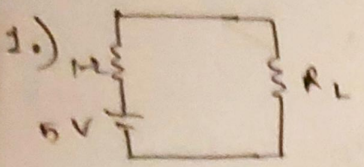
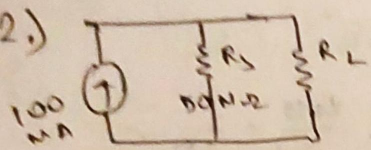
22/09/23 ASSIGNMENT 2...

1.) 

for Voltage to be stiff

$\underline{R_L \geq 100 R_s}$

2.) 

we know for current to be stiff $R_L \leq \frac{1}{100} R_s$

$$R_L \leq \frac{1}{100} \times 50 \times 10^6$$

$$\underline{R_L = 5 \times 10^5 \,\Omega}$$

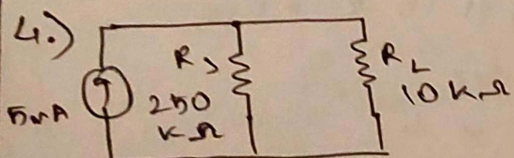
3.) $R = 0.1\,\Omega$

$i = 5\,A$

voltage drop $\Rightarrow$ $V = iR$

$V = 0.1 \times 5$

$\underline{V = 5\,V}$

4.) 

$$R_{eq} = \frac{250 \times 10}{250 + 10}$$

$$\Rightarrow \frac{250 \times 1\cancel{0}}{26\cancel{0}} \Rightarrow R_{eq} = 9.61\,\Omega$$

$$R_L \leq \frac{1}{100} R_s$$

$$10 \times 10^3\,\Omega \leq \frac{1}{100} \times 250 \times 10^3 \Rightarrow 10 \times 10^3 \not\leq 2500$$

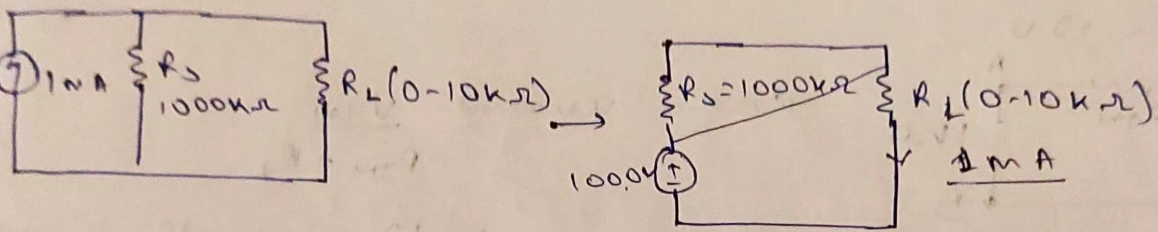
condition for R_s & R_L are not satisfied so it is not stiff current.

5.) For stiff current $R_s \geq 100 R_L$

$R_s \geq 100 \times 10\ k\Omega$

$R_s \geq 1000\ k\Omega$

Main value of R_s should be $1000\ k\Omega$



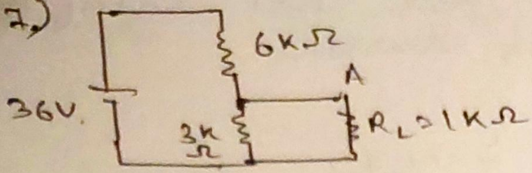
$$\frac{R_s \times I}{R_s + R_L} = 1mA$$

$$\frac{1000k\Omega}{1010k\Omega} \times I = 1 \times 10^{-3}.$$

$$I = 10^{-3} \times 0.99 = 9.9 \times 10^{-4}$$

6.

7.)

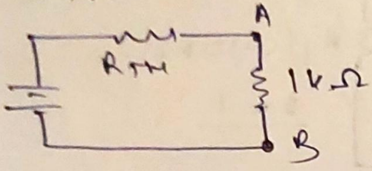


$R_{TH} = \frac{6\times3}{6+3} = \frac{24}{9} = 2k\Omega$

36 V source is decreased to 12V

$R_{TH} = 2k\Omega$

$V_{TH} = 12V$



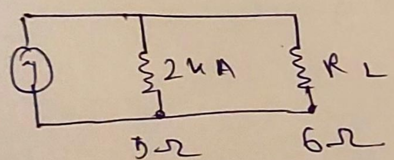
Load current $\frac{V_{TH}}{R_{TH}+R_L}$

$\Rightarrow \frac{12}{(2+1)k\Omega} \Rightarrow \frac{12}{3\times1000} \Rightarrow \frac{12}{3\times10^3}$

$\Rightarrow 4\times10^{-3}$ A

$\Rightarrow$ 4mA

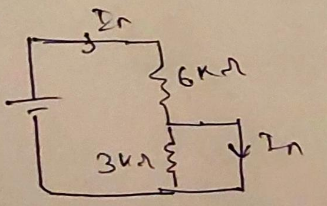
8.) $I_{norton} = \frac{V_{TH}}{R_{TH}} = \frac{12}{2k\Omega} = 6$ mA



$R_n = \frac{6\times3}{6+3} = \frac{18}{9} = 2k\Omega$

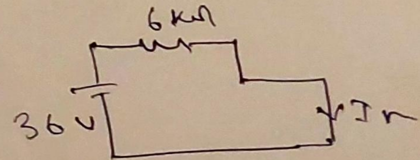
Norton's circuit.

