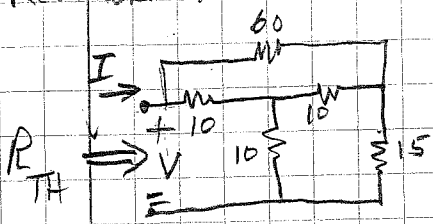
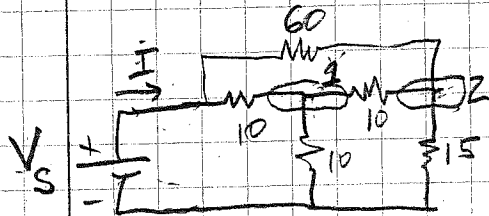


Prob. 5.8-1. No Pspice. Reduce the right half to one Resistor. Then solve for the numbers



Find V_{TH} - Apply a voltage on the left, find the current, then $R_{TH} = \frac{V}{I}$



$$\textcircled{1} \frac{V_1 - V_S}{10} + \frac{V_1 - V_2}{10} + \frac{V_1}{10} = 0, \textcircled{2} \frac{V_2 - V_1}{10} + \frac{V_2 - V_S}{60} + \frac{V_2}{15} = 0$$

$$\begin{bmatrix} \frac{1}{10} + \frac{1}{10} + \frac{1}{10} & -\frac{1}{10} \\ -\frac{1}{10} - \frac{1}{60} & \frac{1}{10} + \frac{1}{60} + \frac{1}{15} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} \frac{V_S}{10} \\ \frac{V_S}{60} \end{bmatrix}$$

$$\times 60 \quad \begin{bmatrix} 6+6+6 & -6 \\ -6-1 & 6+1+4 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 6V_S \\ 1V_S \end{bmatrix}, \quad \begin{bmatrix} 18 & -6 \\ -7 & 11 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 6V_S \\ 1V_S \end{bmatrix}$$

$$\begin{cases} 18V_1 - 6V_2 = 6V_S \\ -7V_1 + 11V_2 = 1V_S \end{cases}; V_2 = \frac{V_S + 7V_1}{11}$$

$$18V_1 - 6 \left[\frac{7V_1 + 1V_S}{11} \right] = 6V_S$$

$$3V_1 - \left[\frac{7V_1 + 1V_S}{11} \right] = 1V_S$$

$$V_1 \left[3 - \frac{7}{11} \right] = \left(1 + \frac{1}{11} \right) V_S$$

$$V_1 \left[\frac{26}{11} \right] = \left[\frac{12}{11} \right] V_S$$

$$V_1 = \frac{12}{26} V_S = \frac{6}{13} V_S$$

$$V_2 = \frac{7}{11} V_1 + \frac{V_S}{11}$$

$$V_2 = \frac{7}{11} \left(\frac{6}{13} \right) V_S + \frac{V_S}{11}$$

$$11V_2 = \frac{42}{13} V_S + V_S$$

$$11V_2 = \frac{1}{13} (42V_S + 13V_S)$$

$$11V_2 = \frac{55}{13} V_S, V_2 = \frac{5}{13} V_S$$

FROM CKT

$$I = \frac{V_S - V_1}{10} + \frac{V_S - V_2}{60} = \frac{V_S - \frac{6}{13} V_S}{10} + \frac{V_S - \frac{5}{13} V_S}{60}$$

$$I = V_S \left[\frac{7/13}{10} + \frac{8/13}{60} \right] = V_S \left(\frac{1}{13} \right) \left(\frac{7}{10} + \frac{8}{60} \right) = V_S \left(\frac{1}{13} \right) \left(\frac{42+8}{60} \right) = V_S \left(\frac{1}{13} \right) \left(\frac{5}{6} \right)$$

$$= V_S / 15, R = 15 = 15.6 \Omega$$