

## Assigned HW – Chapter 4

4.3 and 4.4: Number of independent KCL and KVL equations a circuit can have. (*Solutions to these problems will not be posted.*)

4.6, 4.9, 4.10, 4.19, 4.20, 4.21, 4.26, 4.27: Node voltage method.

4.31 to 4.34, 4.37, 4.38, 4.43, 4.46: Mesh current method.

4.52 and 4.54: Deciding which one, Node voltage or Mesh current method, is better suited.

4.55 and 4.58: Source transformations.

4.59 Thevenin equivalent circuit.

4.62 Norton equivalent circuit.

4.63 Think of using Thevenin equivalent circuit to solve this problem.

4.65 Thevenin equivalent circuit with dependent sources.

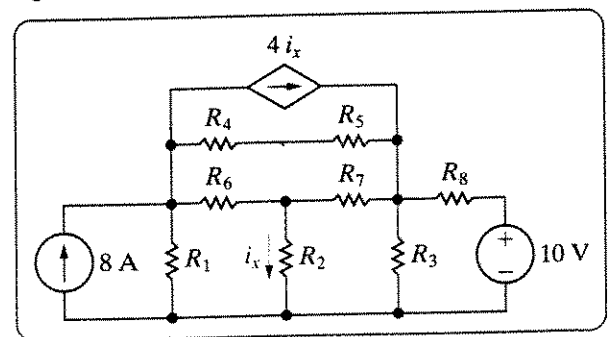
4.73 Thevenin equivalent circuit with no independent sources. (*Solution to this problem will not be posted.*)

4.75 and 4.76: Maximum power transfer.

4.87 and 4.88: Superposition principle. (*Solutions to these problems will not be posted.*)

- 4.3**
- If only the essential nodes and branches are identified in the circuit in Fig. P4.1, how many simultaneous equations are needed to describe the circuit?
  - How many of these equations can be derived using Kirchhoff's current law?
  - How many must be derived using Kirchhoff's voltage law?
  - What two meshes should be avoided in applying the voltage law?

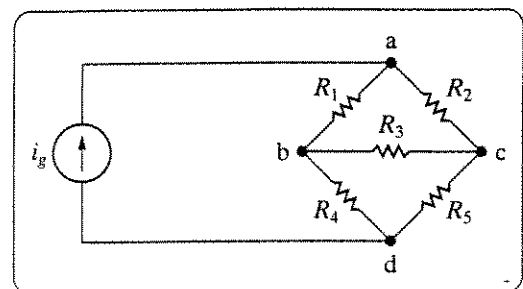
Figure P4.1



- 4.4** Assume the current  $i_g$  in the circuit in Fig. P4.4 is known. The resistors  $R_1$ – $R_5$  are also known.

- How many unknown currents are there?
- How many independent equations can be written using Kirchhoff's current law (KCL)?
- Write an independent set of KCL equations.
- How many independent equations can be derived from Kirchhoff's voltage law (KVL)?
- Write a set of independent KVL equations.

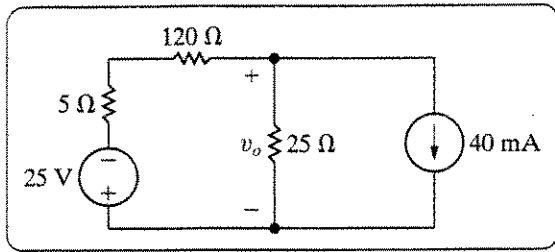
Figure P4.4



4.6 Use the node-voltage method to find  $v_o$  in the circuit in Fig. P4.6.

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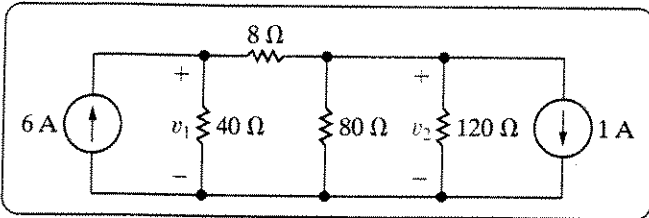
Figure P4.6



4.9 Use the node-voltage method to find  $v_1$  and  $v_2$  in the circuit shown in Fig. P4.9.

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Figure P4.9

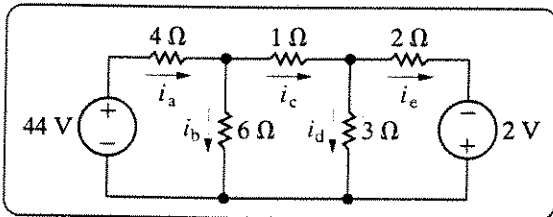


4.10 a) Use the node-voltage method to find the branch currents  $i_a - i_e$  in the circuit shown in Fig. P4.10.

