Problem 1

Use source transformation to find $i_x$ in the circuit. ($I_s=3.33\,\text{A}$)

\[ 10\Omega \quad + \quad 40\Omega \quad 50\Omega \quad 8\Omega \quad 60\text{V} \quad \quad i_x \quad 3i_x \]

Problem 2

Determine $R_{TH}$ and $V_{TH}$ at terminals 1-2 of each circuit.

\[ 80\Omega \quad + \quad 40\Omega \quad 10\Omega \quad 20\Omega \quad 2\text{A} \quad 20\text{V} \]

Answer: (a) $V_{TH}=16\,\text{V}$, $R_{TH}=8\,\Omega$

\[ 2\text{A} \quad 20\Omega \quad 80\Omega \quad + \quad 30\text{V} \]

Answer: (b) $V_{TH}=38\,\text{V}$, $R_{TH}=16\,\Omega$
Problem 3

Obtain the Thevenin equivalent at terminals a-b of the circuit.

Answer: $V_{TH} = -41.6V$, $R_{TH} = 24\Omega$

Problem 4

Obtain the Thevenin and Norton equivalent circuits of the following circuit with respect to terminals a and b.

Answer: $V_{TH} = 3.788V$, $R_{TH} = R_N = 0.455\Omega$, $I_N = 8.325A$
Problem 5

Determine the Norton’s equivalent at terminals a-b for the following circuit.

\[ I_N = 1.714 \text{A}, \quad R_N = 7 \Omega \]

Problem 6

Obtain the Norton’s equivalent as viewed from terminals:

(a) a-b 
(b) c-d

Answer: (a) \( R_N = 2 \Omega, \quad I_N = 6 \text{A} \) 
(b) \( R_N = 1.5 \Omega, \quad I_N = 8 \text{A} \)
Problem 7

Find the Thevenin equivalent at terminals a-b of the circuit.

Answer: $V_{TH} = 3V$, $R_{TH} = 3.5\Omega$

Problem 8

Determine the Thevenin’s and Norton’s equivalents at terminals a-b

Answer: $I_N = -1.371A$, $R_N = R_{TH} = 29.167\Omega$, $V_{TH} = -40V$
Problem 9

Find the maximum power that can be delivered to the resistor R in the following circuit. Answer: $V_{th} = 4V$, $R_{th} = 3.2\Omega$, $P_{max} = 1.25W$

Problem 10

Determine the maximum power delivered to the variable resistor R shown in the circuit. Answer: $V_{th} = 8V$, $R_{th} = 26\Omega$, $P_{max} = 0.615W$
Problem 11

Determine the maximum power that can be delivered to the variable resistor $R$ in the circuit. Answer: $P_{\text{max}} = 14.424\, \text{W}$