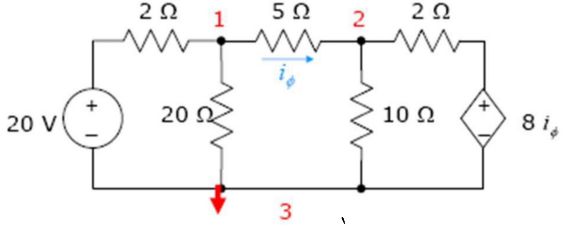


Node 1 : $\frac{V_1 - 20}{2} + \frac{V_1}{20} + \frac{V_1 - V_2}{5} = 0$ (10)

Node 2 : $\frac{V_2}{10} + \frac{V_2 - 8i_\phi}{2\Omega} + \frac{V_2 - V_1}{5} = 0$ (1)

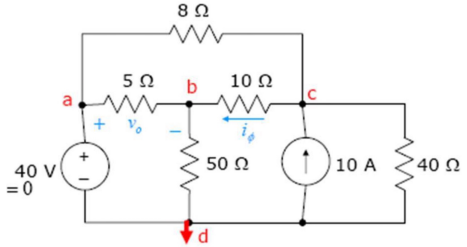
We have $i_\phi = \frac{V_1 - V_2}{5}$

$$8 i_\phi = 8\left(\frac{V_1 - V_2}{5}\right) = \frac{8V_1 - 8V_2}{5}$$

Node 2 : $\frac{V_2}{10} + \frac{V_2 - V_1}{5} + \frac{13V_2 - 8V_1}{2} = 0$

(1)(2) $\begin{cases} V_1\left(\frac{1}{2} + \frac{1}{20} + \frac{1}{5}\right) + V_2\left(-\frac{1}{5}\right) = 10 \\ V_1\left(-\frac{1}{5} - \frac{8}{2}\right) + V_2\left(\frac{1}{5} + \frac{13}{2}\right) = 0 \end{cases}$

$\begin{cases} V_1 = 16 \\ V_2 = 10 \end{cases} \Rightarrow i_\phi = \frac{16 - 10}{5} = 1.2\ A$



$V_a = 40\ V$

Node B: $\frac{V_B - 40}{5} + \frac{V_B}{50} + \frac{V_B - V_C}{10} = 0$ (1)

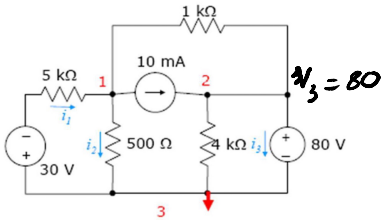
Node C: $\frac{V_C - 40}{8} + \frac{V_C - V_B}{10} + \frac{V_C}{40} = 10$ (2)

$$\begin{cases} V_B\left(\frac{1}{5} + \frac{1}{50} + \frac{1}{10}\right) + V_C\left(-\frac{1}{10}\right) = 8 \\ V_B\left(-\frac{1}{10}\right) + V_C\left(\frac{1}{8} + \frac{1}{10} + \frac{1}{40}\right) = 15 \end{cases}$$

$$\Rightarrow \begin{cases} V_B = 50\ V \\ V_C = 80\ V \end{cases}$$

$$v_o = \frac{40 - V_B}{5} = \frac{40 - 50}{5} = -2\ V$$

$$i_\phi = \frac{V_C - V_B}{10} = \frac{80 - 50}{10} = 3\ A$$



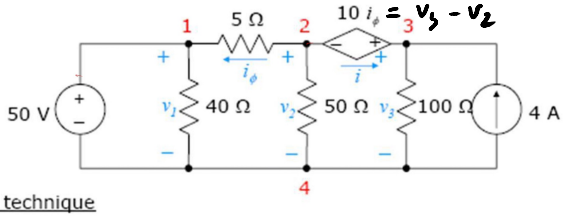
Node 1: $\frac{V_1 + 30}{5000} + \frac{V_1 - 80}{1000} + \frac{V_1}{500} + 10 \times 10^{-3} = 0$

$\Rightarrow V_1 = 20\ V$

$$i_1 = \frac{30 - V_1}{5000} = 0.002\ A$$

$$i_2 = \frac{V_1 - 0}{500} = \frac{20}{500} = 0.04\ A$$

$$i_3 = \frac{80 - 0}{4000} = 0.02\ A$$



$i = \frac{v}{R}$

$\Rightarrow v = iR$

st technique

$V_1 = 50V$

Supernode at (2)(3): $\frac{V_2 - 50}{5} + \frac{V_2}{50} + \frac{V_3}{100} = 14$ 4)

