

Important Remarks

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

1. Problem 1.49

Answer:

a) $i_e = v_1/[R_1 + R_e + (1 - \alpha)R_b]$;

b) $v_2 = \alpha R_L v_1/[R_1 + R_e + (1 - \alpha)R_b]$

c) $v_2/v_1 = 21$

2. Problem 1.56 Answer: $p_2/p_1 = 20.58$

3. Problem 2.10 Answer: $v_2 = 1.5V$; $v_3 = 2.5V$; $v_4 = 3.5V$;

4. Problem 2.37 Answer: a) $v_2/v_1 = 30.96$; b) $R_{eq} = 43.22\Omega$

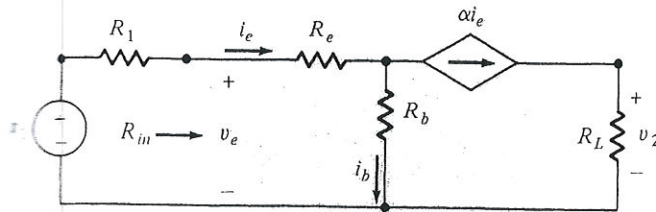


Fig. P1.49

- 1.49** The circuit in Fig. P1.49 is another single BJT amplifier. The portion of the circuit in the colored box is an alternative model of a BJT.
- Find i_e in terms of the various resistors, α , and the input voltage v_1 .
 - Find v_2 in terms of the resistors, α , and v_1 .
 - Given that $R_1 = 40 \Omega$, $R_e = 27 \Omega$, $R_b = 150 \Omega$, $R_L = 1.5 \text{ k}\Omega$, and $\alpha = 0.98$, find the voltage gain v_2/v_1 .
- 1.50** Consider the circuit given in Problem 1.49 and the values given in part (c).
- Find the resistance $R_{eq} = v_1/i_e$ seen by the voltage source.
 - Find the resistance $R_{in} = v_e/i_e$ at the input of the amplifier.
 - Find the voltage gain v_2/v_e .
- 1.51** For the circuit in Fig. 1.45 (p. 28), find the power absorbed by each element.
- 1.52** For the circuit in Fig. 1.46 (p. 29), find the power absorbed by each element.
- 1.53** For the circuit in Fig. 1.47 (p. 30), find the power absorbed by each element.
- 1.54** For the circuit given in Fig. P1.41, find the power absorbed by each element for (a) $K = 2$ and (b) $K = 4$.
- 1.55** For the circuit given in Fig. P1.42, find the power absorbed by each element for (a) $K = 2$ and (b) $K = 4$.
- 1.56** For the single BJT amplifier given in Problem 1.49, find the power gain p_2/p_1 from source to load, where p_1 is the power supplied by the independent voltage source v_1 and p_2 is the power absorbed by the load $R_L = 1.5 \text{ k}\Omega$.

4. A set of mesh equations can be expressed as a single matrix equation of the form $\mathbf{Ri} = \mathbf{v}$.
5. To use loop analysis (on planar or nonplanar circuits) apply KVL around each loop formed from one nonbranch edge and branches, express the resulting equations in terms of the loop currents, and solve.
6. A set of loop equations can be expressed as a single matrix equation of the form $\mathbf{Ri} = \mathbf{v}$.

● PROBLEMS FOR CHAPTER 2

2.1 For the circuit shown in Fig. P2.1, select node *a* to be the reference node. (a) Use nodal analysis to find the nonreference node voltages. (b) Find $i_1, i_2, i_3,$ and i_4 .

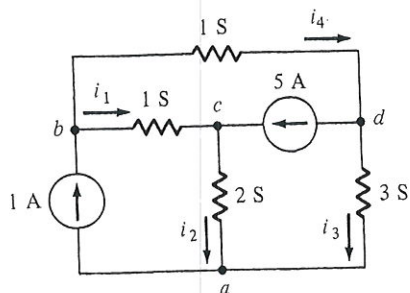


Fig. P2.1

- 2.2 Repeat Problem 2.1 using node *b* as the reference node.
- 2.3 Repeat Problem 2.1 using node *c* as the reference node.

