5.70 For the series *RL* circuit shown in Fig. P5.69, suppose that $R = 2\ \Omega$ and $L = 2$ H. Find $i(t)$ and $v(t)$ when $v_s(t) = 12e^{-2t}u(t)$ V.

5.71 For the series *RL* circuit shown in Fig. P5.69, suppose that $R = 2\ \Omega$ and $L = 2$ H. Find $i(t)$ and $v(t)$ when $v_s(t) = 12e^{-t}u(t)$ V.

5.72 Find the step responses $v(t)$ and $i(t)$ for the circuit shown in Fig. P5.72 when $v_s(t) = 12u(t)$ V.

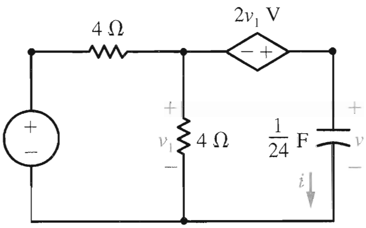

Fig. P5.72

5.73 For the circuit shown in Fig. P5.72, replace the capacitor with a 3-H inductor, and find the step responses $v(t)$ and $i(t)$ when $v_s(t) = 20u(t)$ V.

5.74 For the op-amp circuit shown in Fig. P5.3, suppose that $R = 2\ \Omega$ and $C = \frac{1}{8}$ F. Find the step response $v_2(t)$ when $v_1(t) = 3u(t)$ V.

5.75 For the op-amp circuit shown in Fig. P5.3, suppose that $R = 2\ \Omega$ and $C = \frac{1}{8}$ F. Find $v_2(t)$ when $v_1(t) = 3e^{-2t}u(t)$ V.

5.76 For the op-amp circuit shown in Fig. P5.3, suppose that $R = 2\ \Omega$ and $C = \frac{1}{8}$ F. Find $v_2(t)$ when $v_1(t) = 3e^{-4t}u(t)$ V.

5.77 For the op-amp circuit shown in Fig. P5.8, suppose that $R = 2\ \Omega$ and $C = \frac{1}{8}$ F. Find the step response $v_2(t)$ when $v_1(t) = 3u(t)$ V.

5.78 For the op-amp circuit shown in Fig. P5.8, suppose that $R = 2\ \Omega$ and $C = \frac{1}{8}$ F. Find $v_2(t)$ when $v_1(t) = 3e^{-2t}u(t)$ V.

5.79 For the op-amp circuit shown in Fig. P5.8, suppose that $R = 2\ \Omega$ and $C = \frac{1}{8}$ F. Find $v_2(t)$ when $v_1(t) = 3e^{-4t}u(t)$ V.

5.80 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = \frac{1}{3}\ \Omega$, $L = \frac{1}{12}$ H, $C = 3$ F, and $v_s(t) = 0$ V. Find $v(t)$ and $i(t)$ when $i(0) = 4$ A and $v(0) = 0$ V.

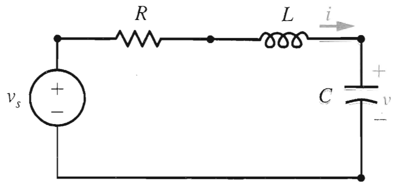

Fig. P5.80

5.81 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = \frac{1}{3}\ \Omega$, $L = \frac{1}{12}$ H, $C = \frac{3}{5}$ F, and $v_s(t) = 0$ V. Find $v(t)$ and $i(t)$ when $i(0) = 4$ A and $v(0) = 0$ V.

5.82 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = \frac{1}{3}\ \Omega$, $L = \frac{1}{12}$ H, $C = 4$ F and $v_s(t) = 0$ V. Find $v(t)$ and $i(t)$ when $i(0) = 4$ A and $v(0) = 0$ V.

5.83 For the parallel *RLC* circuit shown in Fig. P5.83, suppose that $R = \frac{1}{2}\ \Omega$, $L = \frac{1}{4}$ H, $C = \frac{1}{2}$ F, and $i_s(t) = 0$ A. Find $v(t)$ and $i(t)$ when $i(0) = 6$ A and $v(0) = 0$ V.

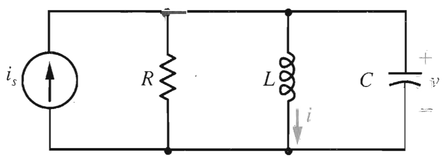

Fig. P5.83

5.84 For the parallel *RLC* circuit shown in Fig. P5.83, suppose that $R = \frac{1}{3}\ \Omega$, $L = \frac{1}{4}$ H, $C = \frac{1}{2}$ F, and $i_s(t) = 0$ A. Find $v(t)$ and $i(t)$ when $i(0) = 6$ A and $v(0) = 0$ V.

