Important Remarks

- Homework is due on March 9 at the beginning of class.

1. Problem 3.12
2. Problem 3.22
3. Problem 3.32
4. Problem 4.6
5. Problem 5.1

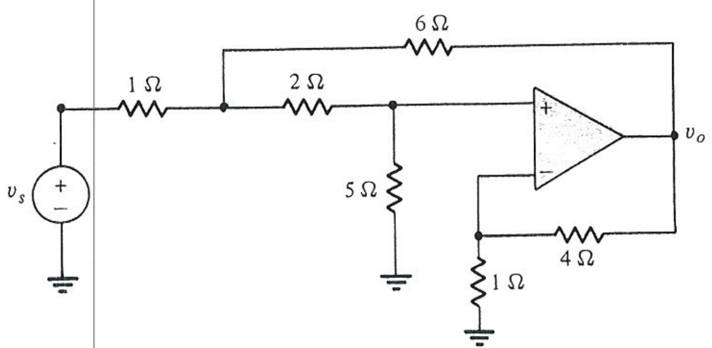

Fig. P3.11

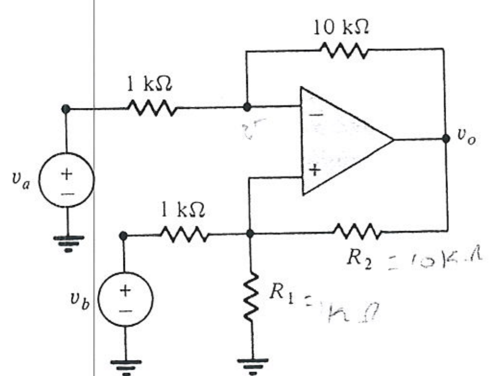

Fig. P3.12

3.11 For the op-amp circuit given in Fig. P3.11, find the voltage gain v_o/v_s.

3.12 For the op-amp circuit shown in Fig. P3.12, find v_o when $R_1 = 1\ \text{k}\Omega$ and $R_2 = 10\ \text{k}\Omega$.

3.13 Repeat Problem 3.12 for the case that $R_1 = \infty$ and $R_2 = 20\ \text{k}\Omega$.

3.14 For the op-amp circuit given in Fig. P3.14, find the voltage gain v_o/v_s.

3.15 For the op-amp circuit given in Fig. P3.15, find the voltage gain v_o/v_s when (a) $R_1 = 4\ \Omega$, $R_2 = 5\ \Omega$ and (b) $R_1 = 5\ \Omega$, $R_2 = 4\ \Omega$.

