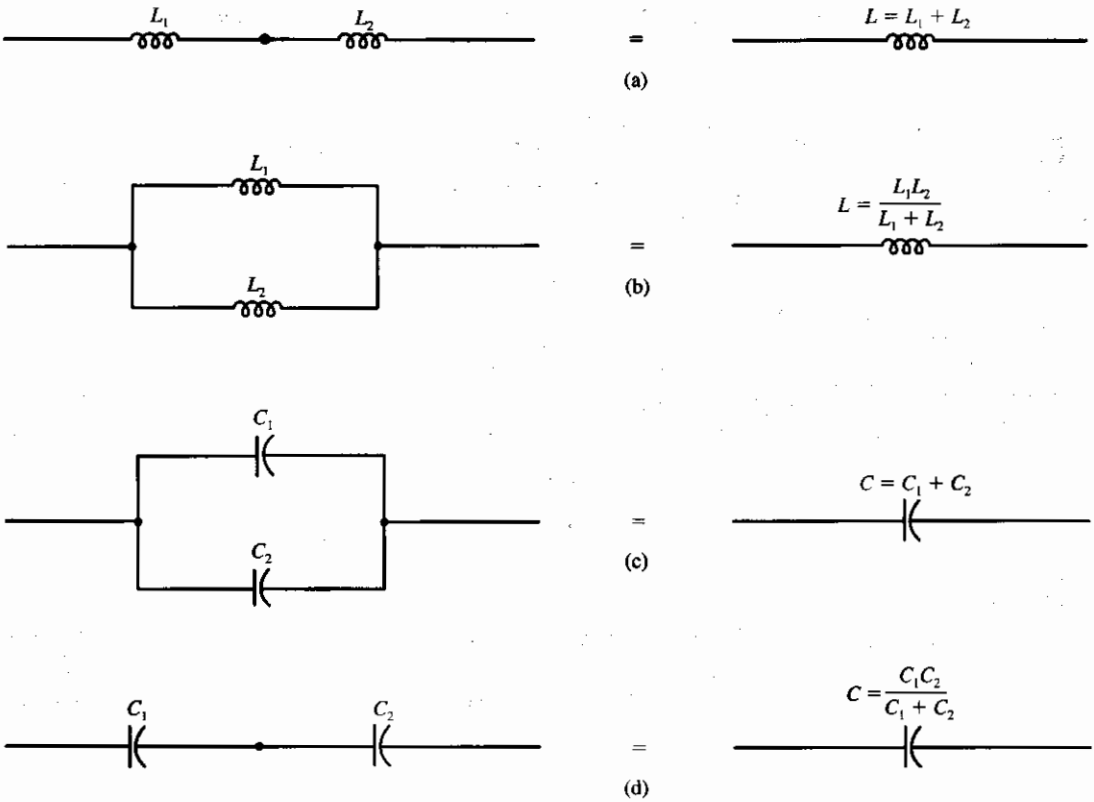


Fig. P3.15

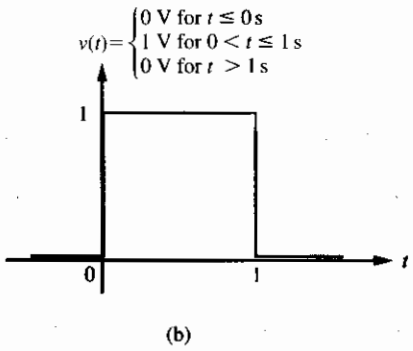


Fig. P3.16

3.17 For the circuit shown in Fig. P3.17, suppose that $v(t)$ is described by the function given in Fig. P3.16. Sketch (a) $i_L(t)$, (b) $i_R(t)$, and (c) $i_s(t)$.

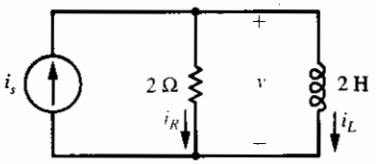


Fig. P3.17

3.18 For the op-amp circuit shown in Fig. P3.18, suppose that $v(t)$ is described by the function given in Fig. P3.16. Sketch (a) $i_R(t)$, (b) $v_C(t)$, and (c) $v_o(t)$.

