CSE250
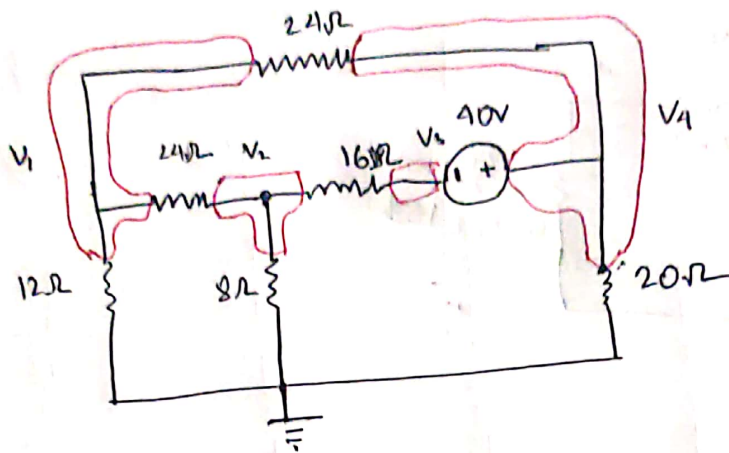
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Section: 2
Assignment no: 2

Hene,

Node-1,

$$V_1\left(\frac{1}{12} + \frac{1}{24} + \frac{1}{24}\right) - \frac{V_2}{24} - \frac{V_A}{24} = 0$$

Node -2,

$$V_2\left(\frac{1}{24} + \frac{1}{16} + \frac{1}{8}\right) - \frac{V_1}{24} - \frac{V_3}{16} = 0$$

~~Node 3~~

Component eqn of V_3 & V_A,

$$V_A - V_3 = 40$$

Supen node eqn,

$$V_3\left(\frac{1}{16}\right) - \frac{V_2}{16} + V_A\left(\frac{1}{20} + \frac{1}{24}\right) - \frac{V_1}{24} = 0$$

Now, solving the eqns $@$ using calculator,

$V_1 = 1.79401\ V$

$V_2 = -6.7774\ V$

$V_3 = -26.046511\ V$

$V_4 = 13.95348\ V$

Now,

$$J_o = \frac{V_3 - V_2}{16}$$

$$= \frac{-26.0465 - (-6.7774)}{16}$$

$$\underset{2}{=} \frac{\cancel{86} - 19.2691}{16} = -1.2043\ A$$

Hence,

$$P = \Delta V \cdot I \quad = \quad 40 \times (-1.2043)$$

$$= -48.172\ W.$$

V_x

1kₒ   2kₒ

8V   3kₒ   6kₒ   2mA

---

i)

V_x

+

2kₒ

8mA   1kₒ 3kₒ   6kₒ   2mA

---

ii)

V_x

-    +

2kₒ

8mA   3kₒ   6kₒ   2mA

---

iii)

