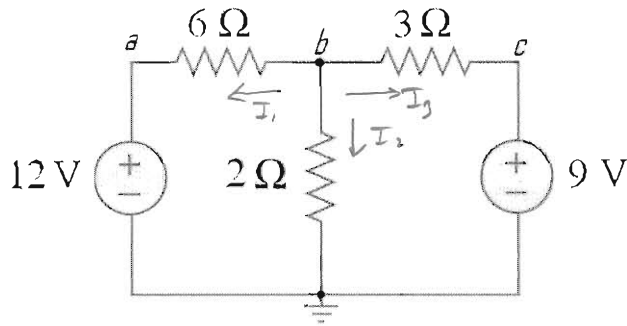


1. Given the following circuit:



- a. Identify the voltage at each of the three nodes (either as a value or as UNKNOWN if it must be calculated)

$$V_a = \underline{12V}$$

$$V_b = \underline{UNK}$$

$$V_c = \underline{9V}$$

- b. Write the equations for the three branch currents at node b. DRAW the current arrows corresponding to these equations on the circuit above.

$$I_1 = \frac{(V_b - V_a)}{6} = \frac{(V_b - 12)}{6}$$

$$I_2 = \frac{(V_b)}{2}$$

$$I_3 = \frac{(V_b - V_c)}{3} = \frac{(V_b - 9)}{3}$$

- c. Write the resulting Nodal Analysis equation and solve for the unknown voltages.

$$I_1 + I_2 + I_3 = 0$$

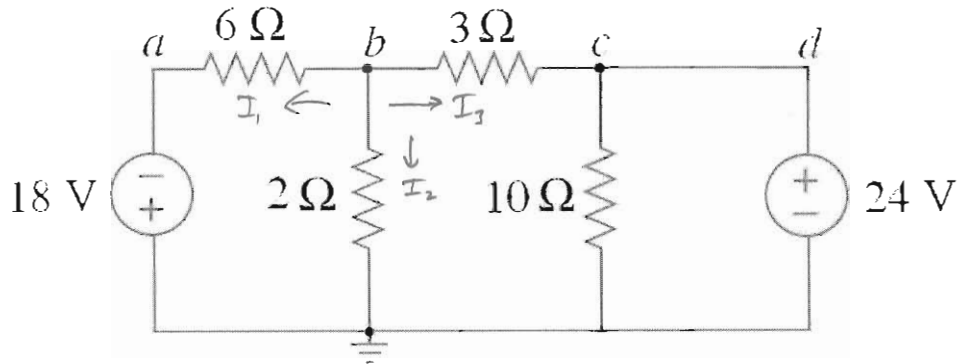
$$\left(\frac{V_b - 12}{6}\right) + \left(\frac{V_b}{2}\right) - \left(\frac{V_b - 9}{3}\right) = 0$$

$$V_b \left[\frac{1}{6} + \frac{1}{2} + \frac{1}{3}\right] = \frac{12}{6} + \frac{9}{3}$$

$$V_b(1) = 2 + 3 = 5 \rightarrow \boxed{V_b = 5V}$$

EE301 Nodal Analysis Part I Homework Assignment

2. Given the following circuit:



a. Identify the voltage at each of the lettered points above (either as a value or as UNKNOWN if it must be calculated)

$$V_a = -18V$$

$$V_b = \text{UNK}$$

$$V_c = 24V$$

$$V_d = V_c = 24V$$

b. Write the equations for the three branch currents at node b. DRAW the current arrows corresponding to these equations on the circuit above.

$$I_1 = \frac{V_b - (-18)}{6} = \frac{V_b + 18}{6}$$

$$I_2 = \frac{V_b}{2}$$

$$I_3 = \frac{V_b - 24}{3}$$

c. Write the resulting Nodal Analysis equation and solve for the unknown voltages.

$$I_1 + I_2 + I_3 = 0$$

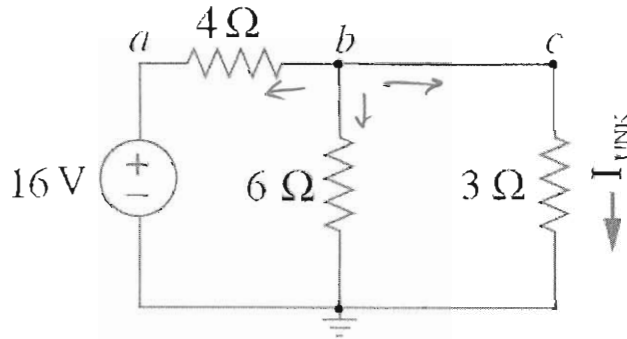
$$\left(\frac{V_b + 18}{6}\right) + \frac{V_b}{2} + \left(\frac{V_b - 24}{3}\right) = 0$$

$$V_b \left[\frac{1}{6} + \frac{1}{2} + \frac{1}{3}\right] = \frac{24}{3} - \frac{18}{6}$$

$$V_b(1) = 8 - 3 = 5 \rightarrow \boxed{V_b = 5V}$$

EE301 Nodal Analysis Part I Homework Assignment

3. Given the following circuit:



- a. Identify the voltage at each of the lettered points above (either as a value or as UNKNOWN if it must be calculated)

$$V_a = \underline{16V}$$

$$V_b = \underline{UNK}$$

$$V_c = \underline{V_b = UNK}$$

- b. Write the equations for the three branch currents at node b. DRAW the current arrows corresponding to these equations on the circuit above.

$$I_1 = \underline{\frac{(V_b - 16)}{4}}$$

$$I_2 = \underline{\frac{(V_b)}{6}}$$

$$I_3 = \underline{\frac{(V_b)}{3}}$$

- c. Write the resulting Nodal Analysis equation and solve for the unknown voltages. Determine the current I_{UNK} .

$$I_1 + I_2 + I_3 = 0$$

$$\left(\frac{V_b - 16}{4}\right) + \left(\frac{V_b}{6}\right) + \left(\frac{V_b}{3}\right) = 0$$

$$V_b \left[\frac{1}{4} + \frac{1}{6} + \frac{1}{3} \right] = \frac{16}{4}$$

$$V_b [0.75] = 4$$

$$V_b = \frac{4}{0.75} = \boxed{5.33V = V_b}$$

$$I_{UNK} = \left(\frac{V_b - 0}{3}\right) = \frac{5.33}{3} = \boxed{1.78A = I_{UNK}}$$