P 4.81 [a]

\[ \frac{v_{Th} - 18}{6000} + \frac{v_{Th} - 50}{10,000} = 0 \]

Solving, \( v_{Th} = 30 \text{ V} \)

\[ R_{Th} = 1250 + 10,000||(2000 + 4000) = 5 \text{ k} \Omega \]

\[ R_c = R_{Th} = 5 \text{ k} \Omega \]

[b]

\[ p_{max} = (3 \times 10^{-3})^2(5000) = 45 \text{ m W} \]
P 4.91 [a] 75 V source acting alone:

\[ R_e = 20 \parallel 20 = 10 \Omega \]

\[ i' = \frac{75}{5 + 10} = 5 \text{ A} \]

\[ v' = (5)(10) = 50 \text{ V} \]

6 A source acting alone:

\[ 5 \parallel 20 = 4 \Omega \]

\[ 4 + 8 = 12 \Omega \]

\[ 12 \parallel 12 = 6 \Omega \]

Hence our circuit reduces to:

\[ v''_a = 6(6) = 36 \text{ V} \]

and
\[ v'' = \frac{4}{4 + 8}(-36) = -12 \text{ V} \]

\[ \therefore v = v' + v'' = 50 - 12 = 38 \text{ V} \]

[b] \[ p = \frac{v^2}{20} = 72.2 \text{ W} \]

P 4.92 70-V source acting alone:

\[ v' = 70 - 4i'_b \]

\[ i'_s = \frac{v'_b}{2} + \frac{v'}{10} = i'_a + i'_b \]

70 = 20i'_a + v'_b

\[ i'_a = \frac{70 - v'_b}{20} \]

\[ \therefore i'_b = \frac{v'_b}{2} + \frac{v'}{10} - \frac{70 - v'_b}{20} = \frac{11}{20}v'_b + \frac{v'}{10} - 3.5 \]

\[ v' = v'_b + 2i'_b \]

\[ \therefore v'_b = v' - 2i'_b \]

\[ \therefore i'_b = \frac{11}{20}(v' - 2i'_b) + \frac{v'}{10} - 3.5 \quad \text{or} \quad i'_b = \frac{13}{42}v' - \frac{70}{42} \]

\[ \therefore v' = 70 - 4\left(\frac{13}{42}v' - \frac{70}{42}\right) \quad \text{or} \quad v' = \frac{3220}{94} = \frac{1610}{47} \quad V = 34.255 \text{ V} \]

50-V source acting alone: