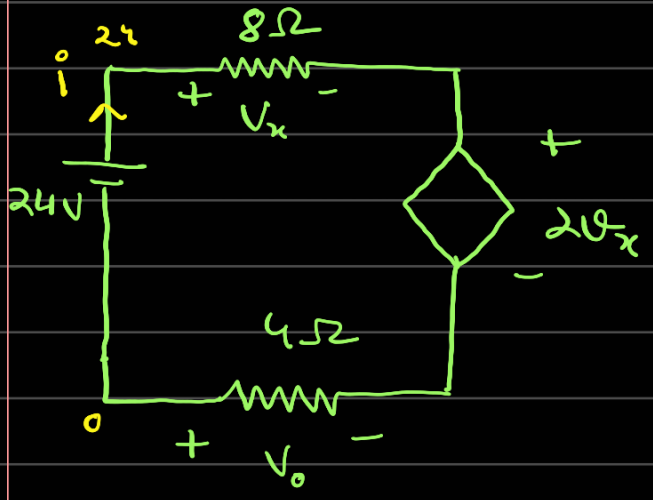
Day – 2

1.)



Find V_o, V_x.

Ans.) $24 - 8i - 2v_x - 4i = 0$

$(V_x = 8i)$

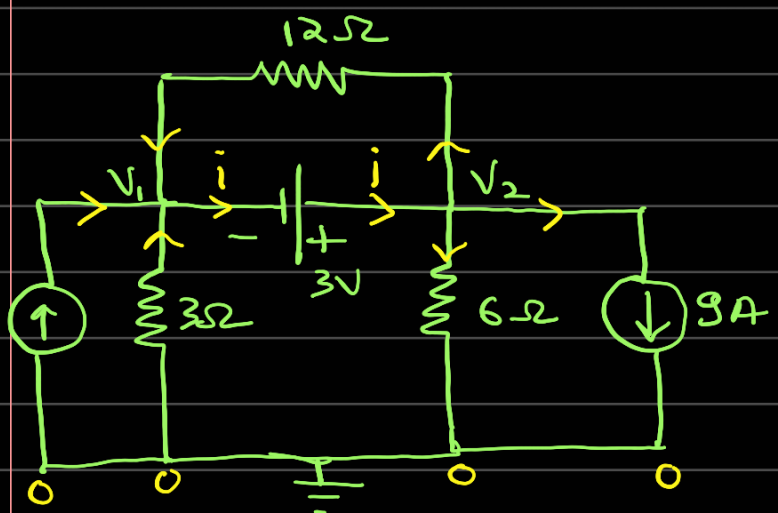
$24 - 8i - 16i - 4i = 0$

$\Rightarrow i = \frac{24}{28} = \frac{6}{7}$

$v_x = \frac{8 \times 6}{7} = \frac{48}{7}$ V

$V_o = -4 \times \frac{6}{7} = -\frac{24}{7}$ V

2.)



Find V_1, V_2.

