EXERCISES 7

In Exercises 1 and 2, perform the indicated operations if the given changes are made in the indicated examples of this section.

1. In Example 1, change the value of X_L to 16.0 Ω and then solve the given problem.
2. In Example 5, double the values of L and C and then solve the given problem.

In Exercises 3–6, use the circuit shown in Fig. 28. The current in the circuit is 5.75 mA. Determine the indicated quantities.

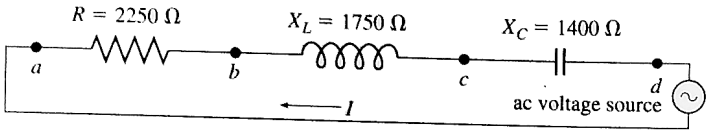

Fig. 28

3. The voltage across the resistor (between points a and b).
4. The voltage across the inductor (between points b and c).
5. (a) The magnitude of the impedance across the resistor and the inductor (between points a and c).
   (b) The phase angle between the current and the voltage for this combination.
   (c) The voltage across this combination.
6. (a) The magnitude of the impedance across the resistor, inductor, and capacitor (between points a and d).
   (b) The phase angle between the current and the voltage for this combination.
   (c) The voltage across this combination.

In Exercises 7–10, an ac circuit contains the given combination of circuit elements from among a resistor (R = 45.0 Ω), a capacitor (C = 86.2 μF), and an inductor (L = 42.9 mH). If the frequency in the circuit is f = 60.0 Hz, find (a) the magnitude of the impedance and (b) the phase angle between the current and the voltage.

7. The circuit has the inductor and the capacitor (an *LC* circuit).
8. The circuit has the resistor and the capacitor (an *RC* circuit).
9. The circuit has the resistor and the inductor (an *RL* circuit).
10. The circuit has the resistor, the inductor, and the capacitor (an *RLC* circuit).

In Exercises 11–24, solve the given problems.

11. Given that the current in a given circuit is $3.90 - 6.04j$ mA and the impedance is $5.16 + 1.14j$ kΩ, find the magnitude of the voltage.
12. Given that the voltage in a given circuit is $8.375 - 3.140j$ V and the impedance is $2.146 - 1.114j$ Ω, find the magnitude of the current.
13. A resistance (R = 25.3 Ω) and a capacitance (C = 2.75 nF) are in an AM radio circuit. If f = 1200 kHz, find the impedance across the resistor and the capacitor.
14. A resistance (R = 64.5 Ω) and an inductance (L = 1.08 mH) are in a telephone circuit. If f = 8.53 kHz, find the impedance across the resistor and inductor.
15. The reactance of an inductor is 1200 Ω for f = 280 Hz. What is the inductance?
16. A resistor, an inductor, and a capacitor are connected in series across an ac voltage source. A voltmeter measures 12.0 mV, 15.5 mV, and 10.5 mV, respectively, when placed across each element separately. What is the voltage of the source?
17. An inductance of 12.5 μH and a capacitance of 47.0 nF are in series in an amplifier circuit. Find the frequency for resonance.
18. A capacitance (C = 95.2 nF) and an inductance are in series in the circuit of a receiver for navigation signals. Find the inductance if the frequency for resonance is 50.0 kHz.
19. In Example 6, what should be the capacitance in order to receive a 680-kHz radio signal?
20. A 220-V source with f = 60.0 Hz is connected in series to an inductance (L = 2.05 H) and a resistance R in an electric-motor circuit. Find R if the current is 0.250 A.
21. The power P (in W) supplied to a series combination of elements in an ac circuit is $P = VI\cos\theta$, where V is the effective voltage, I is the effective current, and θ is the phase angle between the current and voltage. If V = 225 mV across the resistor, capacitor, and inductor combination in Exercise 10, determine the power supplied to these elements.
22. For two impedances Z_1 and Z_2 in parallel, the reciprocal of the combined impedance Z_C is the sum of the reciprocals of Z_1 and Z_2. Find the combined impedance for the parallel circuit elements in Fig. 29 if the current in the circuit has a frequency of 60.0 Hz.

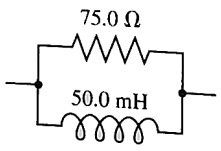

Fig. 29

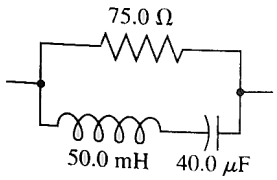

Fig. 30

23. Find the combined impedance of the circuit elements in Fig. 30. The frequency of the current in the circuit is 60.0 Hz. See Exercise 22.
24. (a) If the complex number j, in polar form, is multiplied by itself, what is the resulting number in polar and rectangular forms? (b) In the complex plane, where is the resulting complex number in relation to j?