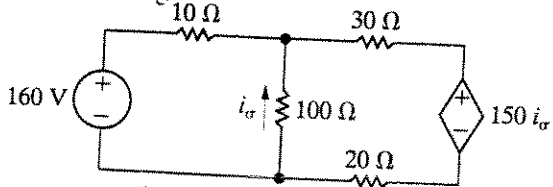
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b) Find the total power developed in the circuit.

Figure P4.10



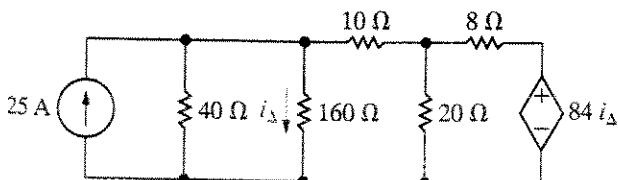
4.19 Use the node-voltage method to calculate the power delivered by the dependent voltage source in the circuit in Fig. P4.19.



4.20 a) Use the node-voltage method to find the total power developed in the circuit in Fig. P4.20.

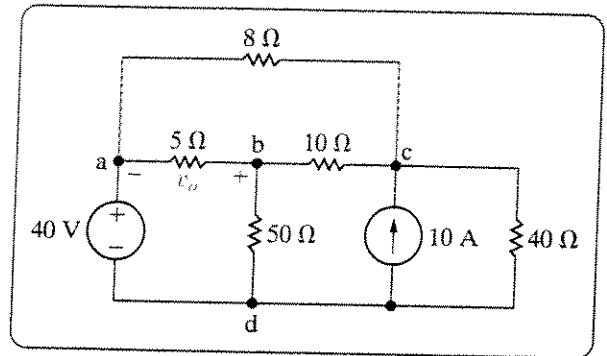
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b) Check your answer by finding the total power absorbed in the circuit.



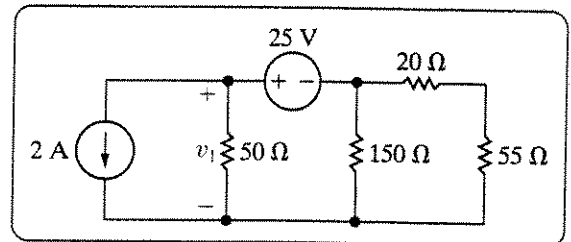
4.21 Use the node-voltage method to find the value of  $v_o$  in the circuit in Fig. P4.21.

Figure P4.21



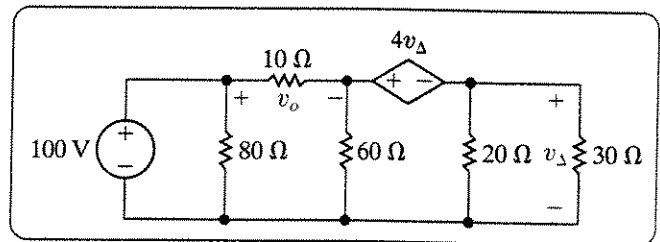
4.26 Use the node-voltage method to find  $v_1$  and the power delivered by the 25 V voltage source in the circuit in Fig. P4.26.

Figure P4.26



4.27 Use the node-voltage method to find  $v_o$  in the circuit in Fig. P4.27.

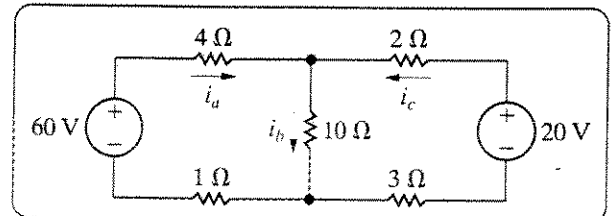
Figure P4.27



4.31 a) Use the mesh-current method to find the branch currents  $i_a$ ,  $i_b$ , and  $i_c$  in the circuit in Fig. P4.31.

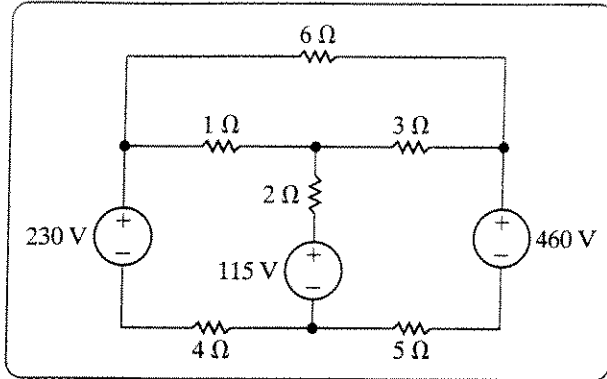
b) Repeat (a) if the polarity of the 60 V source is reversed.

