1-\beta}\right) s.$$

$f = 1\,kHz \Rightarrow T = 1\,ms$.

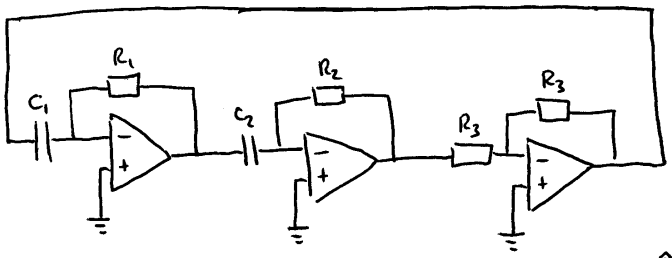
exemplo : $R_1 = R_2 = 1\,k\Omega$, $\beta = 0.5$

$$2RC \ln(3) = 10^{-3}$$

$$RC = \frac{1}{2\ln 3}\,10^{-3},$$

$$R = 1\,k\Omega \Rightarrow C = 0.46\,\mu F$$

1) Solução 3



$\uparrow$ $V(t)$ $\quad$ $\uparrow$ $-R_1C_1\dfrac{dV(t)}{dt}$ $\quad$ $\uparrow$ $R_1C_1R_2C_2\dfrac{d^2V(t)}{dt^2}$ $\quad$ $\uparrow$ $-R_1C_1R_2C_2\dfrac{d^2V(t)}{dt^2}$

$$A\frac{d^2V(t)}{dt^2} + BV(t) = 0 \Rightarrow V(t) = -\frac{A}{B}\frac{d^2V(t)}{dt^2}$$

$$\frac{A}{B} = R_1C_1R_2C_2 = 3.6\ 10^{7}\ s^2$$

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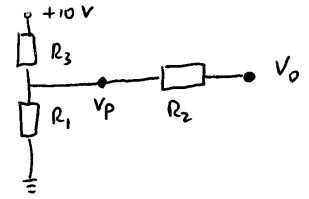
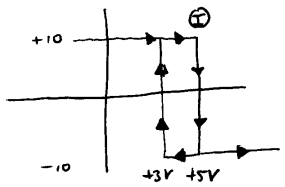
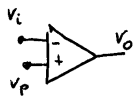
3)

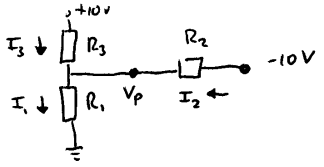






(I) $V_o = +10\,V$, $V_p = +5\,V \Rightarrow R_1 = R_2 /\!/ R_3 \Rightarrow \frac{1}{R_1} = \frac{1}{R_2} + \frac{1}{R_3}$

(II) $V_o = -10\,V$, $V_p = +3\,V \Rightarrow$



$I_1 = I_2 + I_3$

$$\frac{V_p}{R_1} = \frac{-10-V_p}{R_2} + \frac{10-V_p}{R_3} \Rightarrow \overset{\text{com}}{(V_p = 3)}$$

$$\Rightarrow 3\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right) = 10\left(\frac{1}{R_3} - \frac{1}{R_2}\right)$$

Solução: $R_2 = 1\,k\Omega$ (escolha) $\Rightarrow R_3 = 250\,\Omega$, $R_1 = 200\,\Omega$