12V

6V   (3/4) kₒ   2kₒ   6kₒ

Now,

$$V_x = -\left(V \times \dfrac{2}{6.75\,k\Omega}\right) V$$
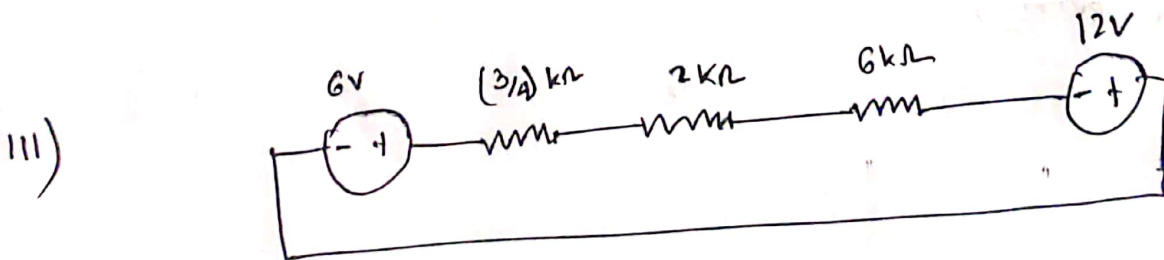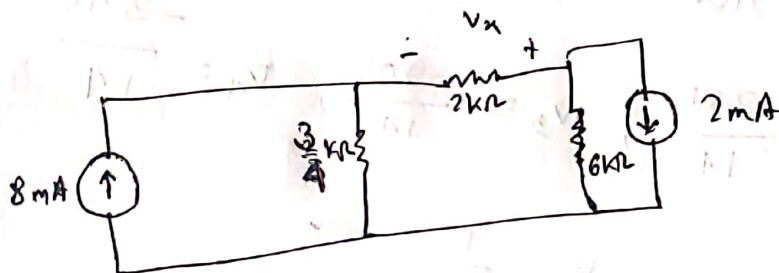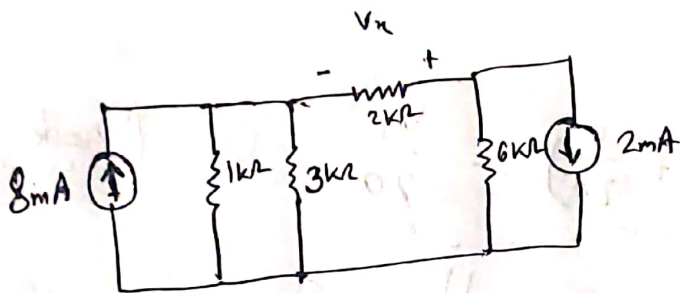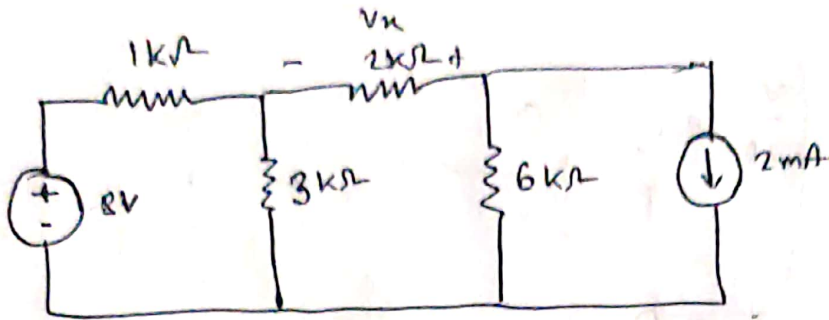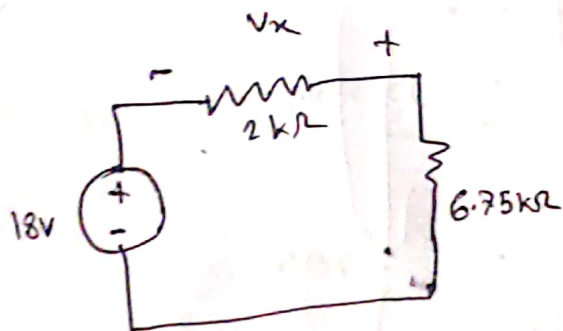
$$= -4.11\,4V \qquad (Am.)$$
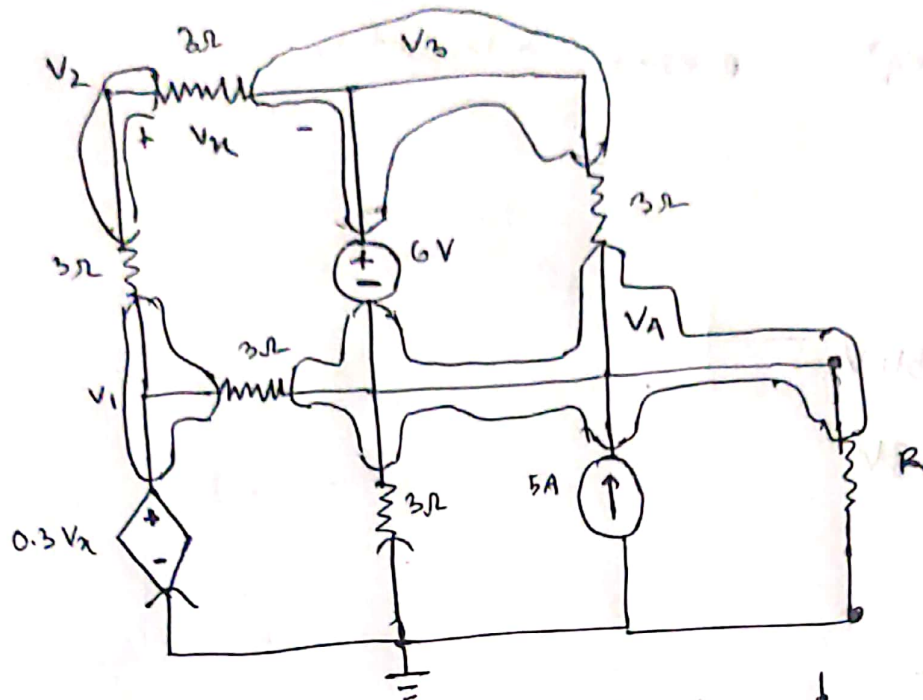
Taking, R part as open circuit

