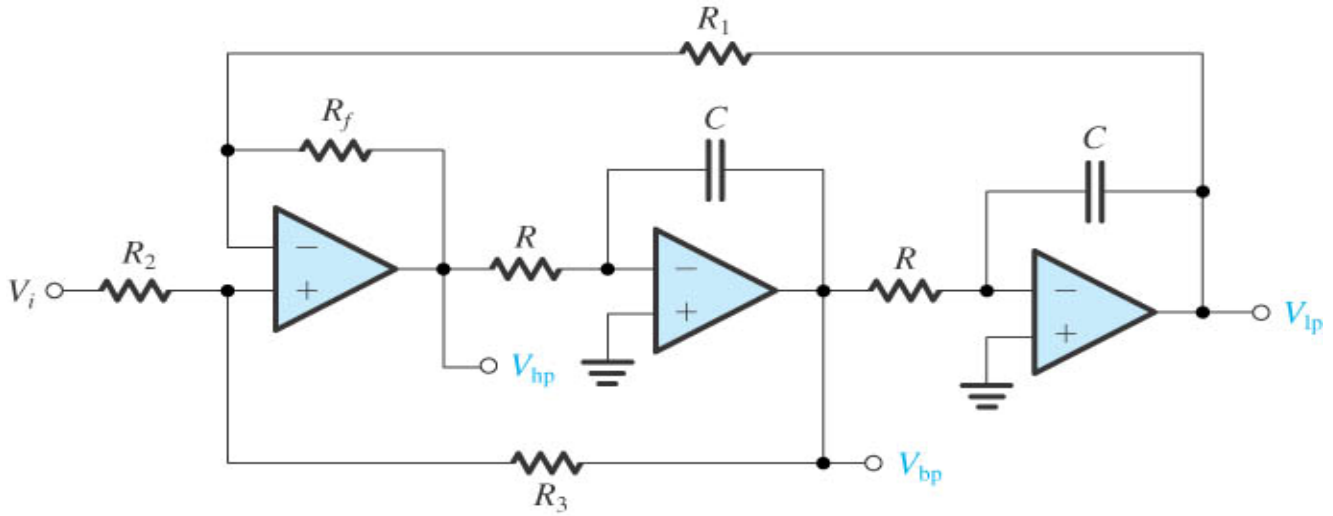
Huelsman-Newcomb Biquad Active Filter



(a)

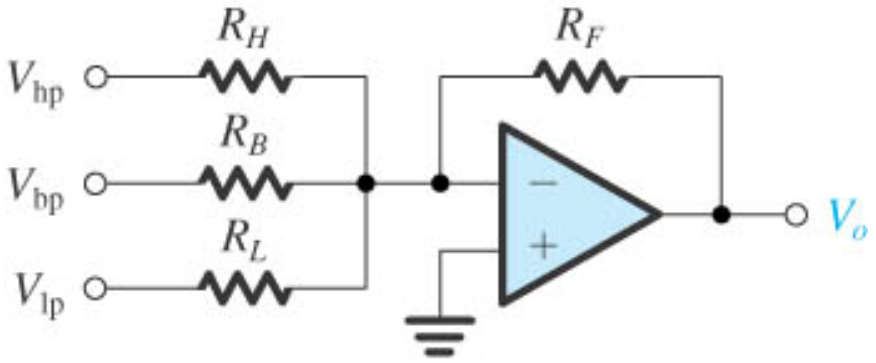
$$V_{hp} = \frac{R_3}{R_2 + R_3}\left(1 + \frac{R_f}{R_1}\right)Vi + \frac{R_2}{R_2 + R_3}\left(1 + \frac{R_f}{R_1}\right)\left(-\frac{\omega_o}{s}V_h p\right) - \frac{R_f}{R_1}\left(\frac{\omega_o^2}{s^2}V_{hp}\right)$$