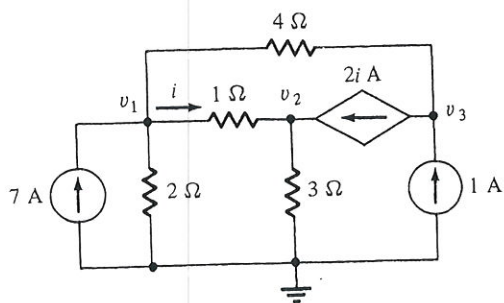


Fig. P2.5

- 2.4 Repeat Problem 2.1 using node *d* as the reference node.
- 2.5 Find the node voltages $v_1, v_2,$ and v_3 for the circuit shown in Fig. P2.5.
- 2.6 Find the node voltages $v_1, v_2,$ and v_3 for the circuit shown in Fig. P2.6.

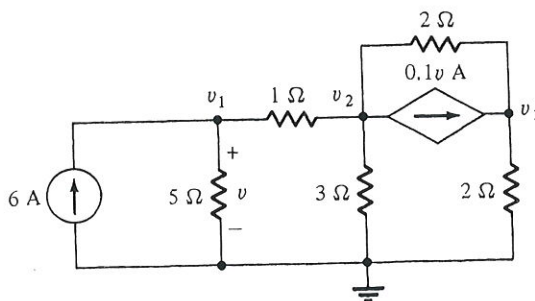


Fig. P2.6

- 2.7 For the circuit shown in Fig. P2.7, find (a) the node voltages $v_1, v_2, v_3,$ and $v_4,$ (b) $i_s,$ and (c) the conductance $G_{eq} = i_s/v_s$ seen by the voltage source.
- 2.8 Repeat Problem 2.7 for the circuit shown in Fig. P2.8.
- 2.9 Find the node voltages $v_1, v_2, v_3,$ and v_4 for the circuit shown in Fig. P2.9.
- 2.10 Find the node voltages $v_1, v_2, v_3,$ and v_4 for the circuit shown in Fig. P2.10.
- 2.11 For the circuit shown in Fig. P2.11, find the node voltages $v_1, v_2,$ and $v_3.$