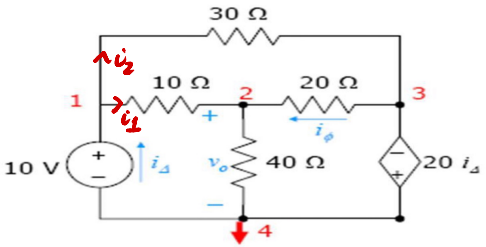
$i_\phi = \frac{V_2 - 50}{5} \Rightarrow 10 i_\phi = \frac{10V_2 - 500}{5} = 2V_2 - 100$

$V_3 = V_2 + 10 i_\phi \Leftrightarrow V_2 - V_3 + 2V_2 - 100 \Leftrightarrow 3V_2 - V_3 = 100$

$$\begin{cases} V_2\left(\frac{1}{5} + \frac{1}{50}\right) + V_3\left(\frac{1}{100}\right) = 14 \\ 3V_2 - V_3 = 100 \end{cases}$$

$$\Rightarrow \begin{cases} V_2 = 60 \\ V_3 = 80 \end{cases} \qquad i_\phi = \frac{60 - 50}{5} = 2A$$

$i = i_2 - i_3 =$



$V_1 = 10\,V$

Node 2: $\frac{V_2}{40} + \frac{V_2 - 10}{10} + \frac{V_2 + 20 v_\Delta}{20}$ (1)

$v_\Delta = v_1 + v_2 = \frac{10 - V_2}{10} + \frac{10 + 20 v_\Delta}{10}$ (2)

$$\begin{cases} V_2\left(\frac{1}{40} + \frac{1}{10} + \frac{1}{20}\right) + v_\Delta\left(\frac{20}{20}\right) = 1 \\ V_2\left(-\frac{1}{10}\right) + v_\Delta\left(\frac{20}{30}\right) = -\frac{5}{3} \end{cases}$$

$$\begin{cases} V_2 = \\ v_\Delta = \end{cases}$$

Node 1: $\frac{V_A - 15}{2} + \frac{V_A}{10} + \frac{V_A - V_B}{6} = 0$

$\Rightarrow V_A\left(\frac{1}{2} + \frac{1}{10} + \frac{1}{6}\right) + V_B\left(\frac{-1}{6}\right) = \frac{15}{2}$

Node 2: $\frac{V_B}{10} + \frac{V_B - V_A}{6} + \frac{V_B - 3i_a}{2} = 0$

$3i_a = 3 \times \frac{(V_A - V_B)}{6} = \frac{V_A - V_B}{2}$

$\frac{V_B}{10} + \frac{V_B - V_A}{6} + \frac{3V_B - V_A}{4}$

$\Rightarrow V_A\left(\frac{-1}{6} - \frac{1}{4}\right) + V_B\left(\frac{1}{10} + \frac{1}{6} + \frac{3}{4}\right) = 0$

$\Rightarrow \begin{cases} V_A = \frac{1525}{142} & i_a = \frac{75}{71} \\ V_B = \frac{625}{142} & P_{6\Omega} = 6.6951 \approx 6.70 \end{cases}$

$\Rightarrow \frac{V_B - \frac{V_A - V_B}{2}}{2} = \frac{\frac{2V_B - V_A + V_B}{2}}{2} = \frac{3V_B - V_A}{4}$

Use the node-voltage method to find the v_A , v_B , i_a , P8Ω , P10Ω(left) , P10Ω(right) in the circuit shown in Fig. 7 and fill in the blanks (Round your answer to 2 decimal places).

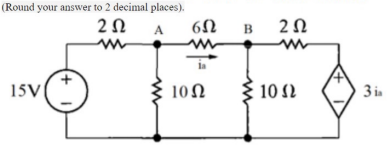


Fig. 7.