$$\frac{R_f}{R_1} = 1$$

$$\frac{R_3}{R_2} = 2Q - 1$$

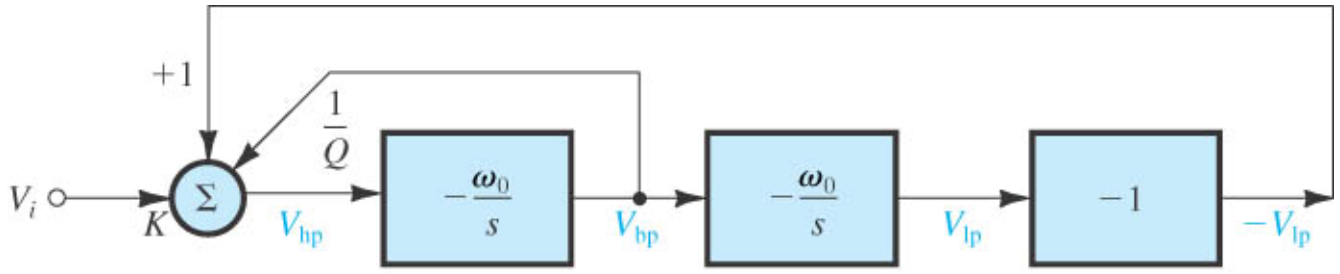
$$K = 2 - \frac{1}{Q}$$

$$V_o = -\left(\frac{R_F}{R_H} V_{hp} + \frac{R_F}{R_B} V_{bp} + \frac{R_F}{R_L} V_l p \right)$$

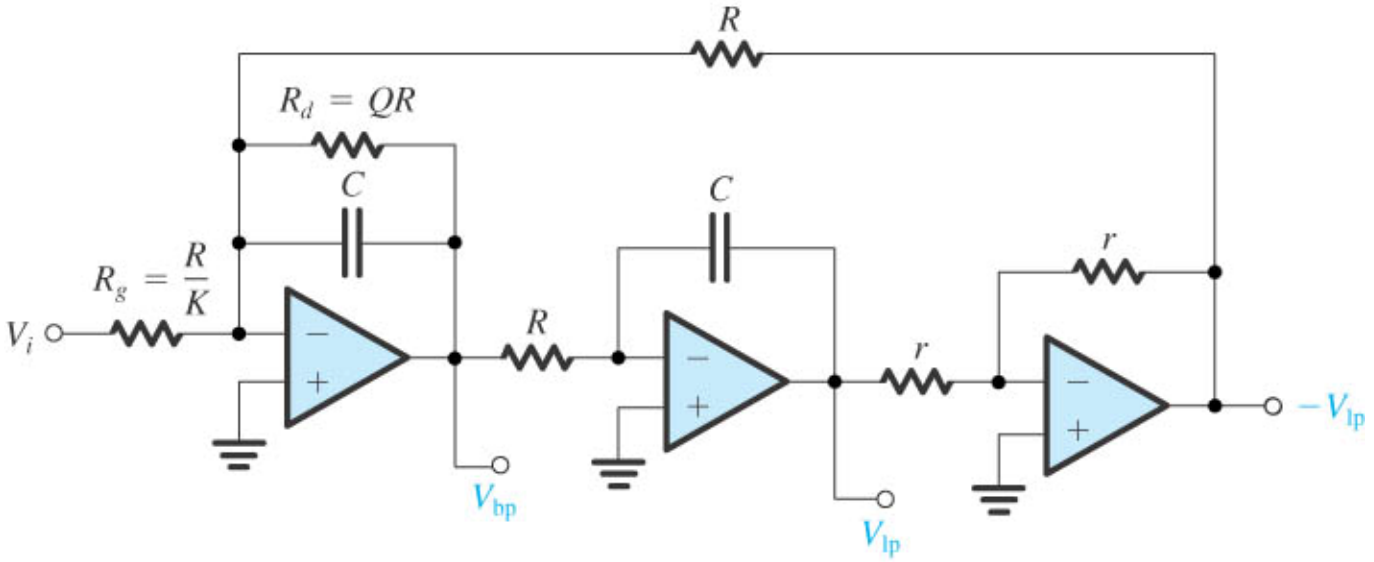


(b)

Tow-Thomas Biquad



(a)



(b)

The Tow-Thomas Biquad with Feedforward