5.85 For the parallel *RLC* circuit shown in Fig. P5.83, suppose that $R = \frac{1}{3}\ \Omega$, $L = \frac{2}{9}$ H, $C = \frac{1}{2}$ F, and $i_s(t) = 0$ A. Find $v(t)$ and $i(t)$ when $i(0) = 6$ A and $v(0) = 0$ V.

5.86 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = 7\ \Omega$, $L = 1$ H, $C = 0.1$ F and $v_s(t) = 0$ V. Find $i(t)$ and $v(t)$ when $v(0) = 12$ V and $i(0) = 0$ A.

5.87 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = 2\ \Omega$, $L = \frac{1}{4}$ H, $C = 0.2$ F, and $v_s(t) = 0$ V. Find $i(t)$ and $v(t)$ when $v(0) = 10$ V and $i(0) = 0$ A.

5.88 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = 2\ \Omega$, $L = 1$ H, $C = 1$ F, and $v_s(t) = 0$ V. Find $i(t)$ and $v(t)$ when $v(0) = 6$ V and $i(0) = 0$ A.

5.89 For the circuit shown in Fig. P5.89, find $v_2(t)$ when $v_s(t) = 0$ V and $v_1(0) = v_2(0) = 6$ V.

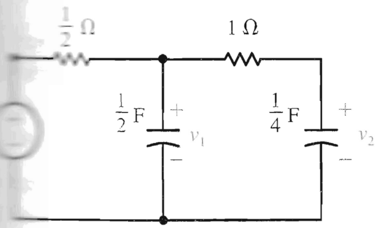

Fig. P5.89

5.90 For the circuit shown in Fig. P5.90, find $v(t)$ when $v_s(t) = 0$ V, $v(0) = 3$ V, and $i(0) = 3$ A.

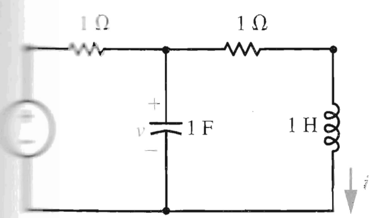

Fig. P5.90

5.91 For the circuit shown in Fig. P5.90, interchange the inductor and the capacitor. Find the capacitor voltage $v(t)$ and the inductor current $i(t)$ when $v_s(t) = 0$ V, $v(0) = 0$ V and $i(0) = 6$ A.

5.92 For the parallel *RLC* circuit shown in Fig. P5.83, suppose that $R = \frac{1}{2}\ \Omega$, $L = \frac{1}{5}$ H, and $C = \frac{1}{4}$ F. Find the step responses $v(t)$ and $i(t)$ when $i_s(t) = 2u(t)$ A.

5.93 For the parallel *RLC* circuit shown in Fig. P5.83, suppose that $R = 3\ \Omega$, $L = 3$ H, and $C = \frac{1}{12}$ F. Find the step responses $v(t)$ and $i(t)$ when $i_s(t) = 4u(t)$ A.

5.94 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = 7\ \Omega$, $L = 1$ H, and $C = 0.1$ F. Find the step responses $v(t)$ and $i(t)$ when $v_s(t) = 12u(t)$ V.

5.95 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = 2\ \Omega$, $L = 1$ H, and $C = 1$ F. Find the step responses $v(t)$ and $i(t)$ when $v_s(t) = 12u(t)$ V.

5.96 For the *RLC* circuit shown in Fig. P5.96, suppose that $R = \frac{1}{2}\ \Omega$, $L = \frac{1}{3}$ H, and $C = \frac{1}{4}$ F. Find the unit step responses $v(t)$ and $i(t)$ when $v_s(t) = u(t)$ V.

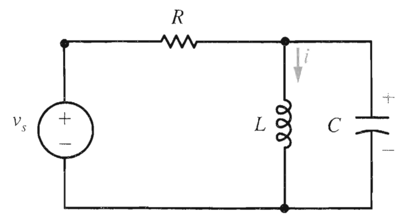

Fig. P5.96

5.97 For the *RLC* circuit shown in Fig. P5.96, suppose that $R = \frac{1}{2}\ \Omega$, $L = \frac{1}{4}$ H, and $C = \frac{1}{2}$ F. Find the unit step responses $v(t)$ and $i(t)$ when $v_s(t) = u(t)$ V.

