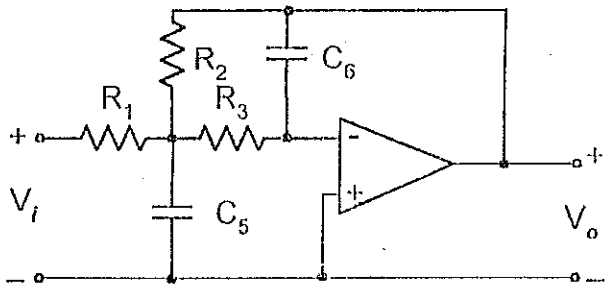
PASA BAJOS GANANCIA INFINITA

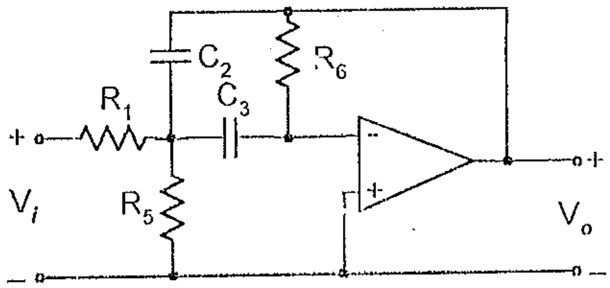


$$\frac{V_o(s)}{V_s(s)} = \frac{-1/R_1 R_3 C_5 C_6}{s^2 + s(1/C_5)(1/R_1 + 1/R_2 + 1/R_3) + 1/R_2 R_3 C_5 C_6}$$

$$\omega_o = \frac{1}{\sqrt{R_2 R_3 C_5 C_6}}$$

$$\frac{1}{Q} = \sqrt{\frac{C_6}{C_5}} \left(\sqrt{\frac{R_2 R_3}{R_1}} + \sqrt{\frac{R_3}{R_2}} + \sqrt{\frac{R_2}{R_3}} \right)$$

PASA BANDA GANANCIA INFINITA

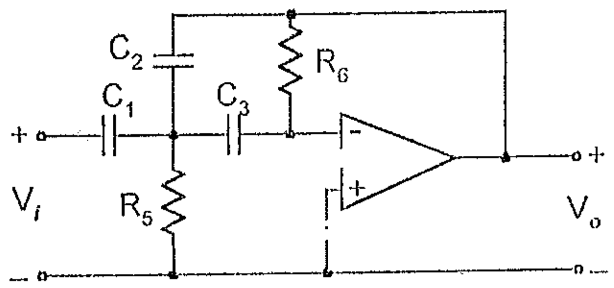


$$\frac{V_o(s)}{V_s(s)} = \frac{-\dfrac{s}{R_1\, C_2}}{s^2 + s\left(1/R_6\, C_3 + 1/R_6\, C_2\right) + \left(1/R_6\, C_2\, C_3\right)\left(1/R_1 + 1/R_5\right)}$$

$$\omega_o = \sqrt{\frac{1 + R_5/R_1}{R_5\, R_6\, C_2\, C_3}}$$

$$\frac{1}{Q} = \frac{\sqrt{R_5\, C_2 / R_6\, C_3} + \sqrt{R_5\, C_3 / R_6\, C_2}}{\sqrt{1 + R_5/R_1}}$$

PASA ALTOS GANANCIA INFINITA

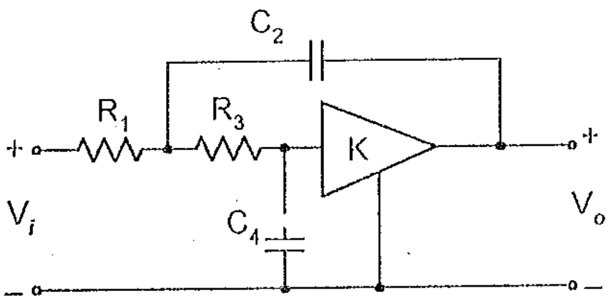


$$\frac{V_o(s)}{V_s(s)}=\frac{-s^2\,\dfrac{C_1}{C_2}}{s^2+s\,(1/R_6)\,(C_1/C_2\,C_3+1/C_2+1/C_3)+1/R_5\,R_6\,C_2\,C_3}$$

$$\omega_o=\frac{1}{\sqrt{R_5\,R_6\,C_2\,C_3}}$$

$$\frac{1}{Q}=\sqrt{\frac{R_5}{R_6}}\left(\frac{C_1}{\sqrt{C_2\,C_3}}+\sqrt{\frac{C_3}{C_2}}+\sqrt{\frac{C_2}{C_3}}\right)$$

PASA BAJOS SALLEN Y KEY



$$\frac{V_o(s)}{V_s(s)} = \frac{K / R_1 R_3 C_2 C_4}{s^2 + s\left(1/R_3 C_4 + 1/R_1 C_2 + 1/R_3 C_2 - K/R_3 C_4\right) + 1/R_1 R_3 C_2 C_4}$$