Figure P4.31



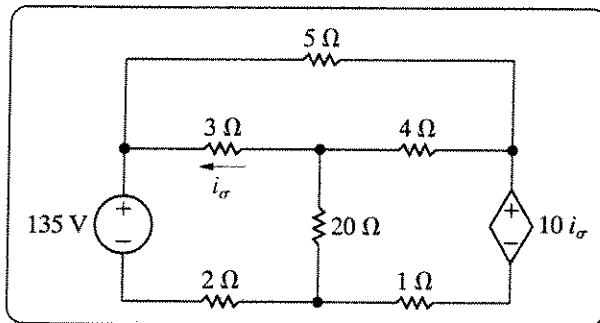
- 4.32 a) Use the mesh-current method to find the total power developed in the circuit in Fig. P4.32.
- b) Check your answer by showing that the total power developed equals the total power dissipated.

Figure P4.32



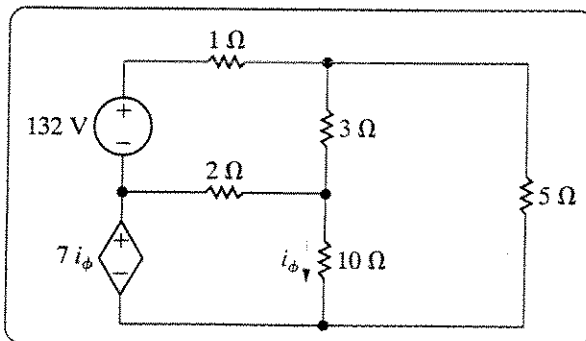
- 4.33 Use the mesh-current method to find the power dissipated in the  $20\ \Omega$  resistor in the circuit in Fig. P4.33.

Figure P4.33



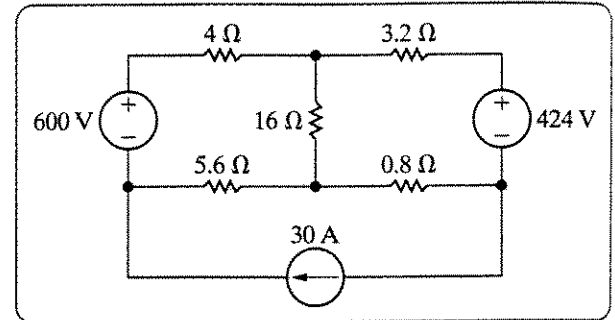
- 4.34 Use the mesh-current method to find the power delivered by the dependent voltage source in the circuit seen in Fig. P4.34.

Figure P4.34



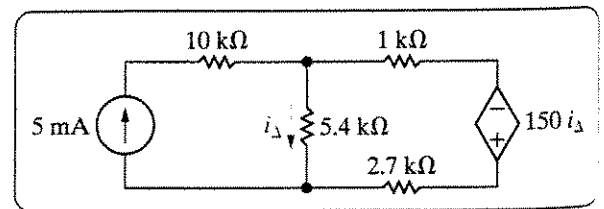
- 4.37 a) Use the mesh-current method to find how much power the  $30\ \text{A}$  current source delivers to the circuit in Fig. P4.37.
- b) Find the total power delivered to the circuit.
- c) Check your calculations by showing that the total power developed in the circuit equals the total power dissipated.

Figure P4.37



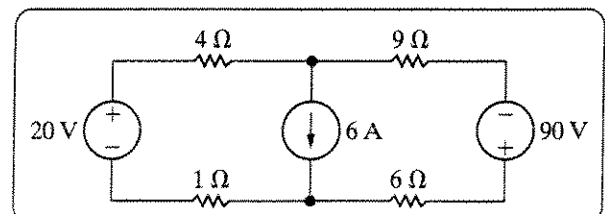
- 4.38 a) Use the mesh-current method to solve for  $i_\Delta$  in the circuit in Fig. P4.38.
- b) Find the power delivered by the independent current source.
- c) Find the power delivered by the dependent voltage source.