v_A = 10.74 V

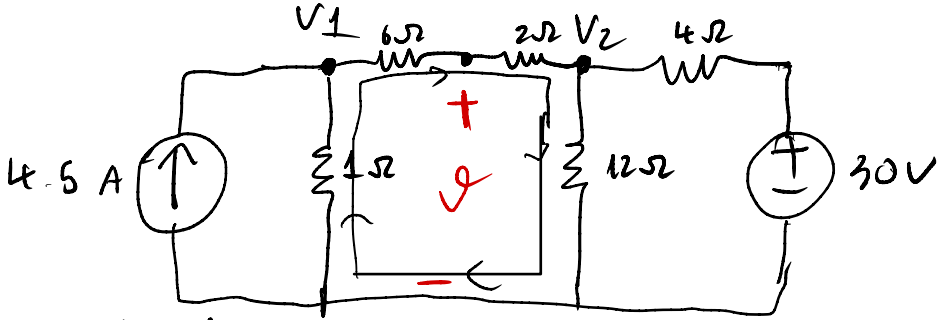
v_B = 4.40 V

i_a = 1.05 A

P6Ω = 6.7 W

P10Ω(left) = 11.53 W

P10Ω(right) = 1.93 W

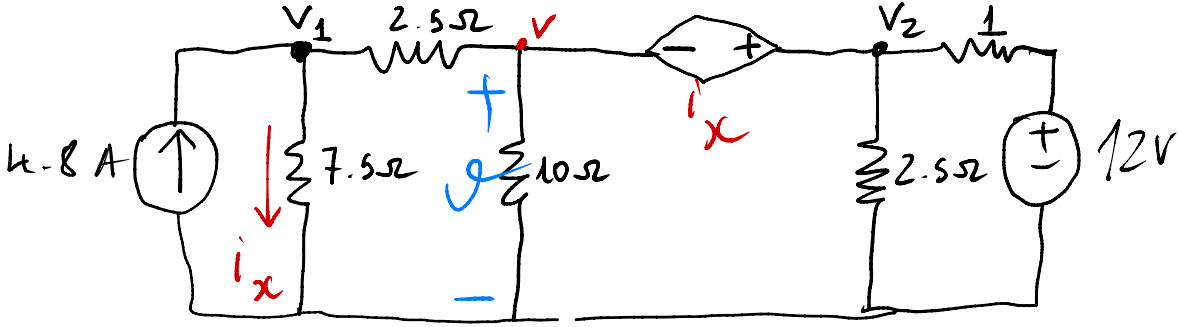


Nod1 : $\frac{V_1 - V_2}{8} + V_1 = 4.5$

Node 2 : $\frac{V_2 - V_1}{8} + \frac{V_2 - 30}{4} + \frac{V_2}{12} = 0$

$$\begin{cases} V_1\left(\frac{1}{8} + 1\right) + V_2\left(\frac{-1}{8}\right) = 4.5 \\ V_1\left(\frac{-1}{8}\right) + V_2\left(\frac{1}{8} + \frac{1}{4} + \frac{1}{12}\right) = 7.5 \end{cases} \Rightarrow \begin{cases} V_1 = 6\ V \\ V_2 = 18\ V \end{cases}$$

$v = ?$



Find v : • $i_x = \boxed{\frac{V_2 - V}{7.5} = \frac{V_1}{7.5}}$ (1)

Node 1: $\frac{V_1}{7.5} + \frac{V_1 - V}{2.5} - 4.8 = 0$ (2)

Super node (V)(V2): $\frac{V}{10} + \frac{V - V_1}{2.5} + \frac{V_2}{2.5} + \frac{V_2 - 12}{1} = 0$

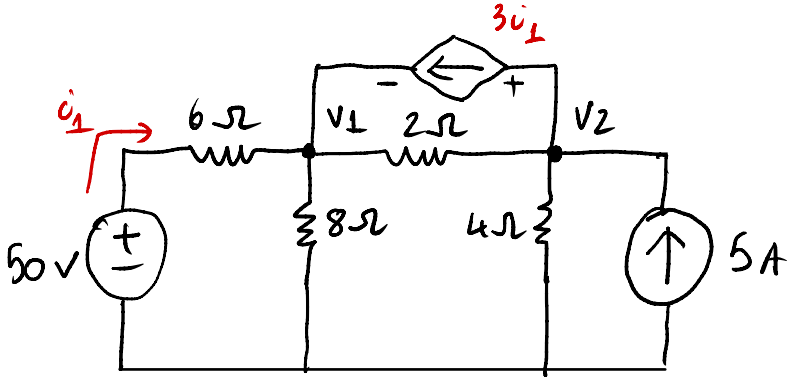
$$\begin{cases} V_1(-1) + 7.5V_2 - 7.5V = 0 \\ V_1\left(\frac{1}{7.5} + \frac{1}{2.5}\right) + V\left(-\frac{1}{2.5}\right) = 4.8 \\ V_1\left(-\frac{1}{2.5}\right) + V_2\left(\frac{1}{2.5} + 1\right) + V\left(\frac{1}{10} + \frac{1}{2.5}\right) = 12 \end{cases} \Rightarrow \begin{cases} V_1 = 15 \\ V_2 = 10 \\ V = 8 \end{cases}$$

$\Rightarrow i_x = 2\ A$ $\quad v = ?$

$i_1 = 3A$

$V_1 = 32v$

$V_2 = 41$



Node 1:

$$\frac{V_1 - 50}{6} + \frac{V_1}{8} + \frac{V_1 - V_2}{2} - 3i_1 = 0 \quad (1)$$

Node 2:

$$\frac{V_2 - V_1}{2} + \frac{V_2}{4} + 3i_1 - 5 = 0 \quad (2)$$

$$i_1 = \frac{50 - V_1}{6} \; ; \; 3i_1 = V_2 - V_1$$