PROBLEMS

SECTIONS 20.2 THROUGH 20.7 Series Resonance

1. Find the resonant ω_s and f_s for the series circuit with the following parameters:
   a. $R = 10\ \Omega$, $L = 1$ H, $C = 16\ \mu$F
   b. $R = 300\ \Omega$, $L = 0.5$ H, $C = 0.16\ \mu$F
   c. $R = 20\ \Omega$, $L = 0.28$ mH, $C = 7.46\ \mu$F

2. For the series circuit of Fig. 20.46:
   a. Find the value of X_C for resonance.
   b. Determine the total impedance of the circuit at resonance.
   c. Find the magnitude of the current I.
   d. Calculate the voltages V_R, V_L, and V_C at resonance. How are V_L and V_C related? How does V_R compare to the applied voltage E?
   e. What is the quality factor of the circuit? Is it a high- or low-Q circuit?
   f. What is the power dissipated by the circuit at resonance?

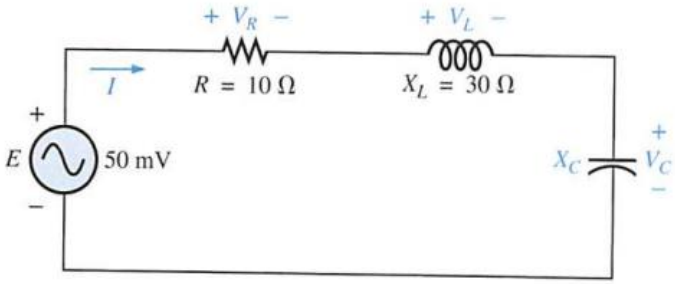

FIG. 20.46
Problem 2.

3. For the series circuit of Fig. 20.47:
   a. Find the value of X_L for resonance.
   b. Determine the magnitude of the current I at resonance.
   c. Find the voltages V_R, V_L, and V_C at resonance, and compare their magnitudes.
   d. Determine the quality factor of the circuit. Is it a high- or low-Q circuit?
   e. If the resonant frequency is 5 kHz, determine the value of L and C.
   f. Find the bandwidth of the response if the resonant frequency is 5 kHz.
   g. What are the low and high cutoff frequencies?

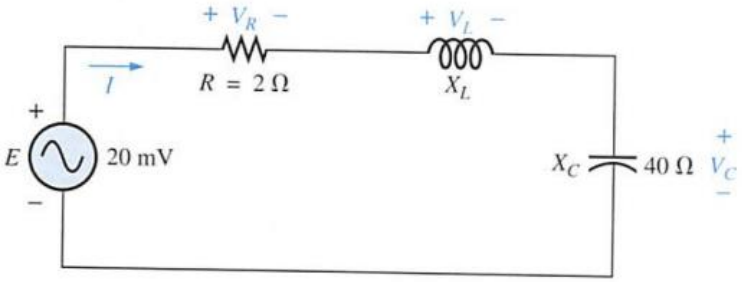

FIG. 20.47
Problem 3.

4. For the circuit of Fig. 20.48:
   a. Find the value of L in millihenries if the resonant frequency is 1800 Hz.
   b. Calculate X_L and X_C. How do they compare?
   c. Find the magnitude of the current I_{rms} at resonance.
   d. Find the power dissipated by the circuit at resonance.
   e. What is the apparent power delivered to the system at resonance?
   f. What is the power factor of the circuit at resonance?
   g. Calculate the Q of the circuit and the resulting bandwidth.
   h. Find the cutoff frequencies, and calculate the power dissipated by the circuit at these frequencies.

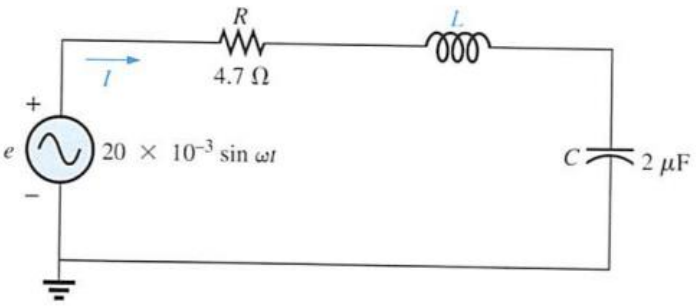

FIG. 20.48
Problem 4.