Ans.) $3 + \frac{3}{12} + \frac{-V_1}{3} = i$

$$i = \frac{3}{12} + \frac{V_2}{6} + 9$$

$$\Rightarrow \frac{13}{4} - \frac{V_1}{3} = \frac{37}{4} + \frac{V_2}{6}$$

$$\Rightarrow \frac{V_1}{3} + \frac{V_2}{6} = -6$$

$$\Rightarrow 2V_1 + V_2 = -36$$

And $V_2 - V_1 = 3$

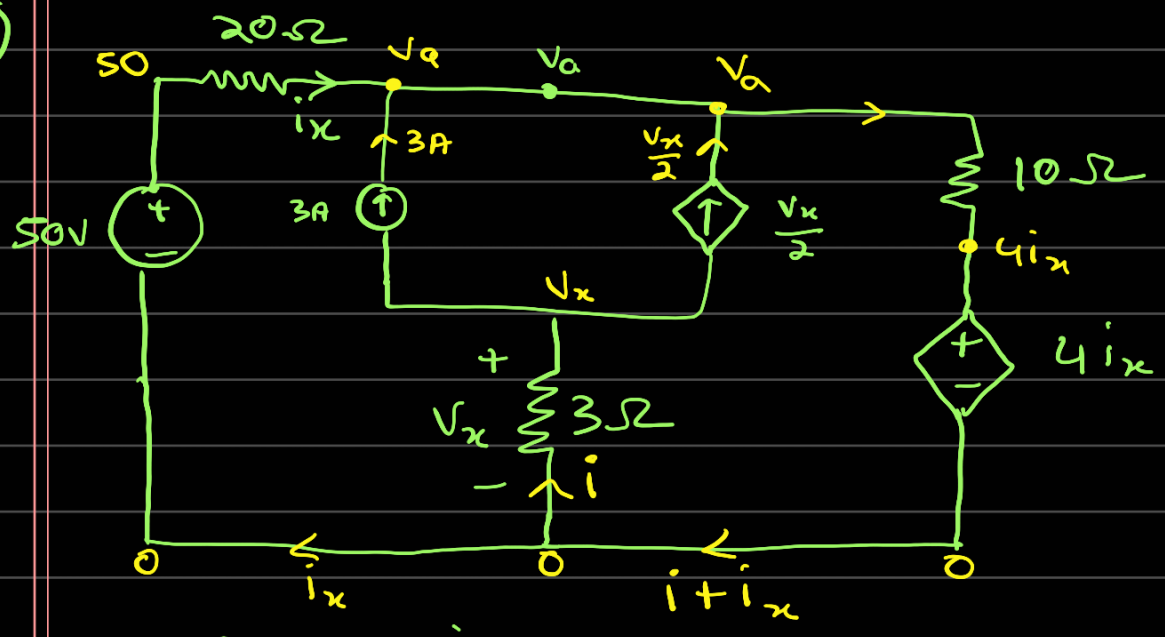
$$\Rightarrow -36 - 2V_1 - V_1 = 3$$

$$\Rightarrow -3V_1 = 39$$

$$\Rightarrow V_1 = -13 \text{ V}$$

$$V_2 = -10 \text{ V}$$

3.)



Find V_x, i_x.

Ans) $i = 3 + \frac{V_x}{2} = -\frac{V_x}{3} \Rightarrow V_x = -\frac{18}{5}$ V

$$50 - 20i_x - 10\left(i_x + 3 + \frac{v_x}{2}\right) - 4i_x = 0$$

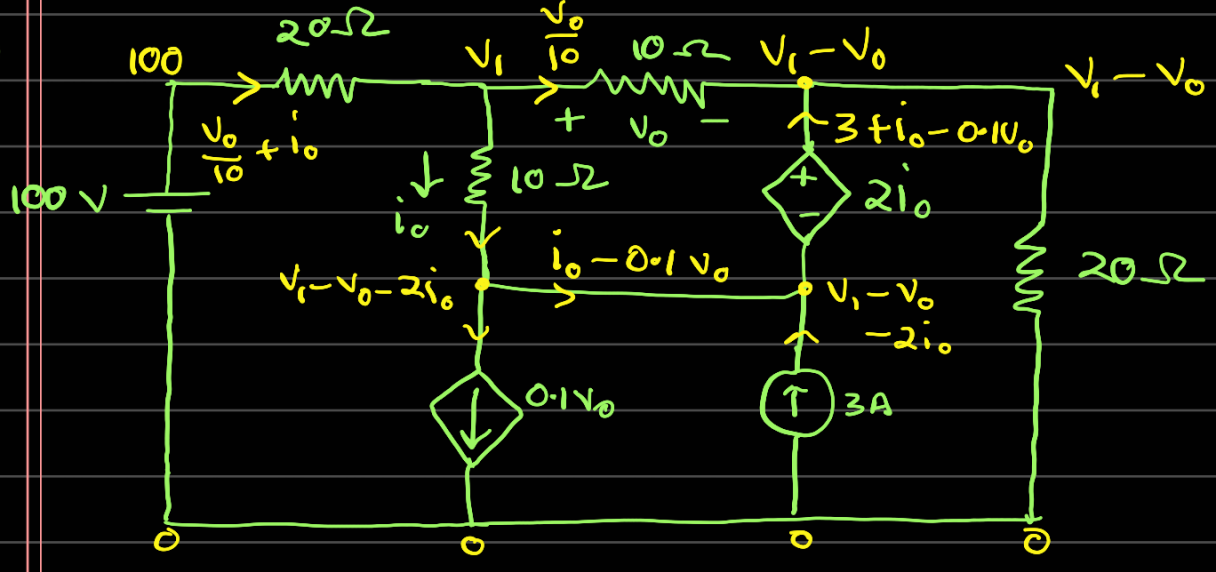
$$\Rightarrow 50 - 20i_x - 10\left(i_x + \frac{6}{5}\right) - 4i_x = 0$$

$$\Rightarrow 50 - 30i_x - 12 - 4i_x = 0$$

$$\Rightarrow -34i_x + 38 = 0$$

$$\Rightarrow i_x = \frac{19}{17}\ A$$

4.)



Find V_o, i_o.

Ans:)