In nortons theorem



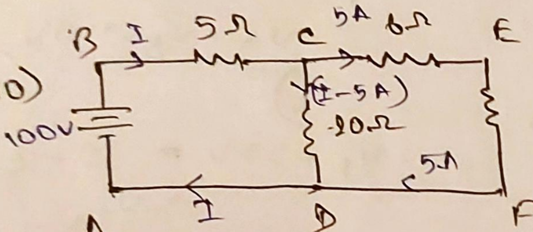
(3kΩ is short)

$\Rightarrow$



$I_n = 6\times10^{-3}$ A

9.)

10) 

In loop ABCD.

$100 - 5I - 20(I-5) = 0$

$100 - 5I - 20I + 100 = 0$

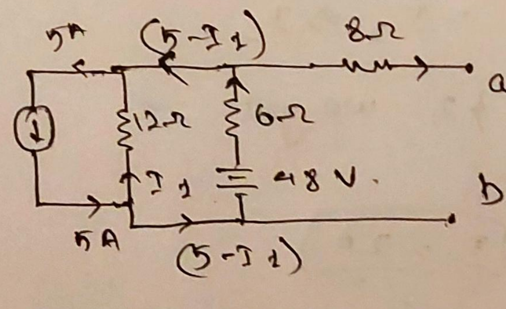
$\underline{I = 8\ A}$

In loop ABEF :-

$100 - 5I - 30 - 5R_L = 0 \quad (I = 8)$

$100 - 40 - 30 - 5R_L = 0$

$30 = 5R_L \quad \boxed{R_L = 6\ \Omega} \leftarrow$ Ans

11) 

$48V - 6(5 - I_1) + 12I_1 = 0 \Rightarrow 48 - 30 + 6I_1 + 12I_1 = 0.$

$\Rightarrow 18 + 18I_1 = 0$

$\underline{I_1 = -1A}$

(-ve mean opposite dirn)

$V_b + 48 - 6(3-(-1)) + -8I = V_a$

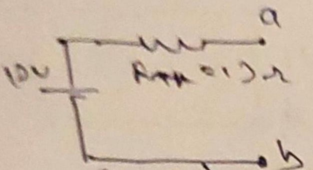
$V_B + 48 - 6(6) = V_a$

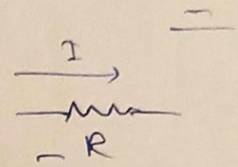
$\therefore V_a - V_b = \underline{V_{TH}} = 48 - 36 = 12\,V$

$12V$

$R_{TH} = \frac{12 \cdot 6}{12+6} + 8 \Rightarrow \frac{\cancel{12}^{2} \cdot 6}{\cancel{18}_{3}} = 4 + 8 = \underline{12 = R_{TH}}$

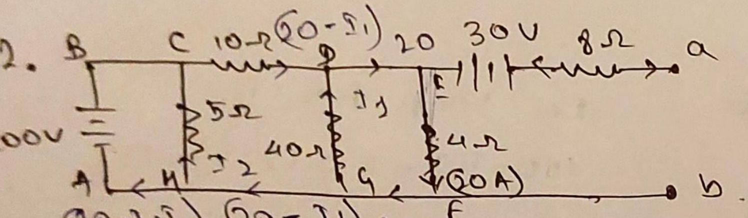
Thevinin's circuit





(20-9I)

12.



(D)

$V_A - 30V + 80V = V_B$

$\underline{V_A - V_B = 110V}$

(L)

$V_A - 30V + 180 - 100 = V_B$

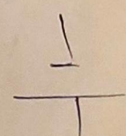
$\underline{V_A + V_B = 50}$

In loop CDGH:-

$-5I_2 - 10(20-I_1) + 40I_1 = 0$

$-5I_2 - 200 + 10I_1 + 40I_1 = 0$

$10I_1 - I_2 = 40 \longrightarrow (1)$



In loop ABCH:-

$100 + 5I_2 = 0 \Rightarrow -100 = I_2 \Rightarrow I_2$

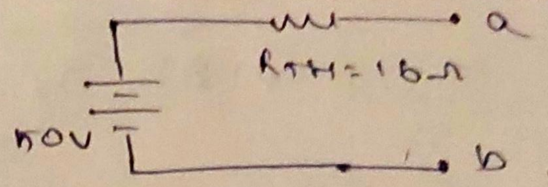
$\boxed{I_2 = -20A}$ from eq 1 & 2 we get

$10I_1 - (-20) = 40,$

$10I_1 + 20 = 40$ $\boxed{I_1 = 2A}$

$R_{TH} = \frac{10 \times 40}{10+40} + 8 = \frac{400}{50} + 8 = 16\Omega$

Thevenins circuit



$$R_{TH} = \frac{10 \times 40}{10 + 40} + 8 = 16\Omega$$

$$V_B - 40(2) + 30 + 8(\cancel{I})^{0} = V_a$$

$$V_b - 80 + 30 = V_a \Rightarrow V_b - V_a = 50V$$

$$V_B - V_a = V_{TH} = 50V.$$