

## DESIGN PROCEDURE

Given:  $H_o$ ,  $Q = \frac{1}{\alpha}$ ,  $\omega_o = 2\pi f_o$

Choose:  $C = C_3 = C_4$

Calculate:  $Q = \frac{1}{\alpha}$

$$R_1 = \frac{Q}{H_o \omega_o C}$$

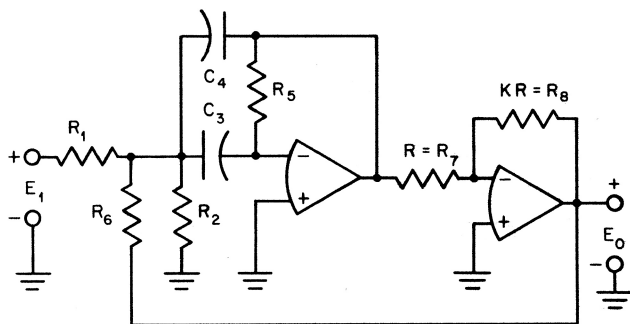
$$R_2 = \frac{Q}{(2Q^2 - H_o) \omega_o C}$$

$$R_5 = \frac{2Q}{\omega_o C}$$

Again, restrictions on  $H_o$  apply to guarantee that the design equations give fairly accurate results.

**Bandpass 2.** Another multiple-feedback circuit uses an additional active element to overcome some of the disadvantages of the single-amplifier circuit, especially the bandpass realization for  $Q$ 's roughly between 10 and 50. High  $Q$ 's realized with bandpass 1 have large spreads of element values and high  $Q$  sensitivities to element value changes. The multiple-feedback circuit with positive feedback is shown in Fig. 8.6. The voltage transfer function is

$$\frac{E_o}{E_1}(s) = \frac{s(K/R_1 C_4)}{s^2 + (s/R_5 C_4)(1 + C_4/C_3 - KR_5/R_6) + (1/C_3 C_4 R_5)(1/R_1 + 1/R_2 + 1/R_6)}$$



**Fig. 8.6** Multiple-feedback bandpass circuit with positive feedback.