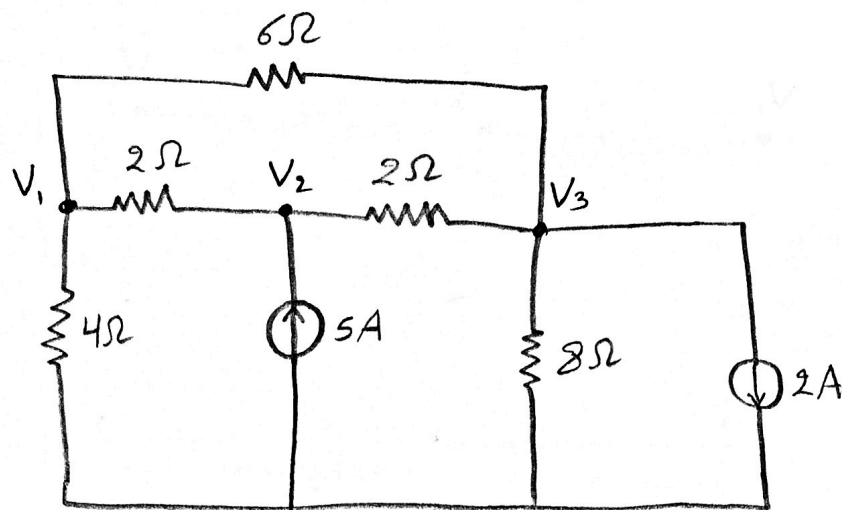


Example 1 :: Use Nodal Voltage method to Find V_1, V_2, V_3



$$\left(\frac{1}{6} + \frac{1}{4} + \frac{1}{2}\right)V_1 - \left(\frac{1}{2}\right)V_2 - \left(\frac{1}{6}\right)V_3 = 0 \quad \text{--- (1)}$$

$$\left(\frac{1}{2} + \frac{1}{2}\right)V_2 - \left(\frac{1}{2}\right)V_1 - \left(\frac{1}{2}\right)V_3 = 5 \quad \text{--- (2)}$$

$$\left(\frac{1}{8} + \frac{1}{2} + \frac{1}{6}\right)V_3 - \left(\frac{1}{6}\right)V_1 - \left(\frac{1}{2}\right)V_2 = -2 \quad \text{--- (3)}$$

$$\left[\left(\frac{11}{12}\right)V_1 - \left(\frac{1}{2}\right)V_2 - \left(\frac{1}{6}\right)V_3 = 0\right] * 12$$

Re

$$11V_1 - 6V_2 - 2V_3 = 0 \quad \text{--- (1)}$$

$$\left[V_2 - \left(\frac{1}{2}\right)V_1 - \left(\frac{1}{2}\right)V_3 = 5\right] * 2$$

$$2V_2 - V_1 - V_3 = 10 \quad \text{--- (2)}$$

$$\left(\frac{19}{24}\right)V_3 - \left(\frac{1}{6}\right)V_1 - \left(\frac{1}{2}\right)V_2 = -2$$

$$19V_3 - 4V_1 - 12V_2 = -48 \quad \text{--- (3)}$$

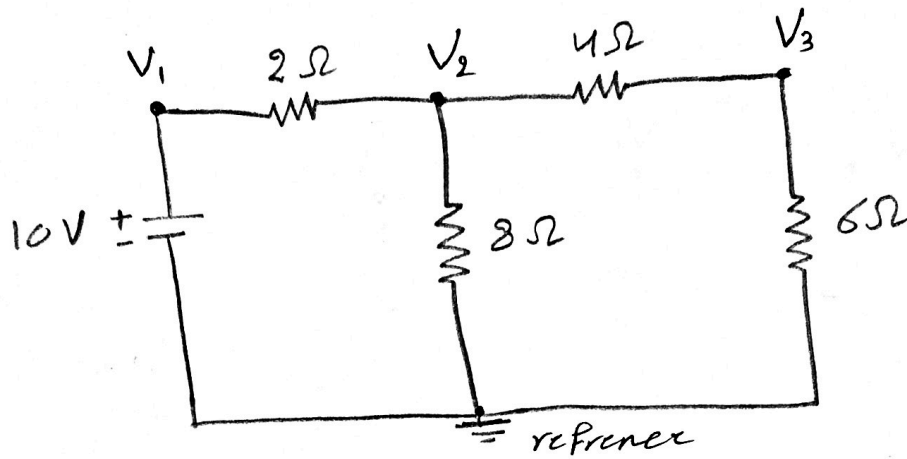
$$V_1 = -23$$

$$V_2 = -35$$

$$V_3 = -20$$

□ 1

Example 2 use nodal voltage method Find V_1, V_2, V_3 ?