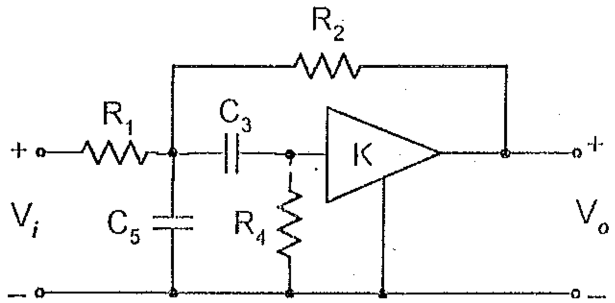
$$\omega_o = \frac{1}{\sqrt{R_1 R_3 C_2 C_4}}$$

$$\frac{1}{Q} = \sqrt{\frac{R_3 C_4}{R_1 C_2}} + \sqrt{\frac{R_1 C_4}{R_3 C_2}} + (1-K)\sqrt{\frac{R_1 C_2}{R_3 C_4}}$$

Si se adopta $R_1 = R_3 = R$ y $C_2 = C_4 = C$ resulta

$$\omega = \frac{1}{RC} \qquad \frac{1}{Q} = 3 - K$$

PASA BANDA SALLEN Y KEY



$$\frac{V_o(s)}{V_s(s)} = \frac{s\,K / R_1\,C_5}{s^2 + s\left(1/R_1\,C_5 + 1/R_2\,C_5 + 1/R_4\,C_5 + 1/R_4\,C_3 - K/R_2\,C_5\right) + \left(1/R_4\,C_3\,C_5\right)\left(1/R_1 + 1/R_2\right)}$$

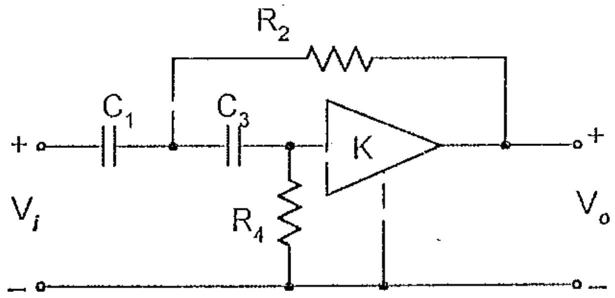
$$\omega_o = \sqrt{\frac{1 + R_1/R_2}{R_1\,R_4\,C_3\,C_5}}$$

$$\frac{1}{Q} = \frac{\left[1 + \left(R_1/R_2\right)\left(1-K\right)\right]\sqrt{R_4\,C_3/R_1\,C_5} + \sqrt{R_1\,C_3/R_4\,C_5} + \sqrt{R_1\,C_5/R_4\,C_3}}{\sqrt{1 + R_1/R_2}}$$

Si se adopta $R_1 = R_2 = R_4 = R$ y $C_3 = C_5 = C$ resulta

$$\omega_o = \frac{\sqrt{2}}{R\,C} \qquad \frac{1}{Q} = \frac{4-K}{\sqrt{2}}$$

PASA ALTOS SALLEN Y KEY



$$\frac{V_o(s)}{V_s(s)}=\frac{s^2\,K}{s^2+s\left(1/R_2\,C_1+1/R_4\,C_3+1/R_4\,C_1-K/R_2\,C_1\right)+1/R_2\,R_4\,C_1\,C_3}$$

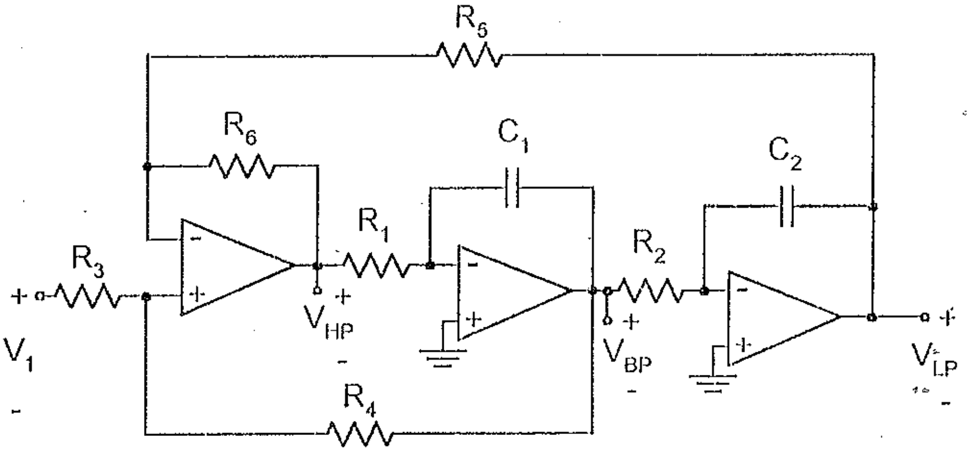
$$\omega_o=\frac{1}{\sqrt{R_2\,R_4\,C_1\,C_3}}$$

$$\frac{1}{Q}=\sqrt{\frac{R_4\,C_3}{R_2\,C_1}}+\sqrt{\frac{R_2\,C_1}{R_4\,C_3}}+\sqrt{\frac{R_2\,C_3}{R_4\,C_1}}-K\sqrt{\frac{R_4\,C_3}{R_2\,C_1}}$$