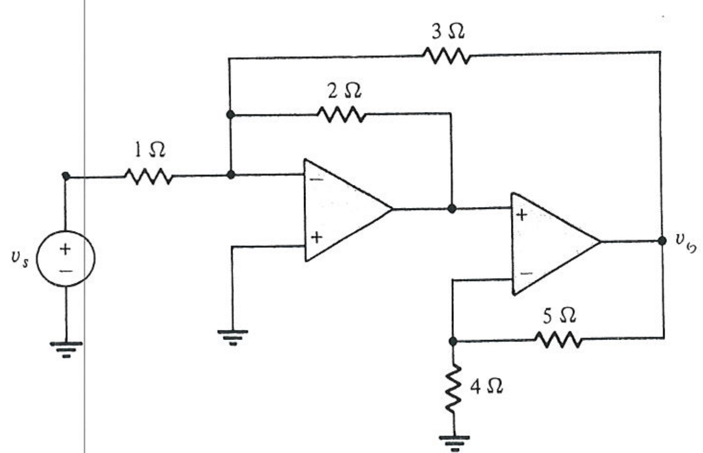

Fig. P3.14

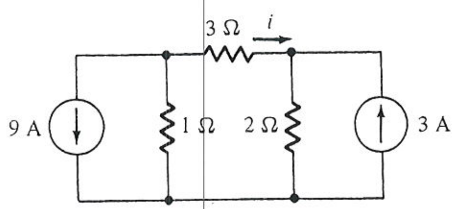

Fig. P3.19

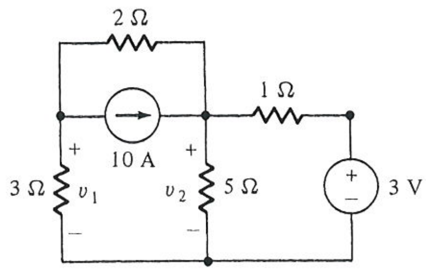

Fig. P3.20

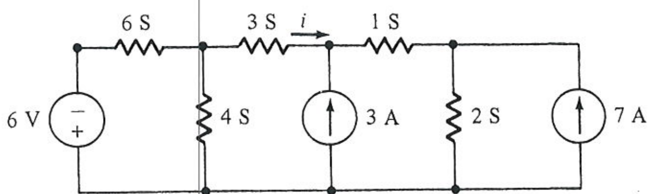

Fig. P3.21

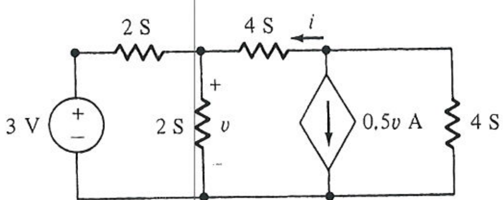

Fig. P3.22

3.20 For the circuit shown in Fig. P3.20, use source transformations to determine v_1 and v_2.

3.21 Repeat Problem 3.18 for the circuit shown in Fig. P3.21.

3.22 For the circuit shown in Fig. P3.22, use source transformations to determine i and v.

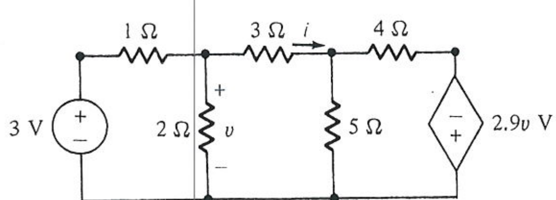

Fig. P3.23

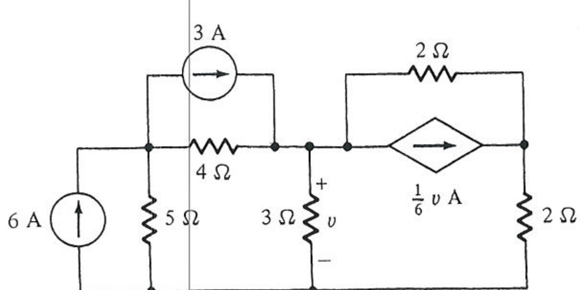

Fig. P3.24

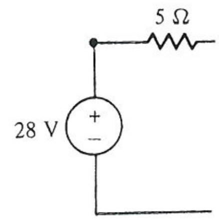

Fig. P3.25

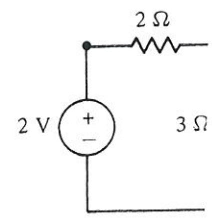

Fig. P3.26

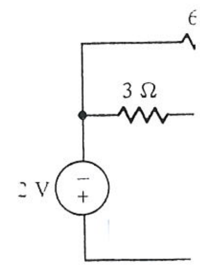

Fig. P3.27

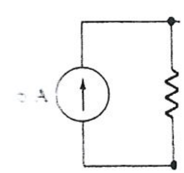

Fig. P3.28

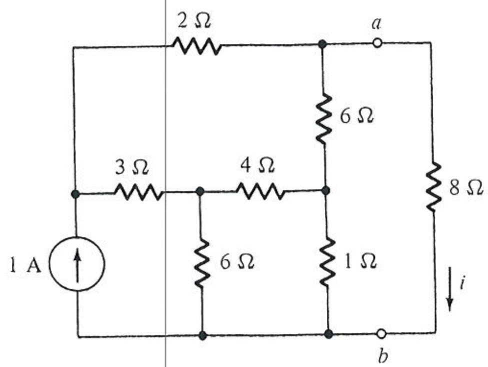

Fig. P3.29

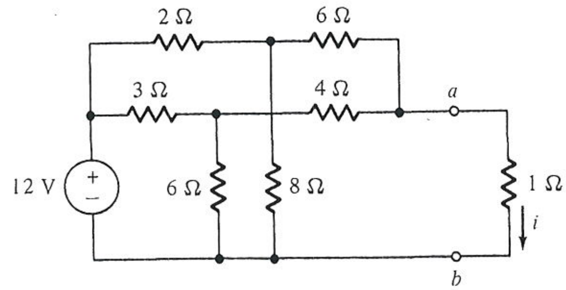

Fig. P3.30

3.29 Repeat Problem 3.25 for the circuit shown in Fig. P3.29.

3.30 Repeat Problem 3.25 for the circuit shown in Fig. P3.30.

3.31 Find the Thévenin equivalent of the circuit shown in Fig. P3.31.

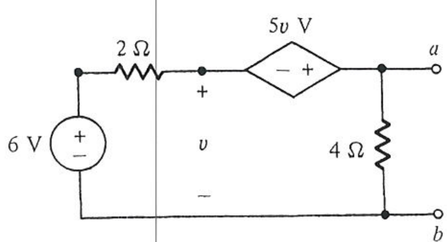

Fig. P3.31

3.32 Find the Thévenin equivalent of the circuit shown in Fig. P3.32.

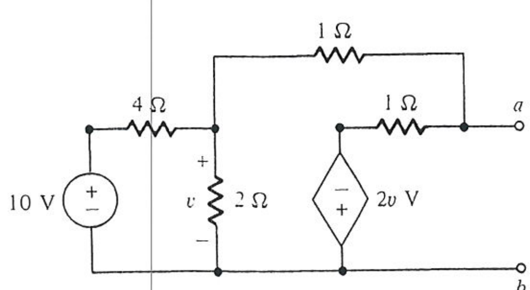

Fig. P3.32

3.33 For the circuit given in Fig. 3.35 (p. 126), change the 2-Ω resistor to a 1-Ω resistor. Find the Thévenin equivalent of the resulting circuit.

