2.26 Assume clockwise mesh currents for the circuit shown in Fig. P2.26 (below). Use mesh analysis to find these mesh currents.

2.27 For the circuit shown in Fig. P2.27, find v_o when the ideal amplifier (a) is an op amp, and (b) has finite gain A.

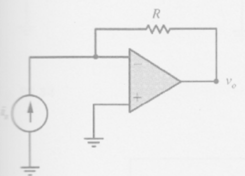

Fig. P2.27

2.28 For the op-amp circuit shown in Fig. P2.28, find (a) v_o, and (b) i_o.

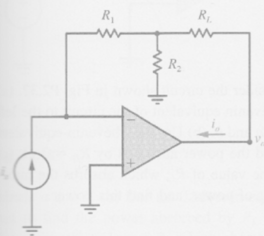

Fig. P2.28

2.29 For the op-amp circuit shown in Fig. P2.29, find (a) v_o, and (b) i_o.

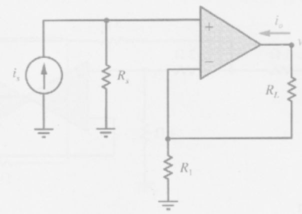

Fig. P2.29

2.30 The op-amp circuit shown in Fig. P2.30 is known as a **negative-impedance converter.** For this circuit, find (a) v_o, and (b) the resistance v_s/i_s.

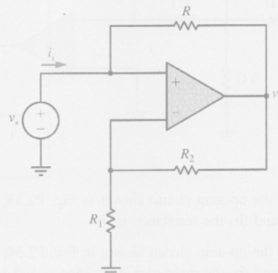

Fig. P2.30

2.31 For the op-amp circuit shown in Fig. P2.31, find (a) v_o, and (b) the resistance v_s/i_s. (See p. 104.)

2.32 For the op-amp circuit shown in Fig. P2.31, interchange the 1-Ω and 2-Ω resistors, and find (a) v_o, and (b) the resistance v_s/i_s. (See p. 104.)

3.40 For the parallel *RC* circuit given in Fig. P3.8, suppose that $i_s(t) = 6u(t)$ A. Find the step responses $v(t)$ and $i(t)$, and sketch these functions.

3.41 For the parallel *RL* circuit given in Fig. P3.17, find the unit step responses $i_L(t)$ and $v(t)$, and sketch these functions.

3.42 For the circuit shown in Fig. P3.42, find the step responses $v(t)$ and $i(t)$, and sketch these functions.

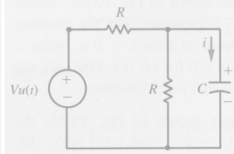

Fig. P3.42

3.43 For the circuit given in Fig. P3.30, suppose that $i_s(t) = 10u(t)$ A. Use Thévenin's theorem to find the step responses $i(t)$ and $v(t)$, and sketch these functions.

3.44 For the circuit given in Fig. P3.30, replace the inductor with a 0.1-F capacitor. Suppose that $i_s(t) = 10u(t)$ A. Use Thévenin's theorem to find the step responses $v(t)$ and $i(t)$, and sketch these functions.

3.45 For the circuit given in Fig. P3.34, suppose that $v_s(t) = 12u(t)$ V. Find the step responses $v(t)$ and $i(t)$, and sketch these functions.

3.46 For the circuit given in Fig. P3.34, replace the capacitor with a 3-H inductor. Suppose that $i_s(t) = 12u(t)$ V. Find the step responses $i(t)$ and $v(t)$, and sketch these functions.

3.47 The step responses $v_C(t)$ and $i(t)$ for the series *RC* circuit shown in Fig. P3.47*a* are given by Eq. 3.19 and Eq. 3.20, respectively. Use duality to determine the step responses $i_L(t)$ and $v(t)$ for the parallel *GL* circuit shown in Fig. P3.47*b*.