Si se adopta $R_2 = R_4 = R$ y $C_1 = C_3 = C$ resulta

$$\omega=\frac{1}{R\,C}\qquad\qquad \frac{1}{Q}=3-K$$

FILTRO KHN



$$\frac{V_{BP}(s)}{V_s(s)} = \frac{-\left[\dfrac{1+R_6/R_5}{1+R_3/R_4}\,\dfrac{s}{R_1\,C_1}\right]}{D(s)}$$

$$\frac{V_{LP}(s)}{V_s(s)} = \frac{\dfrac{1+R_6/R_5}{1+R_3/R_4}\,\dfrac{1}{R_1R_2C_1C_2}}{D(s)}$$

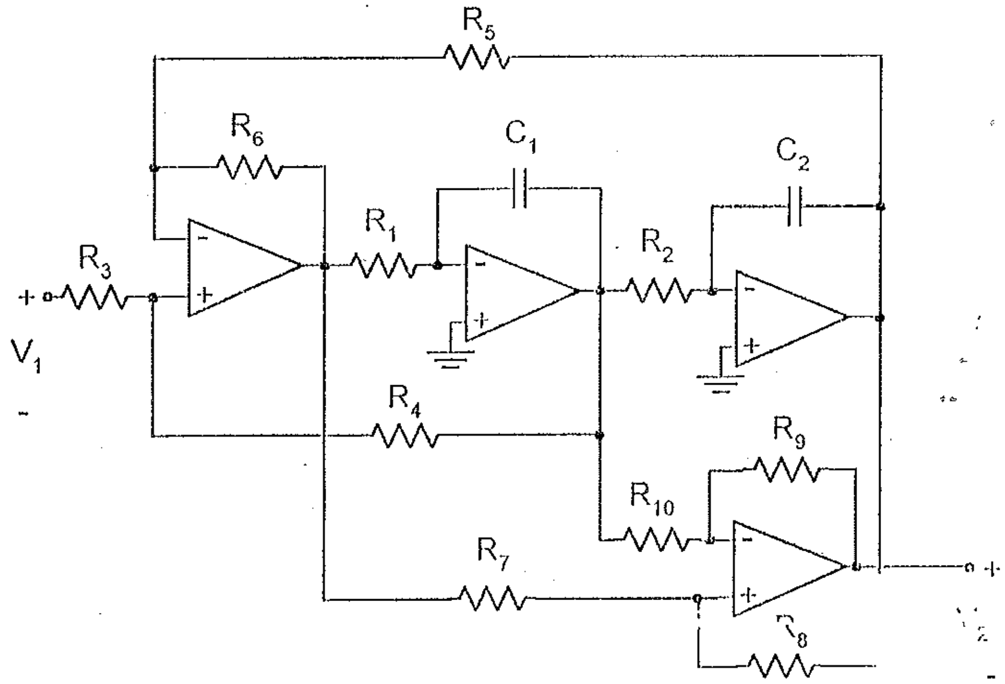
$$\frac{V_{HP}(s)}{V_s(s)} = \frac{\dfrac{1+R_6/R_5}{1+R_3/R_4}\,s^2}{D(s)}$$

$$D(s) = s^2 + \frac{s}{R_1C_1}\,\frac{1+R_6/R_5}{1+R_4/R_3} + \frac{R_6/R_5}{R_1R_2C_1C_2}$$

$$\omega_o = \sqrt{\frac{R_6/R_5}{R_1R_2C_1C_2}}$$

$$\frac{1}{Q} = \frac{1+R_6/R_5}{1+R_4/R_3}\sqrt{\frac{R_5R_2C_2}{R_6R_1C_1}}$$

FILTRO BICUADRATICO



$$\frac{V_2(s)}{V_1(s)} = \frac{1+R_9/R_{10}}{1+R_7/R_8}\,\frac{1+R_6/R_5}{1+R_3/R_4}\,\frac{s^2+\dfrac{s}{R_1C_1}\,\dfrac{1+R_7/R_8}{1+R_{10}/R_9}+\dfrac{R_7/R_8}{R_1R_2C_1C_2}}{s^2+\dfrac{s}{R_1C_1}\,\dfrac{1+R_6/R_5}{1+R_4/R_3}+\dfrac{R_6/R_5}{R_1R_2C_1C_2}}$$

$$\omega_z = \sqrt{\frac{R_7/R_8}{R_1R_2C_1C_2}} \qquad \omega_p = \sqrt{\frac{R_6/R_5}{R_1R_2C_1C_2}}$$

$$\frac{1}{Q_z} = \frac{1+R_7/R_8}{1+R_{10}/R_9}\sqrt{\frac{R_8R_2C_2}{R_7R_1C_1}} \qquad \frac{1}{Q_p} = \frac{1+R_6/R_5}{1+R_4/R_3}\sqrt{\frac{R_5R_2C_2}{R_6R_1C_1}}$$