problem 1 solution

\[ R = \frac{v^2}{P} = \frac{14400}{80} \Omega = 180 \Omega \]

problem 2 solution

(a) \( i = 15/80 = 0.1875 A = 187.5 \text{mA} \)

(b) \( i = 15/75 = 0.2 A = 200 \text{mA} \)

problem 3 solution

\[ i_1 = -6 + 11 A = 5 A \]

\[ i_2 = 11 - 5 A = 6 A \]

\[ i_3 = 13 - i_2 = 13 - 6 A = 7 A \]

problem 4 solution

\[ -10 - 25 + 25 + v_1 = 0 \Rightarrow v_1 = 10V \]

\[ 20 - 25 - v_2 = 0 \Rightarrow v_2 = -5V \]

\[ -v_1 + v_2 + v_3 = 0 \Rightarrow v_3 = 15V \]

problem 5 solution

\[ -18 + v + 3 = 0 \Rightarrow v = 15V \]

\[ -3 + 12 + 3i = 0 \Rightarrow 3i = -9 \Rightarrow i = -3A \]

problem 6 solution

\[ -22 + 3I - 8 + 5I + 6 = 0 \]

\[ I = 3A \]

\[ -V_{ab} + 5I + 6 = 0 \Rightarrow V_{ab} = v_2 + 6 = 5 \times 3 + 6 V = 21V \]

problem 7 solution

\[ -36 + 4i_1 + 5i_0 + 3i_0 = 0 \]

\[ i_0 = 3A \]

problem 8 solution

Assign loop current \( I \).
Assign \( v_1, v_2 \) by passive sign convention.
By Ohm’s Law, \( v_1 = I, v_2 = 2I \)
Since \( I \) enters “-” of \( v_x \), \( v_x = -3I \).

KVL along clockwise direction: \( v_1 + 3v_x - v_x + v_2 - 15 = 0 \),
\[ I + 3v_x - v_x + 2I - 15 = 0 \]
\[ I + 3(-3I) - (-3I) + 2I - 15 = 0 \]
\[ -3I = 15 \]
\[ I = -5A, v_x = -3(-5) = 15V \]
By KCL, same current $I$ flows through $4\Omega$ and $3\Omega$ resistor on left side.

By Ohms Law, $I = \frac{V_0}{3}$. By the dependent current source, $I_0 = 2V_0$

By KCL at top node, $I = 10 + I_0 \Rightarrow \frac{V_0}{3} = 10 + 2V_0 \Rightarrow V_0 = -6V$

Thus, $I = \frac{V_0}{3} = -2A, v_1 = 4I = -8V$.

To find the power dissipated by the controlled source, assign $v$ (passive sign).

Need $v_2$ to compute $v$. By Ohm's Law, $v_2 = 3(2V_0) = 3(-12) = -36V$.

By KVL along outer loop: $-v_1 - v - v_2 - V_0 = 0$

$v = -v_1 - v - v_2 - V_0 = -(-8) - (-36) - (-6) = 50V$

Power dissipated by controlled source $p = v \times 2V_0 = 50(-12) = -600W$.

$V_0 = -6V, p = -600W$