باسمه تعالی

تکلیف سری نهم مدارهای الکتریکی ۱ نام استاد: خانی

1. A series-connected circuit has $R = 4\ \Omega$ and $L = 25$ mH. (a) Calculate the value of C that will produce a quality factor of 50. (b) Find ω_1, ω_2, and B. (c) Determine the average power dissipated at $\omega = \omega_0, \omega_1, \omega_2$. Take $V_m = 100$ V.
Answer: (a) 0.625 μF, (b) 7920 rad/s, 8080 rad/s, 160 rad/s,
(c) 1.25 kW, 0.625 kW, 0.625 kW.

2. A parallel resonant circuit has $R = 100\ \text{k}\Omega$&, $L = 20$ mH, and $C = 5$ nF. Calculate ω_0, ω_1, ω_2, Q, and B.
Answer: 100 krad/s, 99 krad/s, 101 krad/s, 50, 2 krad/s.

3. Calculate the resonant frequency of the circuit in Fig. 14.29.
Answer: 2.179 rad/s.

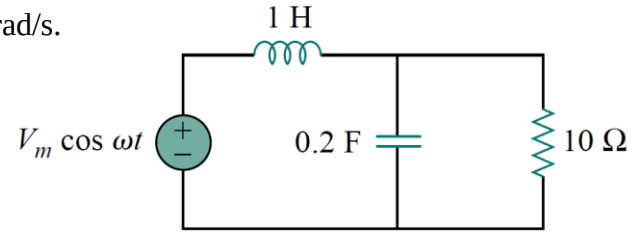

Figure 14.29 For Practice Prob. 14.9.

4. For the circuit in Fig. 14.40, obtain the transfer function $\mathbf{V}_o(\omega)/\mathbf{V}_i(\omega)$. Identify the type of filter the circuit represents and determine the corner frequency. Take $R_1 = 100\ \Omega = R_2$, $L = 2$ mH.

Answer: Highpass filter, $\dfrac{R_2}{R_1 + R_2}\left(\dfrac{j\omega}{j\omega + \omega_c}\right)$,

$$\omega_c = \frac{R_1 R_2}{(R_1 + R_2)L} = 25 \text{ krad/s}.$$

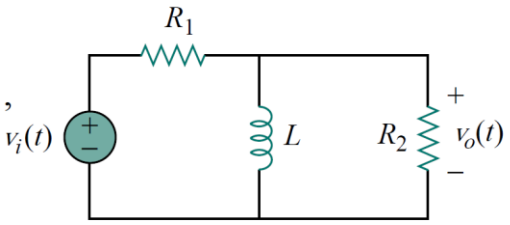

Figure 14.40 For Practice Prob. 14.10.

5. Design a bandpass filter of the form in Fig. 14.35 with a lower cutoff frequency of 20.1 kHz and an upper cutoff frequency of 20.3 kHz. Take $R = 20\ \text{k}\Omega$. Calculate L, C, and Q.
Answer: 7.96 H, 3.9 pF, 101.

6. For the "tank" circuit in Fig. 14.75, find the resonant frequency.

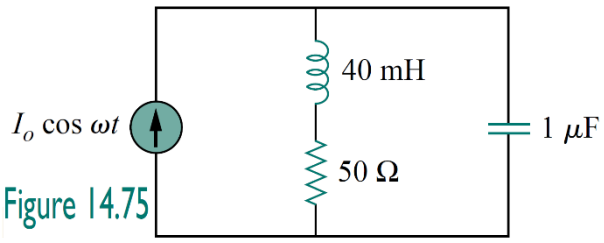

Figure 14.75

7. The RC circuit in Fig. 14.102 is used for a lead compensator in a system design. Obtain the transfer function of the circuit.

8. A certain electronic test circuit produced a resonant curve with half-power points at 432 Hz and 454 Hz. If $Q = 20$, what is the resonant frequency of the circuit?

9. In an electronic device, a series circuit is employed that has a resistance of 100 Ω, a capacitive reactance of 5 kΩ, and an inductive reactance of 300 Ω when used at 2 MHz. Find the resonant frequency and bandwidth of the circuit.

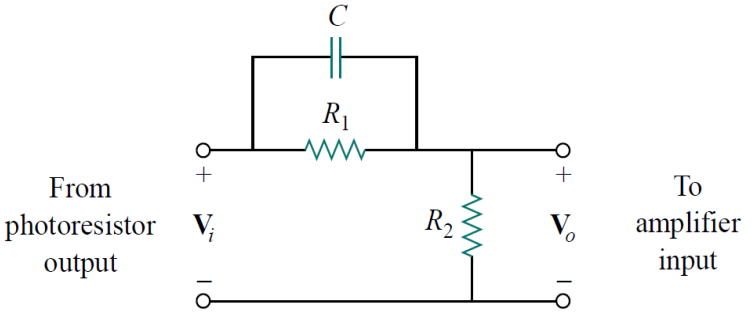

Fig. 14.102