In the Sedra/Smith textbook: Chapter 12.

D12.33 Design the LCR resonator of Fig. 12.17(a) to obtain natural modes with $\omega_0 = 10^4$ rad/s and $Q = 2$. Use $R = 10$ kΩ.

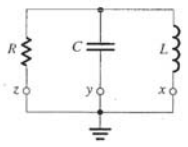


FIGURE 12.17 (a)

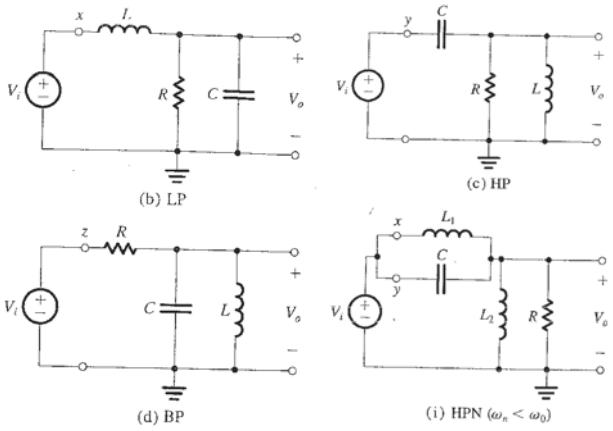
12.35 Derive an expression for $V_o(s)/V_i(s)$ of the high-pass circuit in Fig. 12.18(c).

D12.36 Use the circuit of Fig. 12.18(b) to design a low-pass filter with $\omega_0 = 10^5$ rad/s and $Q = 1/\sqrt{2}$. Utilize a 0.1-μF capacitor.

D12.37 Modify the bandpass circuit of Fig. 12.18(d) to change its center-frequency gain from 1 to 0.5 without changing ω_0 or Q.

12.39 Consider the notch circuit shown in Fig. 12.18(i). For what ratio of L_1 to L_2 does the notch occur at $0.9\omega_0$? For this case, what is the magnitude of the transmission at frequencies $\ll \omega_0$? At frequencies $\gg \omega_0$?

D12.49 Design the KHN circuit of Fig. 12.24(a) to realize a bandpass filter with a center frequency of 1 kHz and a 3-dB bandwidth of 50 Hz. Use 10-nF capacitors. Give the complete circuit and specify all component values. What value of center-frequency gain is obtained?



D12.52 Design the circuit of Fig. 12.26 to realize a low-pass notch filter with $\omega_0 = 10^4$ rad/s, $Q = 10$, dc gain = 1, and $\omega_n = 1.2 \times 10^4$ rad/s. Use $C = 10$ nF and $r = 20$ kΩ.

D12.53 In the all-pass realization using the circuit of Fig. 12.26, which component(s) does one need to trim to adjust (a) only ω_z and (b) only Q_z?

D12.54 It is required to design a third-order low-pass filter whose $|T|$ is equiripple in both the passband and the stopband (in the manner shown in Fig. 12.3, except that the response shown is for $N = 5$). The filter passband extends from $\omega = 0$ to $\omega = 1$ rad/s and the passband transmission varies between 1 and 0.9. The stopband edge is at $\omega = 1.2$ rad/s. The following transfer function was obtained using filter design tables:

$$T(s) = \frac{0.4508(s^2 + 1.6996)}{(s + 0.7294)(s^2 + s0.2786 + 1.0504)}$$

The actual filter realized is to have $\omega_p = 10^4$ rad/s.

(a) Obtain the transfer function of the actual filter by replacing s by $s/10^4$.

(b) Realize this filter as the cascade connection of a first-order LP op amp–RC circuit of the type shown in Fig. 12.13(a) and a second-order LPN Tow-Thomas biquad.

Each section is to have a dc gain of unity. Select appropriate component values. (*Note:* A filter with an equiripple response in both the passband and the stopband is known as an **elliptic filter.**)