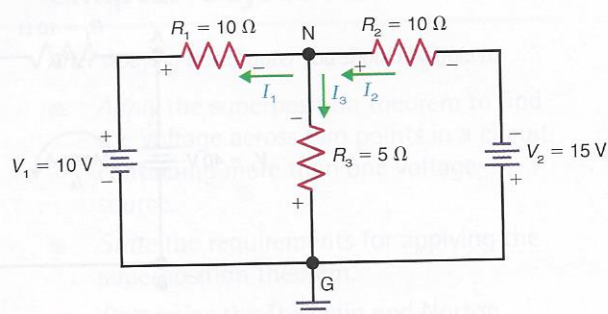


9-19 Repeat Prob. 9-18 for the circuit in Fig. 9-22.

Figure 9-22



SECTION 9-5 METHOD OF MESH CURRENTS

9-20 Using the method of mesh currents, solve for all unknown values of voltage and current in Fig. 9-23. To do this, complete steps a through m.

Figure 9-23

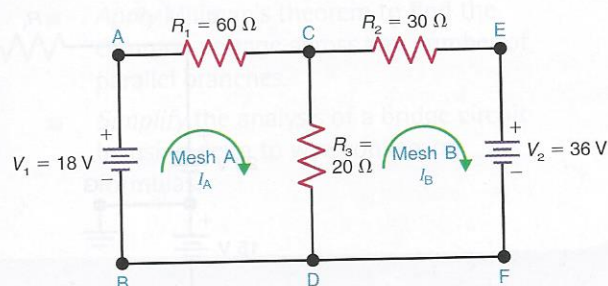
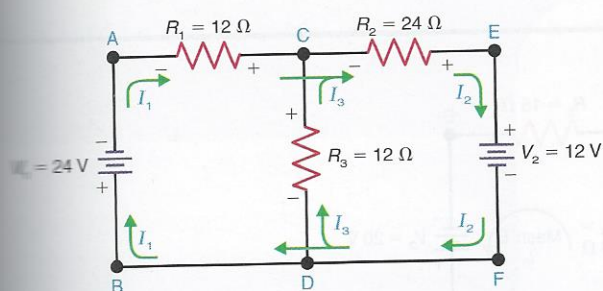


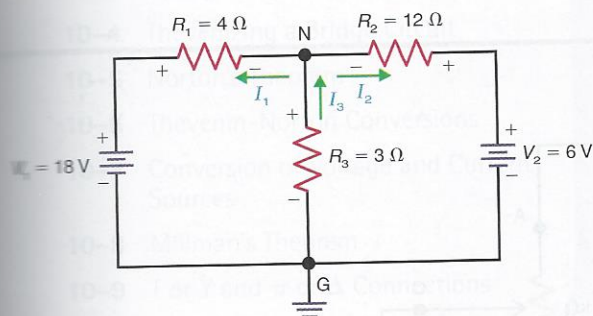
Figure 9-20



SECTION 9-4 NODE-VOLTAGE ANALYSIS

9-18 Using the method of node-voltage analysis, solve for all unknown values of voltage and current in Fig. 9-21. To do this, complete steps a through l. The assumed direction of all currents is shown in the figure.

Figure 9-21



- Using Kirchhoff's current law, write an equation for the currents I_1 , I_2 , and I_3 at the node-point, N.
- Express the KCL equation in step a in terms of V_R/R and V_N/R .
- Write a KVL equation for the loop containing V_1 , V_{R_1} , and V_{R_3} .
- Write a KVL equation for the loop containing V_2 , V_{R_2} , and V_{R_3} .
- Specify V_{R_1} and V_{R_2} in terms of V_N and the known values of V_1 and V_2 .
- Using the values for V_{R_1} and V_{R_2} from step e, write a KCL equation for the currents at the node-point N.
- Solve for the node voltage, V_N .
- Using the equations from step e, solve for the voltage drops V_{R_1} and V_{R_2} .
- In Fig. 9-21, were all the assumed directions of current correct? How do you know?
- Calculate the currents I_1 , I_2 , and I_3 .
- Rewrite the KVL loop equation for both inner loops using actual voltage values. (Be sure that the resistor voltage drops all have the correct polarity based on the final answers for V_{R_1} and V_{R_2} .)
- Based on the actual values for I_1 , I_2 , and I_3 , write a KCL equation for the currents at the node-point, N.

- Identify the components through which the mesh current, I_A , flows.
- Identify the components through which the mesh current, I_B , flows.
- Which component has opposing mesh currents?
- Write the mesh equation for mesh A.
- Write the mesh equation for mesh B.
- Solve for currents I_A and I_B using any of the methods for the solution of simultaneous equations.
- Determine the values of currents I_1 , I_2 , and I_3 .
- Are the assumed directions of the mesh A and mesh B currents correct? How do you know?
- What is the direction of the current, I_3 , through R_3 ?
- Solve for the voltage drops V_{R_1} , V_{R_2} , and V_{R_3} .
- Using the final solutions for V_{R_1} , V_{R_2} , and V_{R_3} , write a KVL equation for the loop ACDBA going clockwise from point A.
- Using the final solutions for V_{R_1} , V_{R_2} , and V_{R_3} , write a KVL equation for the loop EFDCE going clockwise from point E.
- Using the final solutions (and directions) for I_1 , I_2 , and I_3 , write a KCL equation for the currents at point C.