Figure P4.38



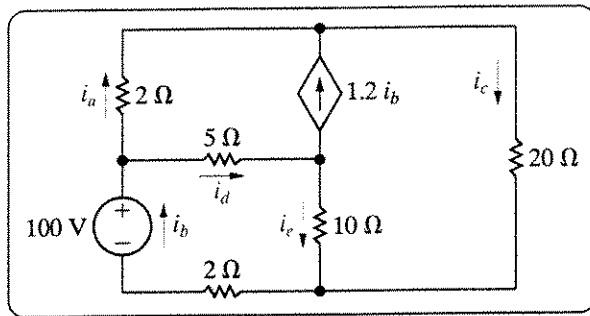
- 4.43 Use the mesh-current method to find the total power dissipated in the circuit in Fig. P4.43.

Figure P4.43



- 4.46 a) Use the mesh-current method to find the branch currents in  $i_a$ – $i_e$  in the circuit in Fig. P4.46.
- b) Check your solution by showing that the total power developed in the circuit equals the total power dissipated.

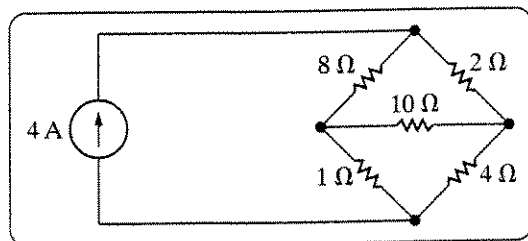
Figure P4.46



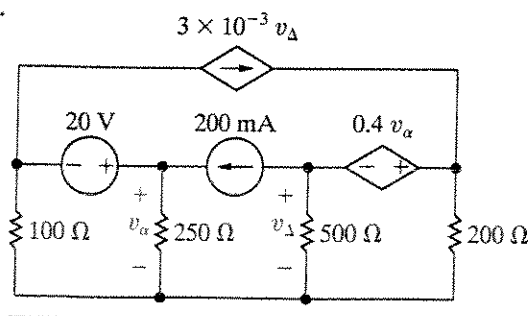
- 4.52 Assume you have been asked to find the power dissipated in the 10 Ω resistor in the circuit in Fig. P4.52.

- a) Which method of circuit analysis would you recommend? Explain why.
- b) Use your recommended method of analysis to find the power dissipated in the 10 Ω resistor.
- c) Would you change your recommendation if the problem had been to find the power developed by the 4 A current source? Explain.
- d) Find the power delivered by the 4 A current source.

Figure P4.52

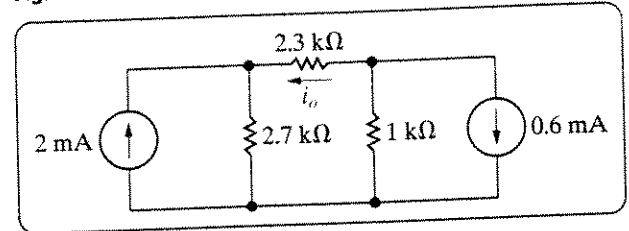


- 4.54 a) Would you use the node-voltage or mesh-current method to find the power absorbed by the 20 V source in the circuit in Fig. P4.54? Explain your choice.
- b) Use the method you selected in (a) to find the power.



- 4.55 a) Use a series of source transformations to find the current  $i_o$  in the circuit in Fig. P4.55.
- b) Verify your solution by using the node-voltage method to find  $i_o$ .

Figure P4.55

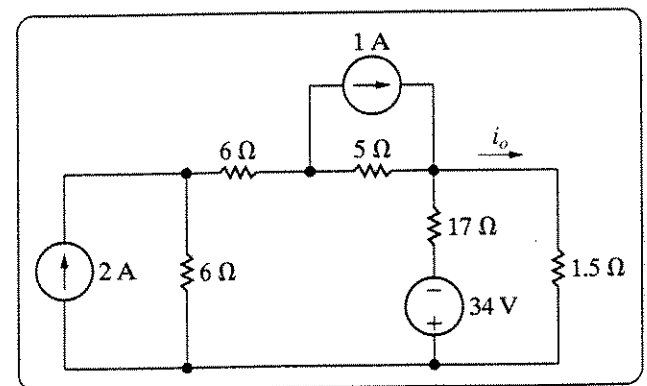


- 4.58 a) Use a series of source transformations to find  $i_o$  in the circuit in Fig. P4.58.

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- b) Verify your solution by using the mesh-current method to find  $i_o$ .

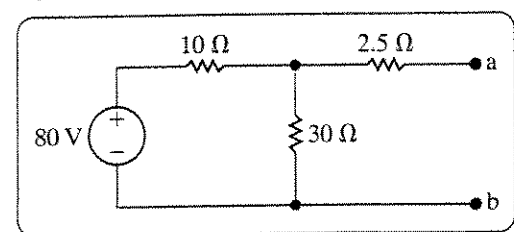
Figure P4.58



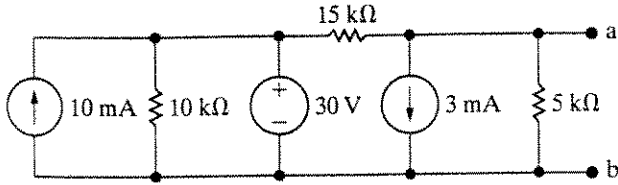
- 4.59 Find the Thévenin equivalent with respect to the terminals a, b for the circuit in Fig. P4.59.