3.34 Find the Thévenin equivalent of the circuit shown in Fig. P3.34.

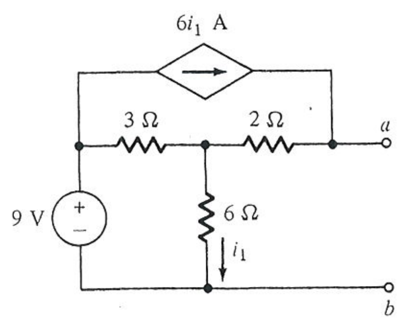

Fig. P3.34

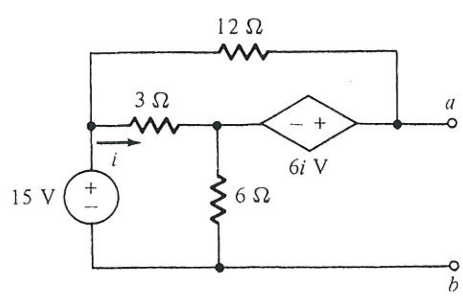

Fig. P3.35

3.35 Finc
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3.36 Finc
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curr

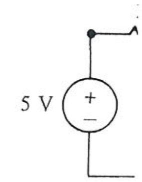

Fig. P3.36

3.37 Rep
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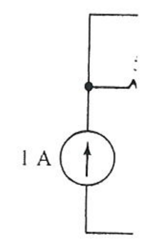


Fig. P3.37

3.38 Finc
amp

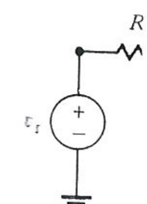


Fig. P3.38

3.39 Finc
amp

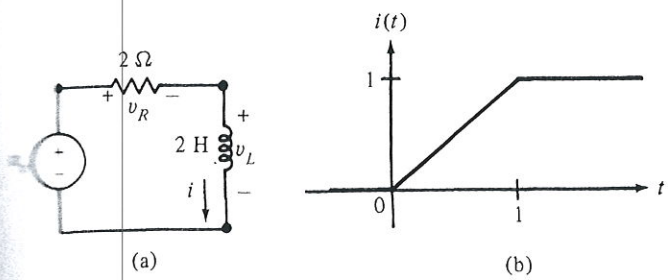


Fig. P4.6

4.5 Repeat Problem 4.2 for the current described in Example 4.3 (p. 163). Sketch the functions.

4.6 Given the circuit shown in Fig. P4.6(a), suppose that the current $i(t)$ is given by the function in Fig. P4.6(b). Sketch $v_L(t)$, $w_L(t)$, $p_R(t)$, $v_R(t)$, and $v_s(t)$.

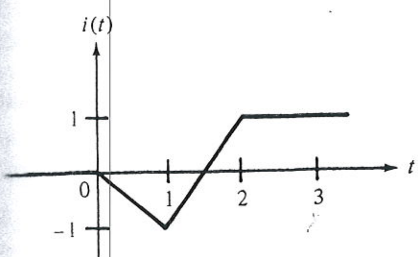


Fig. P4.7

4.7 Repeat Problem 4.6 for the current given by the function in Fig. P4.7.

4.8 Given the circuit shown in Fig. P4.2, suppose that the current $i(t)$ is given by the function in Fig. P4.6(b). Sketch $v_L(t)$, $w_L(t)$, $p_R(t)$, $i_R(t)$, and $i_s(t)$.

4.9 Repeat Problem 4.8 for the current given in Fig. P4.7.

4.10 For the circuit and current shown in Fig. P4.10(a) and P4.10(b), respectively, sketch $v_R(t)$, $v_L(t)$, and $v(t)$.

