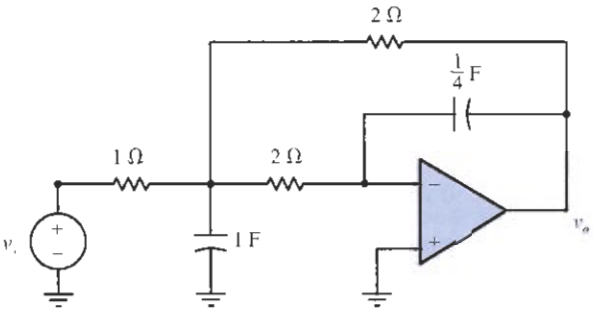

Fig. P4.23

4.47/−63.4° V and $\mathbf{Z}_o = 1.6 + j4.8\ \Omega$. (a) Replace the 4-Ω load resistor by an impedance $\mathbf{Z}_L$ that absorbs the maximum average power, and determine this maximum power. (b) Replace the 4-Ω load resistor with a resistance R_L that absorbs the maximum power for resistive loads, and determine this power.

4.28 For the *RLC* circuit shown in Fig. P4.28, suppose that $v_s(t) = 10 \cos 3t$ V. Find the average power absorbed by the 4-Ω resistor for the case that (a) $C = \frac{1}{6}$ F; (b) $C = \frac{1}{18}$ F; (c) $C = \frac{1}{30}$ F.

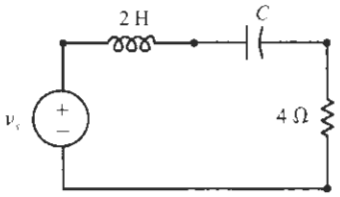

Fig. P4.28

4.29 For the circuit shown in Fig. P4.29, suppose that $v_s(t) = 8 \cos 2t$ V. Find the average power absorbed by each element in the circuit for the case that $\mathbf{Z}_L = 1\ \Omega$.

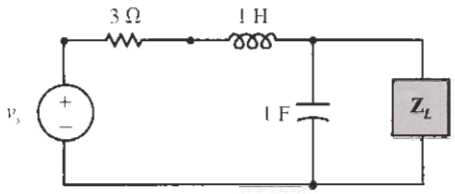

Fig. P4.29

4.30 For the circuit shown in Fig. P4.29, change the value of the resistor to 2 Ω and the value of the capacitor to $\frac{1}{3}$ F. Suppose that $v_s(t) = 8 \cos 2t$ V. (a) Find the load impedance $\mathbf{Z}_L$ that absorbs the maximum average power, and determine this power. (b) Find the load resistance R_L that absorbs the maximum power for resistive loads, and determine this power.

4.31 For the op-amp circuit given in Fig. P4.21, when $v_s(t) = 6 \sin 2t$ V, then the output voltage $v_o(t) = 13.4 \cos(2t - 117°)$ V. Find the average power absorbed by each element.

4.32 For the op-amp circuit given in Fig. P4.22, when $v_s(t) = 3 \cos 2t$ V, then the output voltage $v_o(t) = 10.6 \cos(2t + 135°)$ V. Find the average power absorbed by each element.

4.33 For the op-amp circuit given in Fig. P4.23, when $v_s(t) = 4 \cos(2t - 30°)$ V, then $v_1(t) = 1.6\cos(2t - 66.9°)$ V and $v_o(t) = 1.6\cos(2t + 23.1°)$ V. Find the average power absorbed by each element.

4.34 For the circuit given in Fig. P4.24, when $\mathbf{V}_{s1} = 250\sqrt{2}/-30°$ V, $\mathbf{V}_{s2} = 250\sqrt{2}/-90°$ V, and $\mathbf{Z} = 78 - j45\ \Omega$, then $\mathbf{I}_1 = 6.8/30°$ A and $\mathbf{I}_2 = 6.8/-90°$ A. (a) Find the average power absorbed by each impedance. (b) Find the average power supplied by each source.

4.35 For the circuit given in Fig. P4.25, when $\mathbf{V}_{s1} = 250\sqrt{2}/-30°$ V, $\mathbf{V}_{s2} = 250\sqrt{2}/-90°$ V, and $\mathbf{Z} = 26 - j15\ \Omega$, then $\mathbf{I}_1 = 6.8/30°$ A and $\mathbf{I}_2 = 6.8/-90°$ A. (a) Find the average power absorbed by each impedance. (b) Find the average power supplied by each source.