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Figure P4.59



4.62 Find the Norton equivalent with respect to the terminals a,b in the circuit in Fig. P4.62.

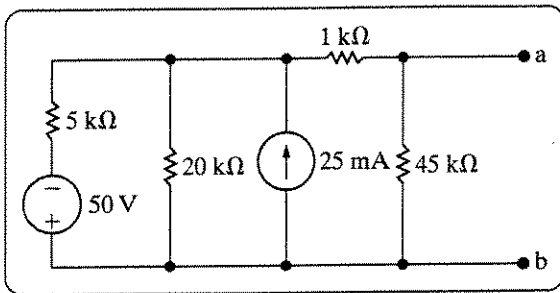


4.63 A voltmeter with a resistance of  $85.5 \text{ k}\Omega$  is used to measure the voltage  $v_{ab}$  in the circuit in Fig. P4.63.

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- What is the voltmeter reading?
- What is the percentage of error in the voltmeter reading if the percentage of error is defined as  $[(\text{measured} - \text{actual})/\text{actual}] \times 100\%$ ?

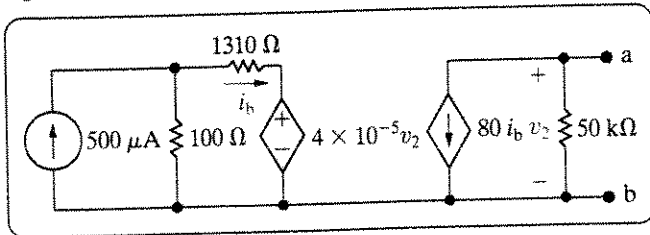
Figure P4.63



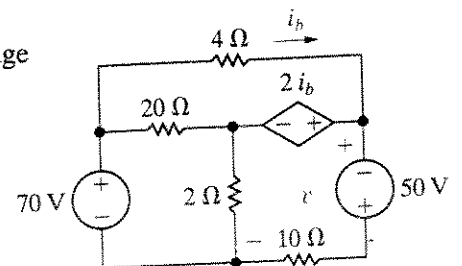
4.65 Determine the Thévenin equivalent with respect to the terminals a,b for the circuit shown in Fig. P4.65.

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Figure P4.65



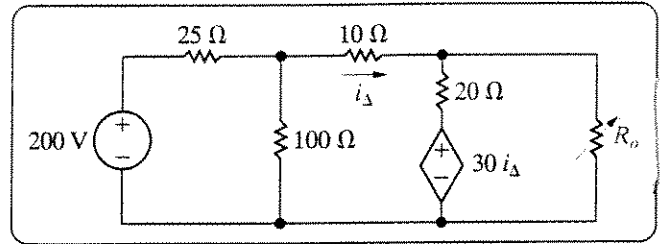
4.88 Use the principle of superposition to find the voltage  $v$  in the circuit of Fig. P4.88.



4.75 The variable resistor ( $R_o$ ) in the circuit in Fig. P4.75 is adjusted until the power dissipated in the resistor is 250 W. Find the values of  $R_o$  that satisfy this condition.

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Figure P4.75

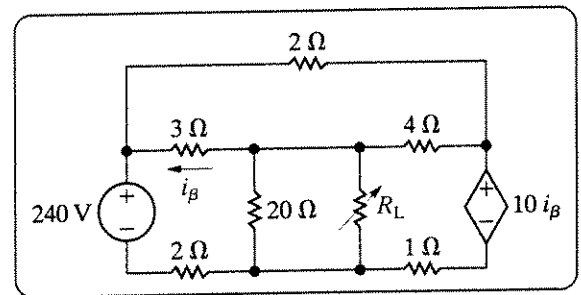


4.76 The variable resistor ( $R_L$ ) in the circuit in Fig. P4.76 is adjusted for maximum power transfer to  $R_L$ .

**P**

- Find the numerical value of  $R_L$ .
- Find the maximum power transferred to  $R_L$ .

Figure P4.76



4.87 a) Use the principle of superposition to find the voltage  $v$  in the circuit of Fig. P4.87.

b) Find the power dissipated in the  $10 \Omega$  resistor.

