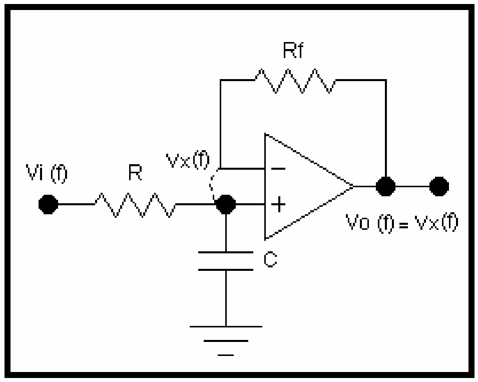
1. ANÁLISIS DE FILTROS

FILTRO PASABAJAS DE –20 db / dec



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

$V_0(w) = V_x(w)$

$$V_{x(w)} = \frac{Z_c}{R+Z_c} V_{i(w)} \quad \rightarrow \quad \frac{V_{o(w)}}{V_{i(w)}} = \frac{\frac{1}{jwc}}{R + \frac{1}{jwc}} \quad \rightarrow \quad \frac{V_{o(w)}}{V_{i(w)}} = \frac{\frac{1}{jwc}}{\frac{jwRC+1}{jwc}}$$

$$A_v(w) = \frac{1}{jwRC+1} \quad \rightarrow \quad |A_v(w)| = \frac{1 \ \angle 0}{\sqrt{(wRC)^2+1} \ \angle \tan^{-1} wRC}$$

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

$$\lim_{w\to\infty} |A_v(w)| = \frac{1}{\sqrt{\infty^2 R^2C^2+1}} = \frac{1}{\infty} = 0 \quad \text{(frecuencias altas no pasan)}$$

$$\lim_{w\to 0} |A_v(w)| = \frac{1}{\sqrt{0^2 R^2C^2+1}} = \frac{1}{1} = 1 \quad \text{(frecuencias bajas pasan)}$$

b. Hallar $w_c \ y \ f_c$

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

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

$$w_c{}^2R^2C^2+1 = 2 \quad \rightarrow \quad w_c{}^2 = \frac{2-1}{R^2C^2} \quad \rightarrow \quad \sqrt{w_c{}^2} = \sqrt{\frac{1}{R^2C^2}}$$

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

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

$$|A_v(w)| = \frac{1}{\sqrt{(wRC)^2+1}} \quad \rightarrow \quad |A_v(f)| = \frac{1}{\sqrt{(2\pi fRC)^2+1}} \quad \rightarrow$$

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

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

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

f	$\lvert A_v(f)\rvert$	$\lvert A_v(f)\rvert \; db$
0	1	0
0.1fc	0.995	-0.043
0.5fc	0.894	-0.973
0.8 fc	0.780	-2.158
fc	0.707	-3.011
2 fc	0.447	-6.993
4 fc	0.242	-12.323
6 fc	0.164	-15.703
8 fc	0.124	-18.131
10 fc	0.099	-20.087