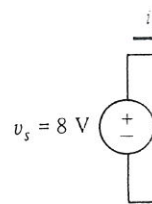


Fig. P2.7

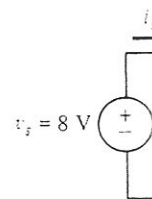


Fig. P2.8

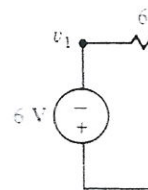


Fig. P2.9

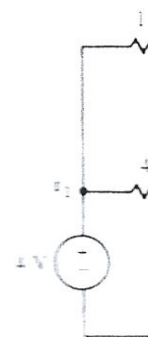


Fig. P2.10

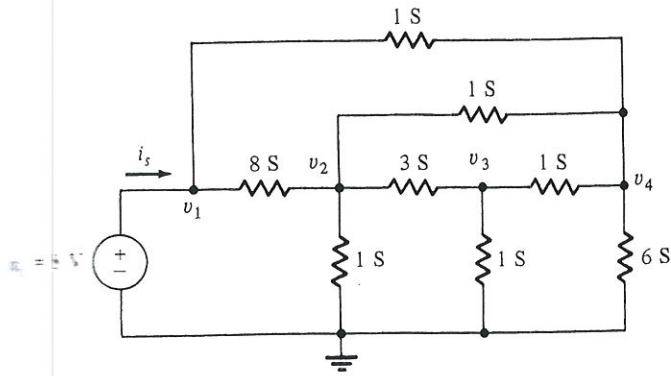


Fig. P2.7

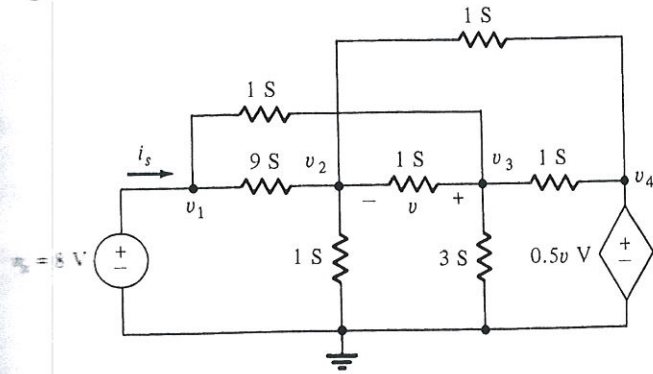


Fig. P2.8

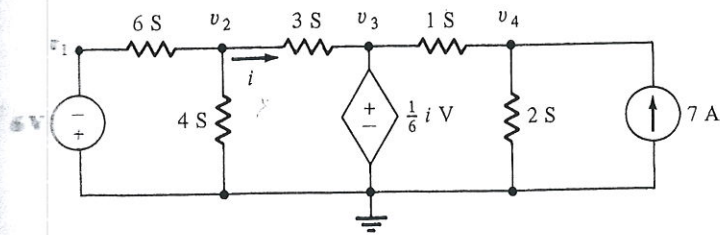


Fig. P2.9

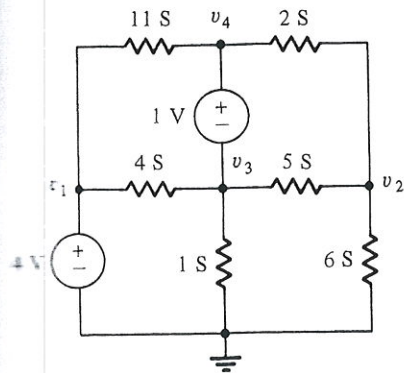


Fig. P2.10

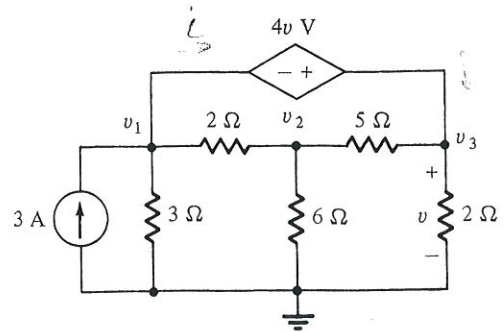


Fig. P2.11

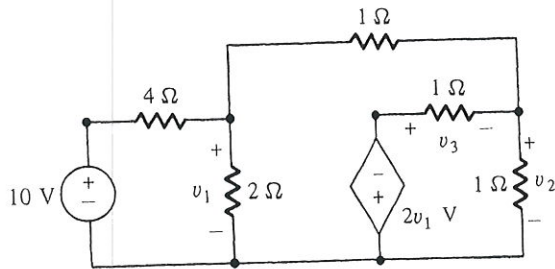


Fig. P2.28

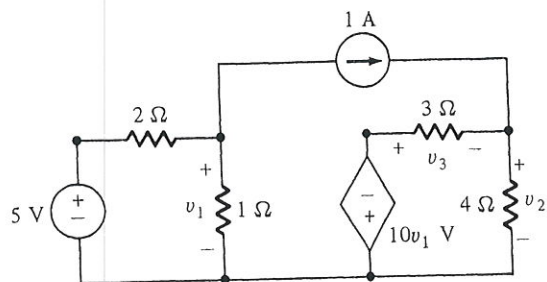


Fig. P2.29

- 2.28 Use mesh analysis to find v_1 , v_2 , and v_3 for the circuit shown in Fig. P2.28.
- 2.29 Repeat Problem 2.28 for the circuit shown in Fig. P2.29.
- 2.30 Repeat Problem 2.28 for the circuit shown in Fig. P2.6.
- 2.31 Repeat Problem 2.28 for the circuit shown in Fig. P2.5.
- 2.32 Find the resistance seen by the 1-A current source for the circuit shown in Fig. P2.32.
- 2.33 For the circuit given in Fig. P2.32, change the 5- Ω resistor to 3 Ω and repeat Problem 2.32.