sol

at node ① $V_1 = 10V$ ——— ①

$$\left(\frac{1}{2} + \frac{1}{8} + \frac{1}{4}\right)V_2 - \left(\frac{1}{2}\right)V_1 - \left(\frac{1}{4}\right)V_3 = 0$$

$$\left[\left(\frac{7}{8}\right)V_2 - \left(\frac{1}{2}\right)V_1 - \left(\frac{1}{4}\right)V_3 = 0\right] * 8$$

$$7V_2 - 4V_1 - 2V_3 = 0 \text{ ——— } ②$$

$$7V_2 - 2V_3 = 40 \text{ ——— } ②$$

at node ③

$$\left(\frac{1}{4} + \frac{1}{6}\right)V_3 - \left(\frac{1}{4}\right)V_2 = 0$$

$$\left[\left(\frac{5}{12}\right)V_3 - \left(\frac{1}{4}\right)V_2 = 0\right] * 12$$

$$5V_3 - 3V_2 = 0 \text{ ——— } ③$$

$$\Delta = \begin{vmatrix} 7 & -2 \\ -3 & 5 \end{vmatrix} = 29$$

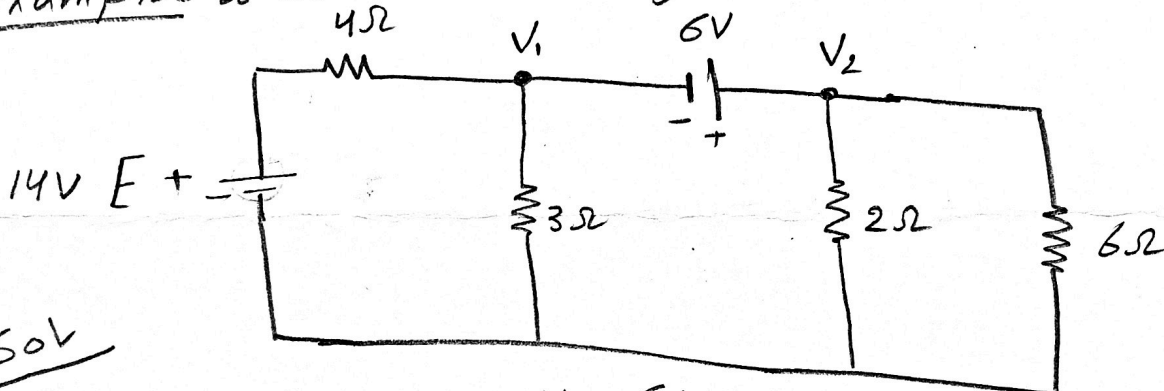
$$\Delta_1 = \begin{vmatrix} 40 & -2 \\ 0 & 5 \end{vmatrix} = 200$$

$$\Delta_3 = \begin{vmatrix} 7 & 40 \\ -3 & 0 \end{vmatrix} = -120$$

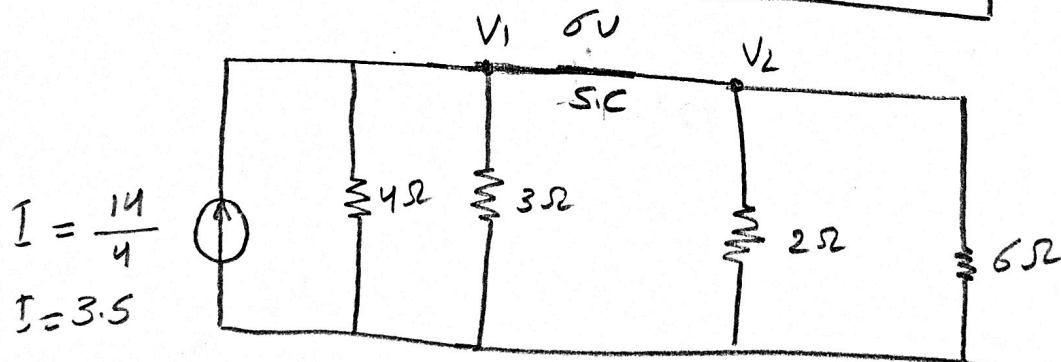
$$V_2 = \frac{\Delta_2}{\Delta} = \frac{200}{29} = 6.89$$

$$V_3 = \frac{\Delta_3}{\Delta} = \frac{-120}{29} = -4.13$$

Example 3 : use nodal voltage method to find V_1, V_2



Sol



$$V_2 - V_1 = 6 \quad \text{--- (1)}$$

عندما نصل S.C. نصل على ص.ع العقد
لكون لدينا super node

$$\left(\frac{1}{4} + \frac{1}{3}\right)V_1 + \left(\frac{1}{2} + \frac{1}{6}\right)V_2 = 3.5$$

$$\left[\left(\frac{7}{12}\right)V_1 + \left(\frac{2}{3}\right)V_2 = 3.5\right] * 12$$

$$7V_1 + 8V_2 = 42 \quad \text{--- (2)}$$

$$\Delta = \begin{vmatrix} -1 & 1 \\ 7 & 8 \end{vmatrix} = -15$$

$$\Delta_1 = \begin{vmatrix} 6 & 1 \\ 42 & 8 \end{vmatrix} = 6$$

$$\Delta_2 = \begin{vmatrix} -1 & 6 \\ 7 & 42 \end{vmatrix} = -84$$

$$V_1 = \frac{\Delta_1}{\Delta} = \frac{6}{-15} = -0.4$$

$$V_2 = \frac{\Delta_2}{\Delta} = \frac{-84}{-15} = 5.6$$