Node (i),

$$V_x = V_2 - V_3$$

or, $V_1 = 0.3(V_2 - V_3)$

Node (ii)

$$V_2\left(\frac{1}{3} + \frac{1}{3}\right) - \frac{V_4}{3} - \frac{V_3}{3} = 0$$

Node (iii),

$$V_3 - V_4 = 6$$

Node (iv),

$$V_4\left(\frac{1}{3} + \frac{1}{3} + \frac{1}{3}\right) - \frac{V_1}{3} - \frac{V_3}{3} - 5 + V_3\left(\frac{1}{3} + \frac{1}{3}\right) - \frac{V_4}{3} - \frac{V_2}{3} = 0$$

or, $V_4 - \frac{V_1}{3} - \frac{V_3}{3} - 5 + V_3 \cdot \frac{2}{3} - \frac{V_4}{3} - \frac{V_2}{3} = 0$

$$-\frac{V_1}{3} - \frac{V_2}{3} + \frac{V_3}{3} + \frac{2V_4}{3} = 5$$
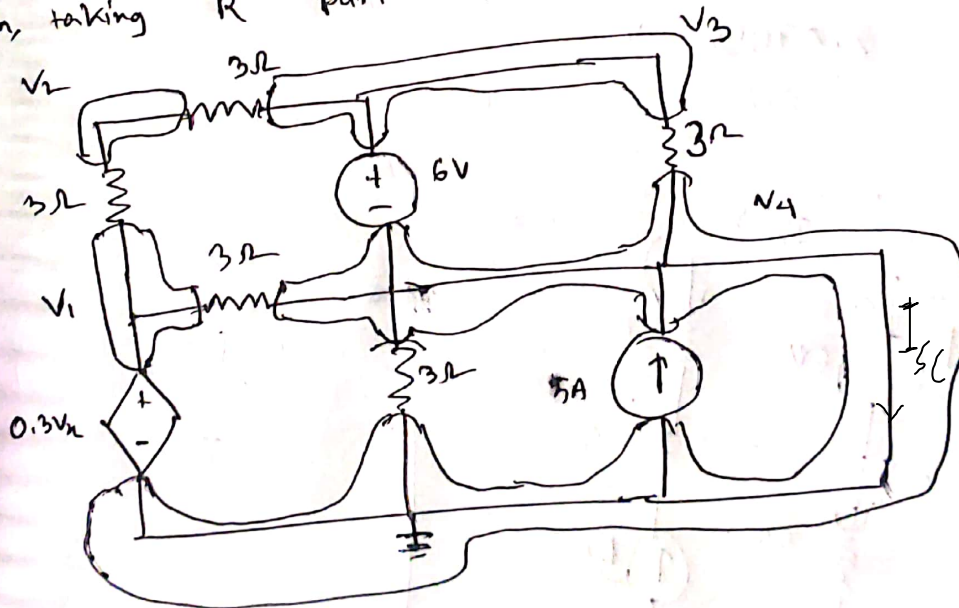
or,

