13. The dividing line for calculating the value of a choke inductance is to make

a. X_L 10 or more times larger than the series R.

b. X_L one-tenth or less than the series R.

c. X_L equal to R.

d. R 10 or more times larger than the series X_L.

14. The Q of a coil is affected by

a. frequency.

b. the resistance of the coil.

c. skin effect.

d. all of the above.

15. If the current through a 300-mH coil increases at the linear rate of 50 mA per 10 μs, how much is the induced voltage, V_L?

a. 1.5 V.

b. 1.5 kV.

c. This is impossible to determine because X_L is unknown.

d. This is impossible to determine because V_L also increases at a linear rate.

Essay Questions

1. What characteristic of the current in an inductance determines the amount of induced voltage? State briefly why.

2. Draw a schematic diagram showing an inductance connected across a sine-wave voltage source, and indicate the current and voltage that are 90° out of phase with one another.

3. Why is the voltage across a resistance in phase with the current through the resistance?

4. (**a**) Draw the sine waveforms for two voltages 90° out of phase, each with a peak value of 100 V. (**b**) Why does their phasor sum equal 141 V and not 200 V? (**c**) When will the sum of two 100-V drops in series equal 200 V?

5. (**a**) Define the phase angle of a sine-wave ac circuit. (**b**) State the formula for the phase angle in a circuit with X_L and R in series.

6. Define the following: (**a**) Q of a coil; (**b**) ac effective resistance; (**c**) rf choke; (**d**) sawtooth current.

7. Why do all waveshapes in Fig. 21–2*b* have the same frequency?

8. Describe how to check the trouble of an open choke with an ohmmeter.

9. Redraw the circuit and graph in Fig. 21–11 for a sawtooth current with a peak of 30 mA.

10. Why is the R_e of a coil considered resistance rather than reactance?

11. Why are rf chokes usually smaller than af chokes?

12. What is the waveshape of v_L for a sine wave i_L?

Problems

SECTION 21–1 SINE WAVE i_L LAGS v_L BY 90°

21–1 In Fig. 21–12, what is the

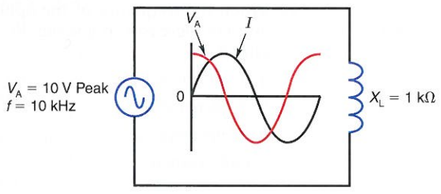
a. peak value of the inductor voltage, V_L?

b. peak value of the inductor current, i_L?

c. frequency of the inductor current, i_L?

d. phase relationship between V_L and i_L?

Figure 21–12



21–2 In Fig. 21–12, what is the value of the induced voltage, V_L, when i_L is at

a. 0 mA?

b. its positive peak of 10 mA?

c. its negative peak of 10 mA?

21–3 In Fig. 21–12, draw the phasors representing V_L and i_L using

a. i_L as the reference phasor.

b. V_L as the reference phasor.

SECTION 21–2 X_L AND R IN SERIES

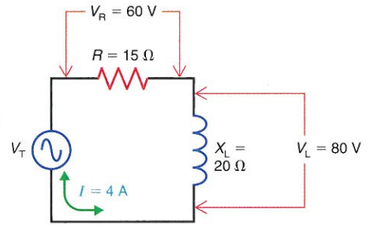
21–4 In Fig. 21–13, how much current, I, is flowing

a. through the 15-Ω resistor, R?

b. through the 20-Ω inductive reactance, X_L?

c. to and from the terminals of the applied voltage, V_T?

Figure 21–13



21–5 In Fig. 21–13, what is the phase relationship between

a. I and V_R?

b. I and V_L?

c. V_L and V_R?

21–6 In Fig. 21–13, how much is the applied voltage, V_T?

21–7 Draw the phasor voltage triangle for the circuit in Fig. 21–13. (Use V_R as the reference phasor.)

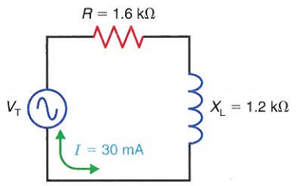
21–8 In Fig. 21–14, solve for

a. the resistor voltage, V_R.

b. the inductor voltage, V_L.

c. the total voltage, V_T.

Figure 21–14



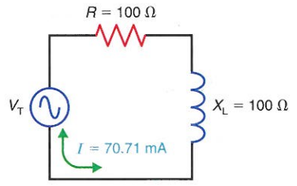
21–9 In Fig. 21–15, solve for

a. the resistor voltage, V_R.

b. the inductor voltage, V_L.

c. the total voltage, V_T.

Figure 21–15



21–10 In a series RL circuit, solve for the applied voltage, V_T, if

a. V_R = 12 V and V_L = 6 V.

b. V_R = 25 V and V_L = 40 V.

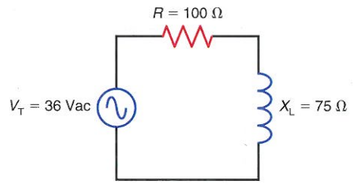
c. V_R = 9 V and V_L = 16 V.

d. V_R = 40 V and V_L = 40 V.

SECTION 21–3 IMPEDANCE Z TRIANGLE

21–11 In Fig. 21–16, solve for Z_T, I, V_L, V_R, and θ_Z.

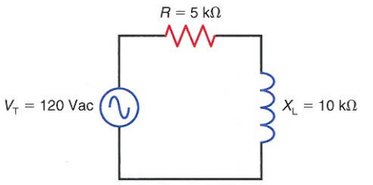
Figure 21–16



21–12 Draw the impedance triangle for the circuit in Fig. 21–16. (Use R as the reference phasor.)

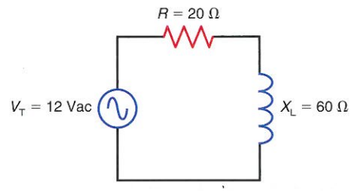
21–13 In Fig. 21–17, solve for Z_T, I, V_L, V_R, and θ_Z.

Figure 21–17



21–14 In Fig. 21–18, solve for Z_T, I, V_L, V_R, and θ_Z.

Figure 21–18



21–15 In Fig. 21–19, solve for Z_T, I, V_L, V_R, and θ_Z.

Figure 21–19