5.98 For the circuit shown in Fig. P5.89, find the step response $v_2(t)$ when $v_s(t) = 9u(t)$ V.

5.99 For the circuit shown in Fig. P5.90, find the step response $v(t)$ when $v_s(t) = 6u(t)$ V.

5.100 For the op-amp circuit shown in Fig. P5.48, suppose that $C = \frac{1}{3}$ F. Find the step response $v_2(t)$ when $v_1(t) = 4u(t)$ V.

5.101 For the op-amp circuit shown in Fig. P5.48, suppose that $C = \frac{1}{8}$ F. Find the step response $v_2(t)$ when $v_1(t) = 8u(t)$ V.

5.102 For the op-amp circuit shown in Fig. P5.48, suppose that $C = \frac{1}{4}$ F. Find the step response $v_2(t)$ when $v_1(t) = 6u(t)$ V.

5.103 For the op-amp circuit shown in Fig. P5.49, suppose that $C = 1$ F. Find the step response $v_2(t)$ when $v_1(t) = 3u(t)$ V.

5.104 For the op-amp circuit shown in Fig. P5.49, suppose that $C = \frac{4}{3}$ F. Find the step response $v_2(t)$ when $v_1(t) = 4u(t)$ V.

5.105 For the op-amp circuit shown in Fig. P5.49, suppose that $C = \frac{1}{5}$ F. Find the step response $v_2(t)$ when $v_1(t) = 2u(t)$ V.

5.106 For the parallel *RLC* circuit shown in Fig. P5.83, suppose that $R = 6\ \Omega$, $L = 7$ H, and $C = \frac{1}{42}$ F. Find $v(t)$ and $i(t)$ when $i_s(t) = 6u(t)$ A, $i(0) = -4$ A, and $v(0) = 0$ V.

5.107 For the series *RLC* circuit shown in Fig. P5.80, suppose that $R = 2\ \Omega$, $L = \frac{1}{4}$ H, and $C = \frac{1}{5}$ F. Find $i(t)$ and $v(t)$ when $v_s(t) = 2u(t)$ V, $i(0) = 0$ A, and $v(0) = -2$ V.

5.108 For the *RLC* circuit shown in Fig. P5.96, suppose that $R = 3\ \Omega$, $L = 4$ H, and $C = \frac{1}{12}$ F. Find $v(t)$ and $i(t)$ when $v_s(t) = -12u(t)$ V, $i(0) = 4$ A, and $v(0) = 0$ V.

5.109 Given that the transfer function of a linear system is $\mathbf{H}(s) = 1/(s + 2)$, find the output $y(t)$ when the input $x(t)$ is (a) $u(t)$, (b) $e^{-t}u(t)$, (c) $(1 - e^{-t})u(t)$, and (d) $e^{-2t}u(t)$.

5.110 Given that the transfer function of a linear system is $\mathbf{H}(s) = s/(s + 2)$, find the output $y(t)$ when the input $x(t)$ is (a) $u(t)$, (b) $e^{-t}u(t)$, (c) $(1 - e^{-t})u(t)$, and (d) $e^{-2t}u(t)$.

5.111 Given that the transfer function of a linear system is $\mathbf{H}(s) = (s - 1)/(s + 10)$, find the input $x(t)$ when the output $y(t)$ is (a) $(-1 + 2e^{-t})u(t)$, (b) $(-2e^{-t} + 3e^{-2t})u(t)$, (c) $(1 - 11t)e^{-10t}u(t)$, and (d) $(1 - 2t)e^{-t}u(t)$.

5.112 For the case that the input to a linear system is $x(t) = e^{-t}u(t)$, find the transfer function $\mathbf{H}(s)$ when the output $y(t)$ is (a) $e^{-2t}u(t)$, (b) $\sin t\ u(t)$, (c) $e^{-t}\sin t\ u(t)$, (d) $te^{-t}u(t)$, and (e) $(e^{-t} - e^{-2t})u(t)$.

5.113 For the case that the input to a linear system is $x(t) = \cos t\ u(t)$, find the transfer function $\mathbf{H}(s)$ when the output $y(t)$ is (a) $e^{-2t}u(t)$, (b) $\sin t\ u(t)$, (c) $e^{-t}\sin t\ u(t)$, (d) $te^{-t}u(t)$, and (e) $(e^{-t} - e^{-2t})u(t)$.