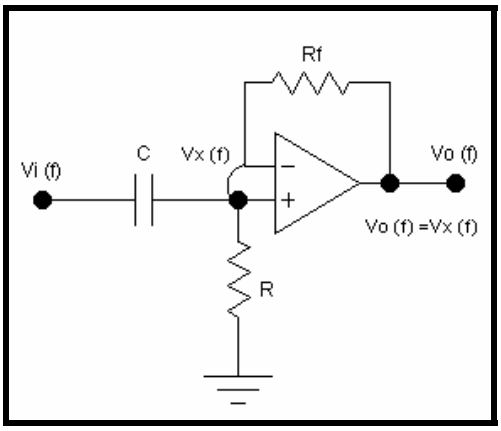
FILTRO PASA ALTAS –20 db/dec



a. Hallar $A_v(w) = f(R,C,w)$

$$V_x(w) = \frac{R}{R+Z_c}V_i(w) \quad \rightarrow \quad V_x(w) = V_o(w) \quad \rightarrow \quad V_o(w) = \frac{R}{R+\frac{1}{jwC}}V_i(w)$$

$$V_o(w) = \frac{R}{\frac{jwRC+1}{jwC}}V_i(w) \quad \rightarrow \quad V_o(w) = \frac{jwRC}{jwRC+1}V_i(w) \quad \rightarrow \quad A_v(w) = \frac{jwRC}{jwRC+1}$$

$$|A_v(w)| = \frac{wRC}{\sqrt{1+(wRC)^2}} \quad \rightarrow \quad \boxed{|A_v(w)| = \frac{wRC}{\sqrt{1+w^2R^2C^2}}}$$

$$\lim_{w\to\infty}|A_v(w)| = \frac{\infty}{\sqrt{\infty^2}} = \frac{\infty}{\infty} = 1$$ (Las frecuencias altas pasan)

$$\lim_{w\to 0}|A_v(w)| = \frac{0}{\sqrt{1}} = \frac{0}{1} = 0$$ (Las frecuencias bajas no pasan)

b. Hallar $w_c \;\; y \;\; f_c$

$$\frac{1}{\sqrt{2}} = \frac{w_c RC}{\sqrt{1+w_c{}^2 R^2 C^2}} \rightarrow \qquad \left(\sqrt{1+w_c{}^2 R^2 C^2} = \sqrt{2} w_c RC\right)^2 \qquad \rightarrow$$

$$1+w_c{}^2 R^2 C^2 = 2 w_c{}^2 R^2 C^2$$

$$w_c{}^2 = \frac{1}{R^2 C^2} \qquad \rightarrow \qquad \sqrt{w_c{}^2} = \sqrt{\frac{1}{R^2 C^2}} \qquad \rightarrow \qquad \boxed{w_c = \frac{1}{RC}} \qquad \rightarrow \qquad 2\pi f_c = \frac{1}{RC}$$

$$\boxed{f_c = \frac{1}{2\pi RC}}$$

c. Hallar $|A_v(f)| = f(f, f_c)$

$$A_v(w) = \frac{\frac{w}{w_c}}{\sqrt{1+\frac{w^2}{w_c{}^2}}} \qquad \rightarrow \qquad w = 2\pi f \;\; y \;\; w_c = 2\pi f_c \qquad \rightarrow$$

$$A_v(w) = \frac{\frac{2\pi f}{2\pi f_c}}{\sqrt{1+\left(\frac{2\pi f}{2\pi f_c}\right)^2}}$$

$$\boxed{A_v(w) = \frac{\frac{f}{f_c}}{\sqrt{1+\left(\frac{f}{f_c}\right)^2}}}$$

d. Dibujar $|A_v(f)| \;\; Vs \;\; f$

$$\boxed{A_v(w) = \frac{\frac{f}{f_c}}{\sqrt{1+\left(\frac{f}{f_c}\right)^2}}} \qquad \boxed{A_v = 20\log\left(\frac{V_0}{V_i}\right)}$$

f	$\lvert A_v(f)\rvert$	$\lvert A_v(f)\rvert$ db
0	0	0
0.1fc	0.10	-20.04
0.5fc	0.45	-6.99
0.8 fc	0.62	-4.09
fc	0.71	-3.01
2 fc	0.89	-0.97
4 fc	0.97	-0.26
6 fc	0.99	-0.12
8 fc	0.99	-0.07
10 fc	1	-0.04