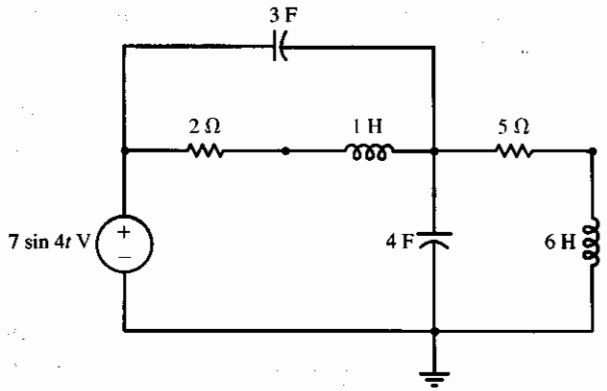


Fig. P3.26

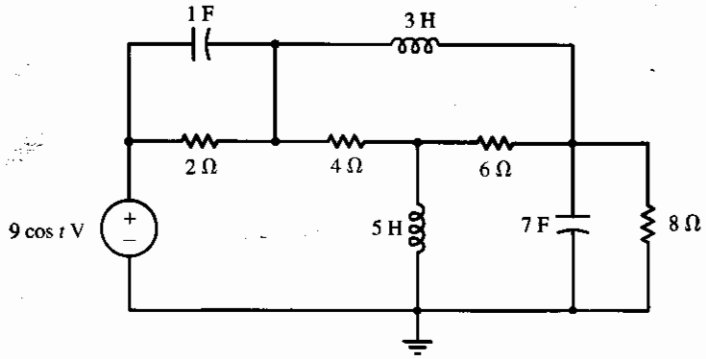


Fig. P3.27

3.29 For the circuit shown in Fig. P3.28, replace the capacitor with a 5-H inductor. For the resulting circuit, the switch opens at time $t = 0$ s. Write a differential equation in $i(t)$ for $t \geq 0$ s. Find $i(t)$ and $v(t)$ for all time and sketch these functions.

3.30 For the circuit shown in Fig. P3.30, suppose that $i_s(t) = 10$ A for $t < 0$ s and $i_s(t) = 0$ A for $t \geq 0$ s. Write a differential equation in $i(t)$ for $t \geq 0$ s. Find $i(t)$ and $v(t)$ for all time and sketch these functions.

3.31 For the circuit shown in Fig. P3.30, replace the inductor with a 0.1-F capacitor. Suppose that $i_s(t) = 10$ A for $t < 0$ s and $i_s(t) = 0$ A for $t \geq 0$ s. Write a differential equation in $v(t)$ for $t \geq 0$ s. Find $v(t)$ and $i(t)$ for all time and sketch these functions.

3.32 For the circuit shown in Fig. P3.32, suppose that $v_s(t) = 18$ V for $t < 0$ s and $v_s(t) = 0$ V for $t \geq 0$ s. Write a differential equation in $i(t)$ for $t \geq 0$ s. Find $i(t)$ and $v(t)$ for all time and sketch these functions.

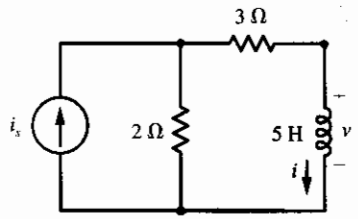


Fig. P3.30

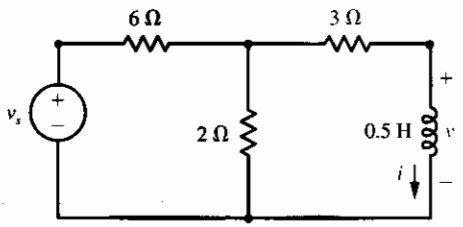


Fig. P3.32

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.

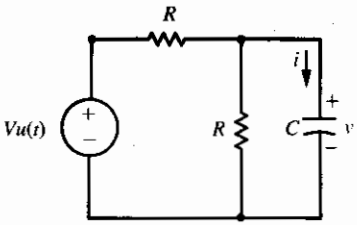


Fig. P3.42

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.

