## Chapter 4, Problem 45.

Find the Thevenin equivalent of the circuit in Fig. 4.112.


Figure 4.112

## Chapter 4, Solution 45.

For $\mathrm{R}_{\mathrm{N}}$, consider the circuit in Fig. (a).


$$
\mathrm{R}_{\mathrm{N}}=(6+6) \| 4=\underline{\mathbf{3} \text { ohms }}
$$

For $\mathrm{I}_{\mathrm{N}}$, consider the circuit in Fig. (b). The 4-ohm resistor is shorted so that 4-A current is equally divided between the two 6 -ohm resistors. Hence,

$$
\mathrm{I}_{\mathrm{N}}=4 / 2=\underline{\mathbf{2} \mathbf{A}}
$$

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## Chapter 4, Problem 48.

Determine the Norton equivalent at terminals $\boldsymbol{a}-\boldsymbol{b}$ for the circuit in Fig. 4.115.


Figure 4.115

## Chapter 4, Solution 48.

To get $\mathrm{R}_{\mathrm{Th}}$, consider the circuit in Fig. (a).


From Fig. (a),

$$
\begin{gathered}
\mathrm{I}_{0}=1, \quad 6-10-\mathrm{V}=0, \text { or } \mathrm{V}=-4 \\
\mathrm{R}_{\mathrm{N}}=\mathrm{R}_{\mathrm{Th}}=\mathrm{V} / 1=\underline{-4} \text { ohms }
\end{gathered}
$$

To get $\mathrm{V}_{\mathrm{Th}}$, consider the circuit in Fig. (b),

$$
\begin{gathered}
\mathrm{I}_{0}=2, \mathrm{~V}_{\mathrm{Th}}=-10 \mathrm{I}_{0}+4 \mathrm{I}_{\mathrm{o}}=-12 \mathrm{~V} \\
\mathrm{I}_{\mathrm{N}}=\mathrm{V}_{\mathrm{Th}} / \mathrm{R}_{\mathrm{Th}}=\underline{\mathbf{3 A}}
\end{gathered}
$$

## Chapter 4, Solution 57.

To find $R_{T h}$, remove the 50 V source and insert a $1-\mathrm{V}$ source at $\mathrm{a}-\mathrm{b}$, as shown in Fig. (a).


We apply nodal analysis. At node A,

$$
\begin{equation*}
\mathrm{i}+0.5 \mathrm{v}_{\mathrm{x}}=(1 / 10)+\left(1-\mathrm{v}_{\mathrm{x}}\right) / 2, \text { or } \mathrm{i}+\mathrm{v}_{\mathrm{x}}=0.6 \tag{1}
\end{equation*}
$$

At node B,

$$
\begin{equation*}
\left(1-v_{0}\right) / 2=\left(v_{x} / 3\right)+\left(v_{x} / 6\right), \text { and } v_{x}=0.5 \tag{2}
\end{equation*}
$$

From (1) and (2), $\quad i=0.1$ and

$$
\mathrm{R}_{\mathrm{Th}}=1 / \mathrm{i}=\mathbf{1 0} \text { ohms }
$$

To get $\mathrm{V}_{\mathrm{Th}}$, consider the circuit in Fig. (b).


At node $1, \quad\left(50-v_{1}\right) / 3=\left(v_{1} / 6\right)+\left(v_{1}-v_{2}\right) / 2$, or $100=6 \mathrm{v}_{1}-3 \mathrm{v}_{2}$
At node $2, \quad 0.5 \mathrm{v}_{\mathrm{x}}+\left(\mathrm{v}_{1}-\mathrm{v}_{2}\right) / 2=\mathrm{v}_{2} / 10, \mathrm{v}_{\mathrm{x}}=\mathrm{v}_{1}$, and $\mathrm{v}_{1}=0.6 \mathrm{v}_{2}$
From (3) and (4),

$$
\begin{gathered}
\mathrm{V}_{2}=\mathrm{V}_{\mathrm{Th}}=\underline{166.67 \mathrm{~V}} \\
\mathrm{I}_{\mathrm{N}}=\mathrm{V}_{\mathrm{Th}} / \mathrm{R}_{\mathrm{Th}}=\underline{16.667 \mathrm{~A}} \\
\mathrm{R}_{\mathrm{N}}=\mathrm{R}_{\mathrm{Th}}=\underline{10 \mathrm{ohms}}
\end{gathered}
$$

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