4.11 For the circuit shown in Fig. DE4.5 (p. 169), suppose that the voltage across the capacitor is

$$v(t) = \begin{cases} 0 & \text{for } -\infty < t < 0 \\ 1 - e^{-t/2} & \text{for } 0 \le t < 1 \text{ s} \\ (e^{1/2} - 1)e^{-t/2} & \text{for } 1 \le t < \infty \end{cases}$$

Find (a) $i_C(t)$; (b) $v_R(t)$; and (c) $v_s(t)$.

4.12 For the circuit shown in Fig. P4.12, suppose that the voltage across the capacitor is

$$v(t) = \begin{cases} 0 & \text{for } -\infty < t < 0 \\ 1 - e^{-t/2} & \text{for } 0 \le t < \infty \end{cases}$$

Find (a) $i_C(t)$; (b) $i_R(t)$; and (c) $i_s(t)$.

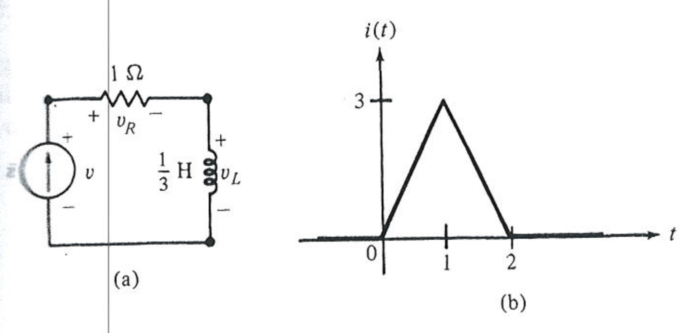


Fig. P4.10

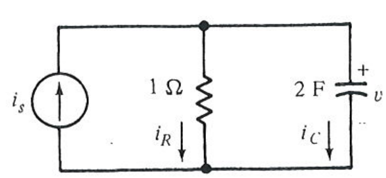
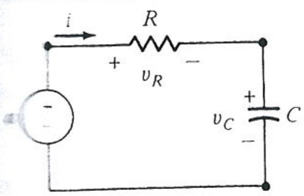
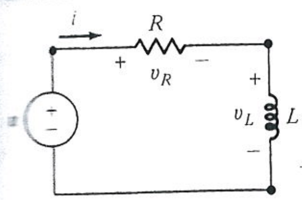
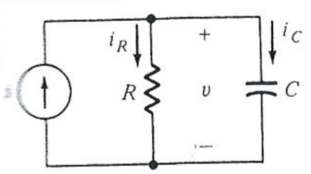
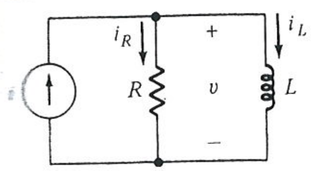


Fig. P4.12

8. In a linear circuit if the input is differentiated, then the zero-state output is differentiated; if the input is integrated, so is the output.

9. Zero-state step responses for RL and RC series and parallel circuits are summarized in Table 5.1.

Table 5.1 SUMMARY OF SERIES AND PARALLEL RC AND RL CIRCUIT STEP RESPONSES

	$v(t) = u(t)$ $i(t) = \frac{1}{R} e^{-t/RC}u(t)$ $v_R(t) = e^{-t/RC}u(t)$ $v_C(t) = (1 - e^{-t/RC})u(t)$
	$v(t) = u(t)$ $i(t) = \frac{1}{R}(1 - e^{-Rt/L})u(t)$ $v_R(t) = (1 - e^{-Rt/L})u(t)$ $v_L(t) = e^{-Rt/L}u(t)$
	$i(t) = u(t)$ $v(t) = R(1 - e^{-t/RC})u(t)$ $i_R(t) = (1 - e^{-t/RC})u(t)$ $i_C(t) = e^{-t/RC}u(t)$
	$i(t) = u(t)$ $v(t) = Re^{-Rt/L}u(t)$ $i_R(t) = e^{-Rt/L}u(t)$ $i_L(t) = (1 - e^{-Rt/L})u(t)$

PROBLEMS FOR CHAPTER 5

5.1 For the circuit shown in Fig. P5.1, the switch is opened when $t = 0$. Find $v(t)$ and $i(t)$ for all t. Sketch these functions.

5.2 For the circuit shown in Fig. P5.1, replace the capacitor with a 5-H inductor and repeat Problem 5.1.

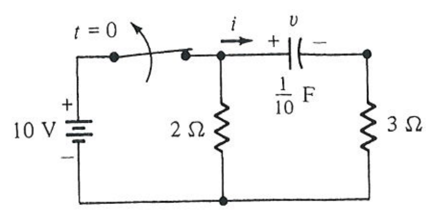


Fig. P5.1