3.48 Find the step response $v_o(t)$ for the op-amp circuit shown in Fig. P3.48.

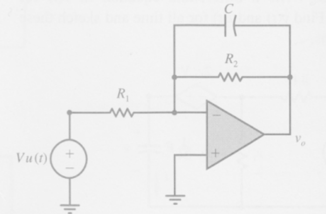

Fig. P3.48

3.49 Find the step responses $v(t)$ and $v_o(t)$ for the op-amp circuit shown in Fig. P3.49.

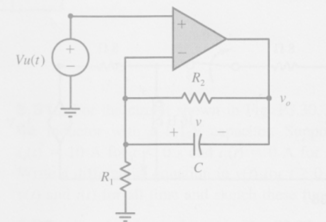

Fig. P3.49

4.18 For the circuit shown in Fig. P4.17, find the Thévenin equivalent of the circuit in the shaded box when $v_s(t) = 4\cos(2t - 60°)$ V. Use this to determine $v_o(t)$.

4.19 Find the frequency-domain Thévenin equivalent (to the left of terminals *a* and *b*) of the circuit shown in Fig. 4.20 on p. 211. (*Hint:* Use the fact that $\mathbf{Z}_o = \mathbf{V}_{oc}/\mathbf{I}_{sc}$.)

4.20 The frequency-domain Thévenin equivalent of a circuit having $\omega = 5$ rad/s has $\mathbf{V}_{oc} =$ [illegible]$\angle -15.9°$ V and $\mathbf{Z}_o = 2.38 - j0.667\ \Omega$. Determine a corresponding time-domain Thévenin-equivalent circuit.

4.21 For the op-amp circuit shown in Fig. P4.21, find $v_o(t)$ when $v_s(t) = 6 \sin 2t$ V.

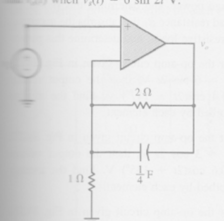

Fig. P4.21

4.22 For the op-amp circuit given in Fig. P4.22, find $v_o(t)$ when $v_s(t) = 3 \cos 2t$ V.

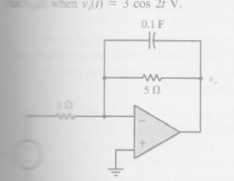

Fig. P4.22

4.23 For the op-amp circuit shown in Fig. P4.23, find $v_o(t)$ when $v_s(t) = 4\cos(2t - 30°)$ V. (See p. 258.)

4.24 For the circuit shown in Fig. P4.24, find the currents $\mathbf{I}_1$ and $\mathbf{I}_2$ when $\mathbf{V}_{s1} = 250\sqrt{2}\angle -30°$ V, $\mathbf{V}_{s2} = 250\sqrt{2}\angle -90°$ V, and $\mathbf{Z} = 78 - j45\ \Omega$.

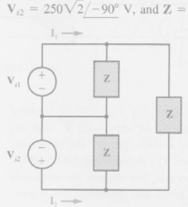

Fig. P4.24

4.25 Use mesh analysis to find $\mathbf{I}_1$ and $\mathbf{I}_2$ for the circuit given in Fig. P4.25 when $\mathbf{V}_{s1} = 250\sqrt{2}\angle -30°$ V, $\mathbf{V}_{s2} = 250\sqrt{2}\angle -90°$ V, and $\mathbf{Z} = 26 - j15\ \Omega$.

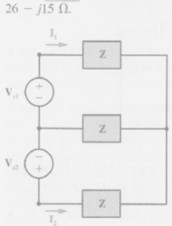

Fig. P4.25

4.26 For the circuit shown in Fig. P4.9, when $i_s(t) = 5\cos 3t$ A then $v_o(t) = 4.47\cos(3t + 26.6°)$ V. Find the average power absorbed by each element in the circuit.

4.27 For the circuit shown in Fig. P4.17, when $v_s(t) = 10\cos 4t$ V, then the Thévenin equivalent of the portion of the circuit in the shaded box is $\mathbf{V}_{oc} =$