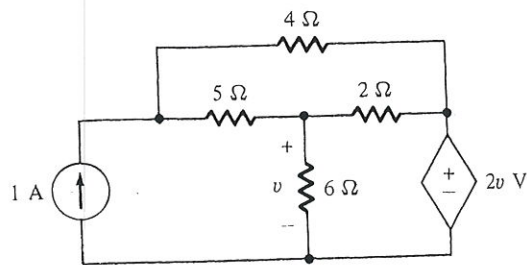


Fig. P2.32

- 2.34 Find the resistance seen by the 1-V voltage source for the circuit shown in Fig. P2.34.
- 2.35 For the circuit given in Fig. P2.34, change the 10- Ω resistor to 8 Ω and repeat Problem 2.34.
- 2.36 The simple transistor amplifier in Fig. P2.36 incorporates an alternative h -parameter model of a transistor. Use mesh analysis to find (a) the voltage gain v_2/v_1 and (b) the resistance $R_{eq} = v_1/i_1$.
- 2.37 For the transistor amplifier circuit in Fig. P2.37, use mesh analysis to find (a) the voltage gain v_2/v_1 and (b) the resistance $R_{eq} = v_1/i_e$.
- 2.38 For the transistor amplifier circuit shown in Fig. P2.38, use mesh analysis to find (a) the voltage gain v_2/v_1 and (b) the resistance $R_{eq} = v_1/i_b$.
- 2.39 For the circuit shown in Fig. P2.39, find the loop currents for the tree corresponding to the 1- Ω , 2- Ω , 3- Ω , and 4- Ω resistors. Determine the resistance seen by the 3-V source.

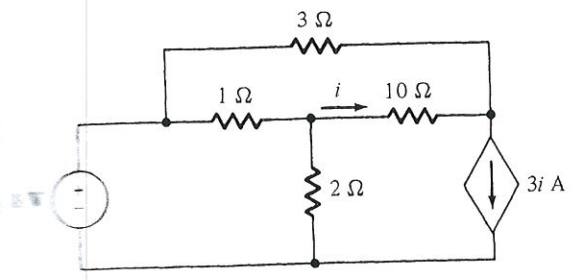


Fig P2.34

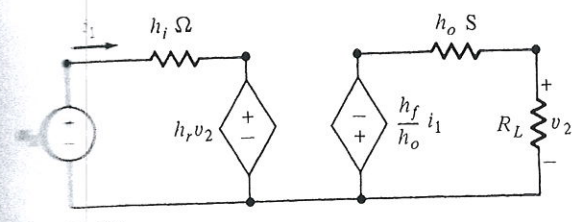


Fig P2.36

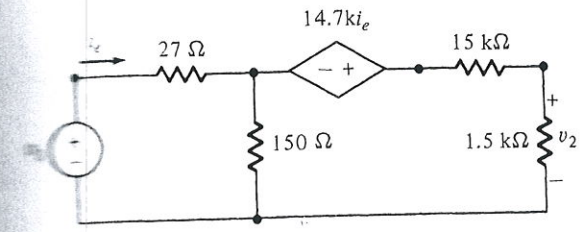


Fig P2.37

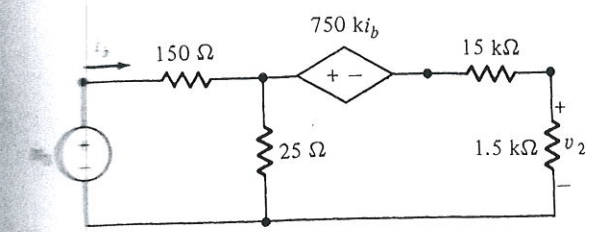


Fig P2.38

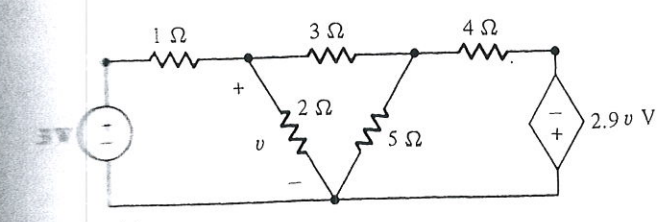


Fig P2.39