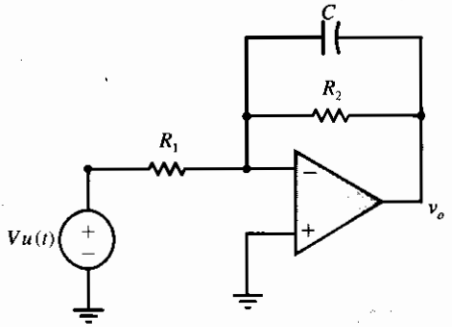


Fig. P3.48

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

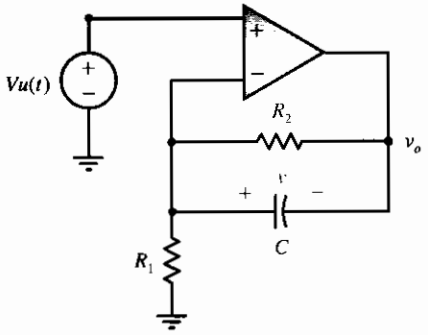


Fig. P3.49

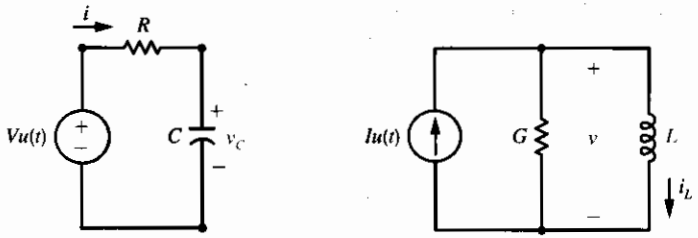


Fig. P3.47

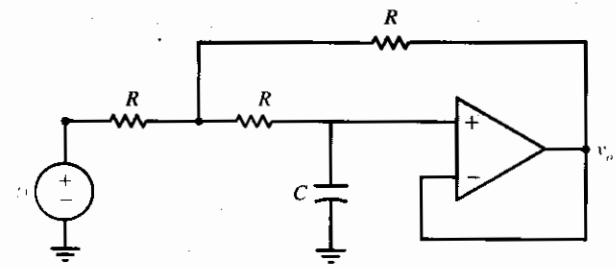


Fig. P3.50

3.50 Find the step response $v_o(t)$ for the op-amp ·cuit shown in Fig. P3.50.

51 For the series *RC* circuit given in Fig. P3.7*a*, ·ppose that $v_s(t) = 12e^{-t/2}u(t)$ V. Find the responses · and $i(t)$.

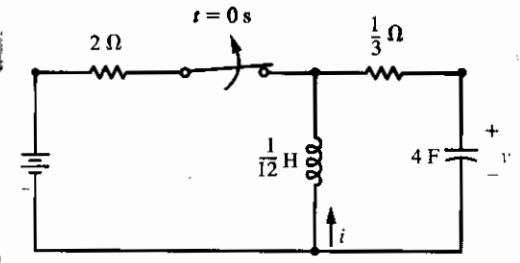
52 For the series *RC* circuit given in Fig. P3.7*a*, ·ppose that $v_s(t) = 12e^{-t/4}u(t)$ V. Find the responses · and $i(t)$.

53 For the series *RL* circuit given in Fig. P3.1*a*, ·ppose that $v_s(t) = 12e^{-2t}u(t)$ V. Find the responses and $v(t)$.

54 For the series *RL* circuit given in Fig. P3.1*a*, ·ppose that $v_s(t) = 12e^{-t}u(t)$ V. Find the responses and $v(t)$.

55 For the circuit shown in Fig. P3.30, when $i_s(t) = 10u(t)$ A, then $i(t) = 4(1 - e^{-t})u(t)$ A and $v(t) = 20e^{-t}u(t)$ V. Find $i(t)$ and $v(t)$ when $i_s(t) = 5u(t) - 5u(t - 1)$ A.

56 For the circuit shown in Fig. P3.34, when · = 12$u(t)$ V, then $v(t) = 18(1 - e^{-4t})u(t)$ V and · = $3e^{-4t}u(t)$ A. Find $v(t)$ and $i(t)$ when $v_s(t) = 4u(t) - 4u(t - 2)$ V.



. P3.57

3.57 For the circuit shown in Fig. P3.57, the switch opens at time $t = 0$ s. Find $v(t)$ and $i(t)$ for all time.

3.58 For the circuit shown in Fig. P3.57, change the value of the capacitor to $\frac{3}{5}$ F. For the resulting circuit, the switch opens at time $t = 0$ s. Find $v(t)$ and $i(t)$ for all time.

3.59 For the circuit shown in Fig. P3.57, change the value of the capacitor to 3 F. For the resulting circuit, the switch opens at time $t = 0$ s. Find $v(t)$ and $i(t)$ for all time.

3.60 For the circuit shown in Fig. P3.60, the switch opens at time $t = 0$ s. Find $i(t)$ and $v(t)$ for all time. (See p. 184.)

3.61 For the circuit shown in Fig. P3.60, change the value of the resistor to $\frac{1}{2}$ Ω. For the resulting circuit, the switch opens at time $t = 0$ s. Find $i(t)$ and $v(t)$ for all time. (See p. 184.)

3.62 For the circuit shown in Fig. P3.60, change the value of the inductor to $\frac{2}{9}$ H. For the resulting circuit, the switch opens at time $t = 0$ s. Find $v(t)$ and $i(t)$ for all time. (See p. 184.)