Here,

$$V_1 = -1.7234 \text{ V}$$

$$V_2 = 4.02127 \text{ V}$$

$$V_3 = 9.76595 \text{ V}$$

$$V_4 = 3.76595 \text{ V}$$

Here,

$$V_4 = V_{oc} = V_{th} = 3.76595 \text{ V or, } 3.766 \text{ V}$$

Again, taking R part as closed circuit,

@ Node-I

$$V_1 = 0.3 \, (\text{f@ } V_2 - V_3) \quad \text{___(1)}$$

For node-II)

$$V_2\left(\frac{1}{3}+\frac{1}{3}\right)-\frac{V_1}{3}-\frac{V_3}{3} = 0 \quad - (u)$$
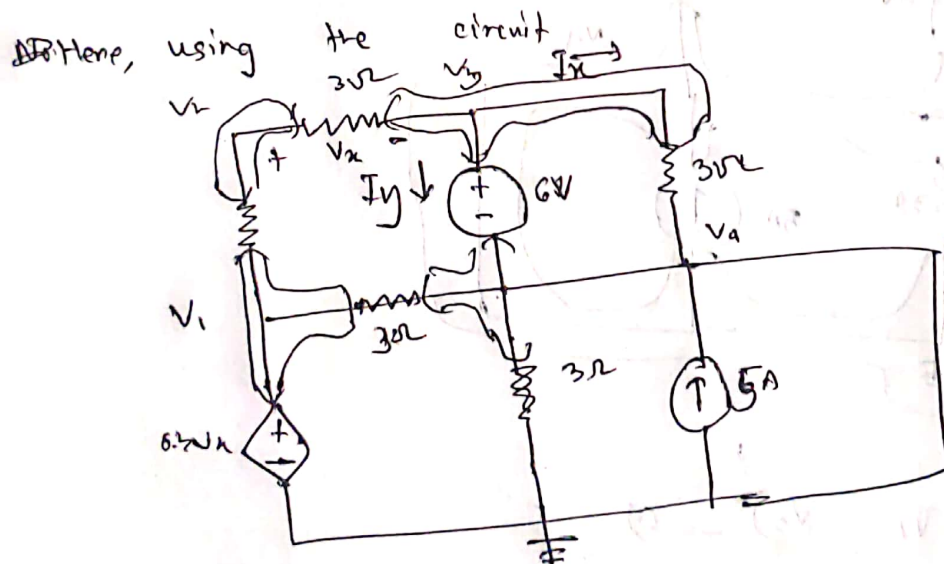
For node III,

$$V_3 - V_A = 6V$$

for, or, $V_3 = 6V$

Now,

$V_1 = \cancel{1.384615} \quad -1.05882.3 \; V$

$V_2 = \cancel{10.61538} \quad 2.470588 \; V$

$V_3 = 6V$

Here, using the circuit

Here,

$I_0 = I_u + I_y$

Alc,

$I_0 = \dfrac{V_1 - V_2}{3} = -1.17647\,A$

Agoin

$I_u = \dfrac{V_3 - V_4}{3} = \dfrac{6}{3} = 2$

Again

$I_y = I_0 - I_u = -3.17647\,A$

Now, putting all values in node (4),

$-5 + \dfrac{0-V_1}{3} + \dfrac{0-0}{3} + \dfrac{0-V_3}{3} + I_{sc} = 0$

or $I_{sc} = \dfrac{0-(-1.05882)}{3} + \dfrac{-6}{3} + 5$

$= 0.352941 + 3$

$= 3.35294.1$

Now

$V_{tt} = \dfrac{I_{sc}}{R_{tt}} \cdot R_{th}$ on, $R_{th} = \dfrac{V_{th}}{I_{sc}} = 1.116\,\Omega$

(Am.)