$$\frac{V_1 - V_o}{20} = \frac{V_o}{10} + 3 + i_o - 0.1V_o$$

$$\Rightarrow \frac{V_1 - V_o}{20} = 3 + i_o$$

$$\Rightarrow V_1 = V_o + 60 + 20i_o$$

$$V_1 - 10i_o = V_1 - V_o - 2i_o$$

$$\Rightarrow V_o = 8i_o$$

$$V_1 = 100 - 20\left(\frac{V_0}{10} + i_0\right)$$

$$\Rightarrow V_0 + 60 + 20 i_0 = 100 - 2V_0 - 20 i_0$$

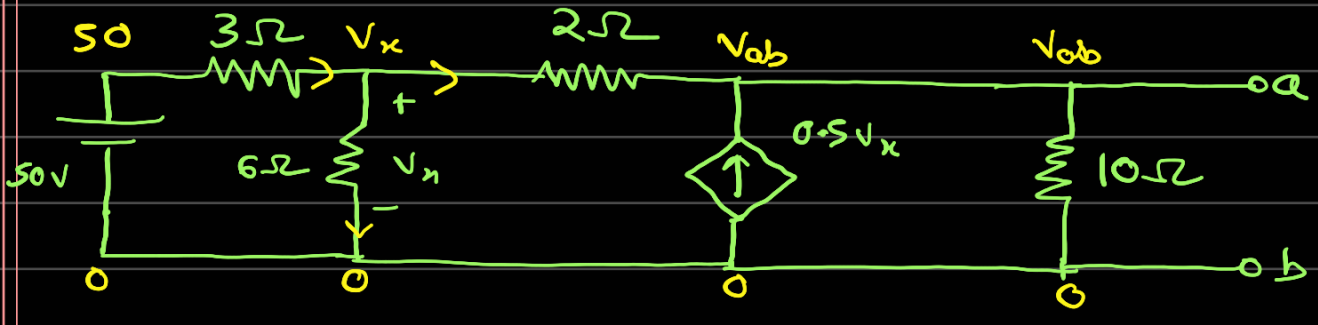
$$\Rightarrow 3V_0 + 40 i_0 = 40$$

$$\Rightarrow 64\, i_0 = 40$$

$$\Rightarrow i_0 = \frac{5}{8} \text{ A}$$

$$V_0 = 5 \text{ V}$$

5.)



Find V_{ab}

Ans.)

$$\frac{50 - V_x}{3} = \frac{V_x}{6} + \frac{V_x - V_{ab}}{2}$$

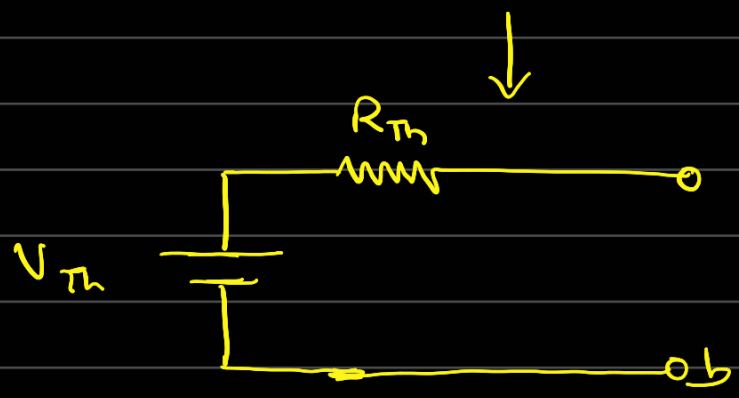
$$\Rightarrow \frac{50}{3} + \frac{V_{ab}}{2} = V_x$$

$$\frac{V_x - V_{ab}}{2} + 0.5V_x = \frac{V_{ab}}{10}$$

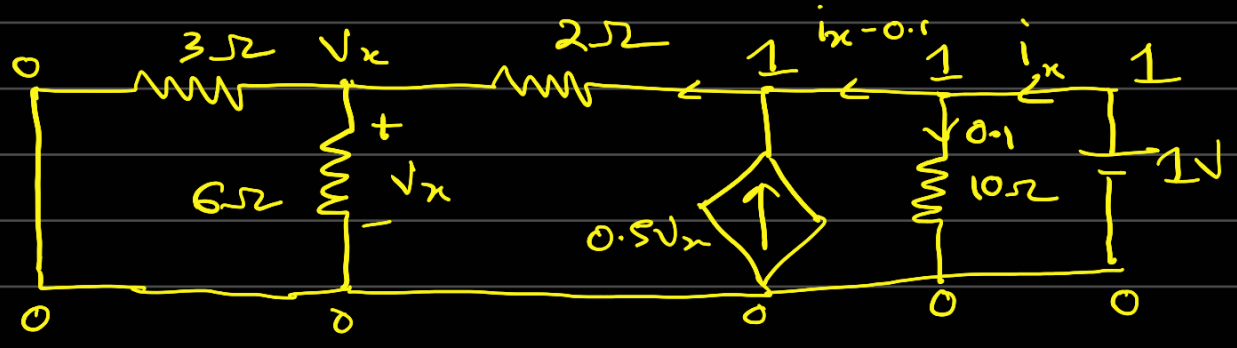
$$\Rightarrow V_x = \frac{3V_{ab}}{5}$$

$$\text{So} \quad \frac{50}{3} + \frac{V_{ab}}{2} = \frac{3V_{ab}}{5}$$

$\Rightarrow V_{ab} = \frac{500}{3}\ V \longrightarrow V_{Th} = \frac{500}{3}\ V$



De-energize, put 1V



$3 \| 6 = 2\ \Omega$

$$i_x - 0.1 + 0.5V_x = \frac{1 - V_x}{2} = \frac{V_x}{2}$$

$$\Rightarrow V_x = 0.5$$

So $i_x = 0.1\ A$

$$\therefore R_{Th} = \frac{1}{0.1} = 10\ \Omega$$