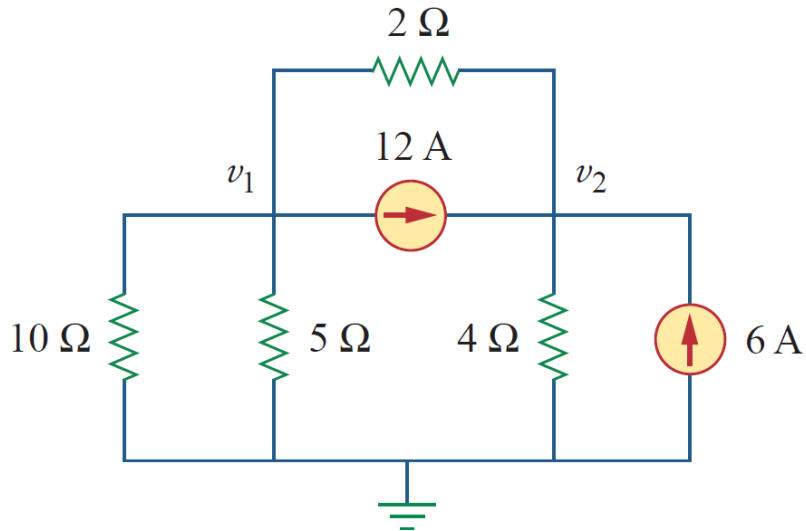


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Circuit 1, Homework 4

1) Use Nodal analysis to solve for V_1 and V_2 .



Applying Nodal Analysis:

Applying KCL at node- V_1 , we get

$$\frac{V_1}{10} + \frac{V_1 + V_2}{2} + 12 + \frac{V_1}{5}$$

$$\frac{V_1}{10} + \frac{V_1}{2} + \frac{V_1}{5} - \frac{V_2}{2} = -12$$

$$V_1 \left[\frac{1}{10} + \frac{1}{2} + \frac{1}{5} \right] - \frac{V_2}{2} = -12$$

$$0.8V_1 - 0.5V_2 = -12$$

Applying KCL at node - V_2 , we get

$$\frac{V_2 - V_1}{2} - 12 + \frac{V_2}{4} - 6 = 0$$

$$-\frac{V_1}{2} + \frac{V_2}{4} + \frac{V_2}{2} = 12 + 6$$

$$-0.5V_1 + 0.75V_2 = 18$$

Solving Eq_1 Eq_2 we get

$$0.5 [0.8V_1 - 0.5V_2 = -12] \rightarrow 0.4V_1 - 0.25V_2 = -6$$

$$0.8 [-0.5V_1 + 0.75V_2 = 18] \rightarrow -0.4V_1 + 0.6V_2 = 14.4$$

$$V_1 = 0\text{V} \quad V_2 = 24\text{V}$$