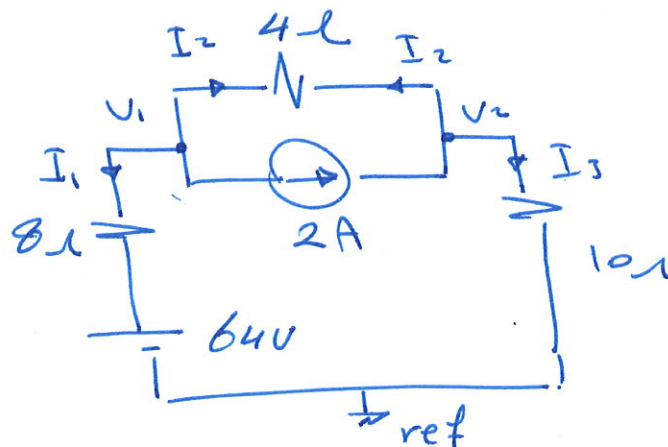


Ex Apply nodal analysis to the network of Fig. to determine all currents.



Sol

at node ①

$$2 + I_1 + I_2 = 0$$

$$2 + \frac{V_1 - 64}{8} + \frac{V_1 - V_2}{4} = 0$$

~~$$2 + \frac{V_1 - 64}{8} + \frac{V_1 - V_2}{4} = 0$$~~

~~24~~

$$2 + V_1 \left(\frac{1}{8} \right) - 8 + V_1 \left(\frac{1}{4} \right) - V_2 \left(\frac{1}{4} \right) = 0$$

$$-6 + 0.375 V_1 - 0.25 V_2 = 0 \quad \text{--- (1)}$$

at node ②

$$2 = I_3 + I_2$$

$$2 = \frac{V_2}{10} + \frac{V_2 - V_1}{4}$$

$$2 = V_2 \left(\frac{1}{10} \right) + V_2 \left(\frac{1}{4} \right) - V_1 \left(\frac{1}{4} \right)$$

$$2 = 0.35 V_2 - 0.25 V_1 \quad \text{--- (2)}$$

لغوب V_1 من (2) ونعوضها في (1)

$$V_1 = \frac{0.35 V_2 - 2}{0.25}$$

$$-6 + 0.375 \left(\frac{0.35 V_2 - 2}{0.25} \right) - 0.25 V_2 = 0 \quad \times 0.25$$

$$\underline{-1.5} + \underline{0.13125 V_2} - \underline{0.75} - 0.0625 V_2 = 0$$

$$-2.25 + 0.06875 V_2 = 0 \Rightarrow V_2 = 32.727V$$

$$V_1 = \frac{0.35(32.727) - 2}{0.25} = 37.818 \text{ V}$$

$$\therefore I_1 = \frac{64 - 37.818}{8} = 3.272 \text{ A}$$

$$I_3 = \frac{V_2}{10} = \frac{32.727}{10} = 3.2 \text{ A}$$

$$I_2 = \frac{V_1 - V_2}{4} = 1.272 \text{ A}$$