4.7 Connect a 5-Ω resistor in parallel with the inductor in the circuit shown in Fig. P4.6. Suppose that $v_s(t) = 13 \cos(2t - 22.6°)$ V. Find the voltage $v_o(t)$ across the inductor by using voltage division. Draw a phasor diagram. Is this circuit a lag network or a lead network?

4.8 Connect a 5-Ω resistor in parallel with the inductor in the circuit shown in Fig. P4.6. Suppose that $v_s(t) = 13 \cos(2t - 22.6°)$ V. Find the voltage $v_o(t)$ across the inductor by using nodal analysis. Draw a phasor diagram. Is this circuit a lag network or a lead network?

4.9 For the circuit given in Fig. P4.9, suppose that $i_s(t) = 5 \cos 3t$ A. Find $v_o(t)$ and $v_s(t)$ by using current division.

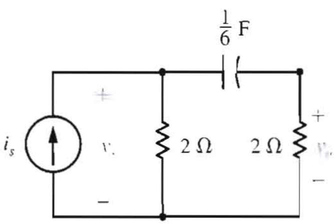

Fig. P4.9

4.10 For the circuit given in Fig. P4.9, suppose that $i_s(t) = 5 \cos 3t$ A. Find $v_o(t)$ and $v_s(t)$ by using nodal analysis.

4.11 A voltage of $v_s(t) = 10 \cos \omega t$ V is applied to a series *RLC* circuit. If $R = 5\ \Omega$, $L = \frac{1}{5}$ H, and $C = \frac{1}{5}$ F, by how many degrees does $v_C(t)$ lead or lag $v_s(t)$ when (a) $\omega = 1$ rad/s, (b) $\omega = 5$ rad/s, and (c) $\omega = 10$ rad/s?

4.12 A voltage of $v_s(t) = 10 \cos \omega t$ V is applied to a series *RLC* circuit. If $R = 5\ \Omega$, $L = \frac{1}{5}$ H, and $C = \frac{1}{5}$ F, by how many degrees does $v_R(t)$ lead or lag $v_s(t)$ when (a) $\omega = 1$ rad/s, (b) $\omega = 5$ rad/s, and (c) $\omega = 10$ rad/s?

4.13 For the *RLC* connection given in Fig. P4.13, find the impedance **Z** when ω is (a) 2, (b) 4, and (c) 8 rad/s.

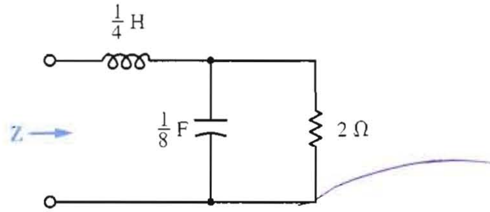

Fig. P4.13

4.14 For the *RLC* connection shown in Fig. P4.14, find the admittance **Y** when ω is: (a) 1, (b) 3, and (c) 7 rad/s.

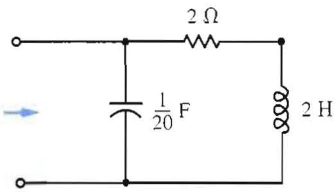

Fig. P4.14

4.15 Show that a general expression for the impedance **Z** depicted in Fig. P4.13 is

$$\mathbf{Z} = \frac{32}{\omega^2 + 16} + j\frac{\omega(\omega^2 - 16)}{4(\omega^2 + 16)}$$

4.16 Show that a general expression for the admittance **Y** depicted in Fig. P4.14 is

$$\mathbf{Y} = \frac{1}{2(\omega^2 + 1)} + j\frac{\omega(\omega^2 - 9)}{20(\omega^2 + 1)}$$

4.17 For the circuit shown in Fig. P4.17, find the Thévenin equivalent of the circuit in the shaded box when $v_s(t) = 4 \cos(4t - 60°)$ V. Use this to determine $v_o(t)$.

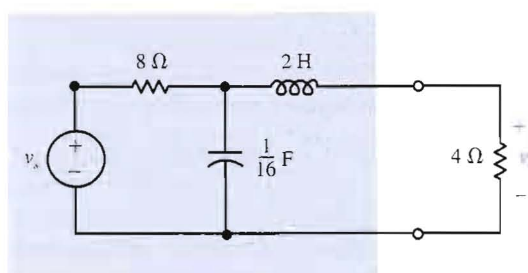

Fig. P4.17