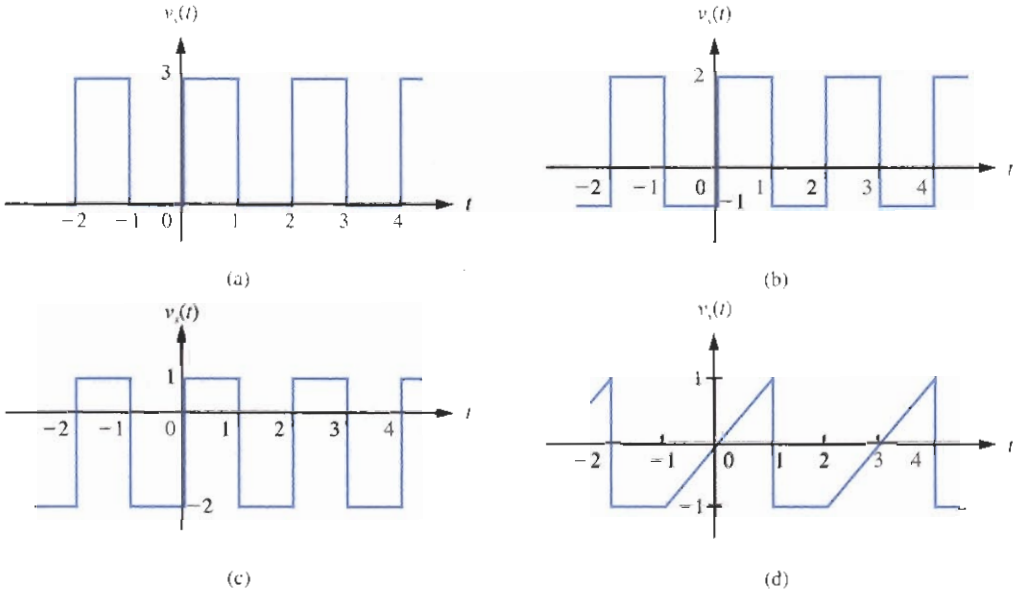

Fig. P4.38

a pf of 0.9 lagging. Find the pf of the combined load. Is this pf leading or lagging?

4.46 Three loads, which are connected in parallel, operate at 230 V rms. One load absorbs 500 W at a pf of 0.8 lagging. The second absorbs 1000 W at a pf of 0.9 lagging. The third absorbs 1500 W at a pf of 0.9 leading. Find the pf of the combined load. Is this pf leading or lagging?

4.47 The parallel connection of two 115-V rms loads absorbs 2000 W at a lagging pf of 0.95. Suppose that one load absorbs 1200 W at a pf of 0.8 lagging. What are the power absorbed and the pf of the second load?

4.48 A load, which operates at 220 V rms, draws 5 A rms at a lagging pf of 0.95. (a) Find the complex power absorbed by the load. (b) Find the average power absorbed by the load. (c) Find the reactive power absorbed by the load. (d) Find the apparent power absorbed by the load. (e) Find the impedance of the load.

4.49 Consider the circuit shown in Fig. P4.28. Suppose that $v_s(t) = 12\sqrt{2}\cos 3t$ V and $C = \frac{1}{6}$ F. Find the complex power absorbed by each element. Is complex power conserved?

4.50 Consider the circuit shown in Fig. P4.28. Suppose that $v_s(t) = 12\sqrt{2}\cos 3t$ V and $C = \frac{1}{6}$ F. Find the apparent power absorbed by each element. Is apparent power conserved?

4.51 Consider the circuit shown in Fig. P4.28. Suppose that $v_s(t) = 12\sqrt{2}\cos 3t$ V and $C = \frac{1}{6}$ F. Find the reactive power absorbed by each element. Is reactive power conserved?

4.52 For the circuit given in Fig. P4.24, when $\mathbf{V}_{s1} = 250\sqrt{2}\angle -30°$ V, $\mathbf{V}_{s2} = 250\sqrt{2}\angle -90°$ V, and $\mathbf{Z} = 78 - j45\ \Omega$, then $\mathbf{I}_1 = 6.8\angle 30°$ A and $\mathbf{I}_2 = 6.8\angle -90°$ A. (a) Find the complex power absorbed by each impedance. (b) Find the complex power supplied by each source.

4.53 For the circuit given in Fig. P4.24, when $\mathbf{V}_{s1} = 250\sqrt{2}\angle -30°$ V, $\mathbf{V}_{s2} = 250\sqrt{2}\angle -90°$ V, and $\mathbf{Z} = 78 - j45\ \Omega$, then $\mathbf{I}_1 = 6.8\angle 30°$ A and $\mathbf{I}_2 = 6.8\angle -90°$ A. (a) Find the apparent power absorbed by each impedance. (b) Find the apparent power supplied by each source.