EXPERIMENT: No. 6(a) Verification of Thevnin's Theorem

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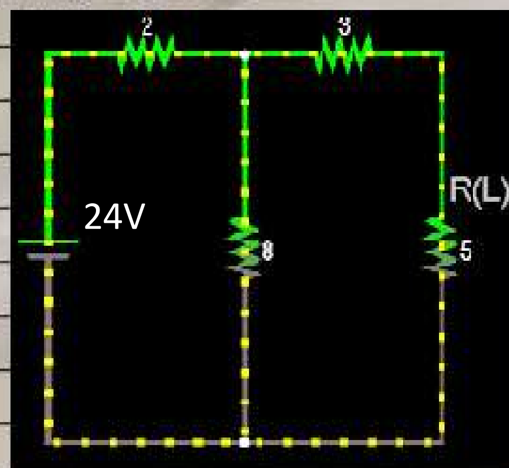
Q·) Find load resistance across 5 Ω resistor, hence find thevnins equivalent circuit.

→ Circuit:-



→ First remove 5 Ω from the circuit and short the voltage source to find out the R_{net} a R_{TH}.

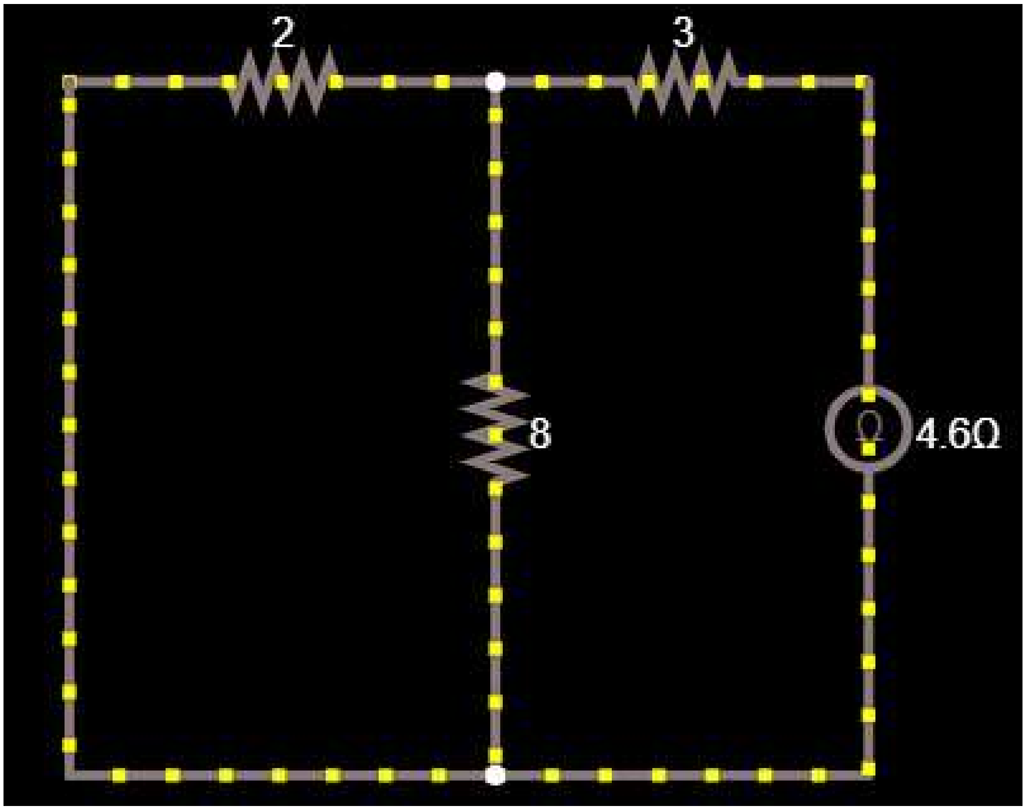
$$R_{TH} = 3 + \frac{2 \times 8}{10}$$

$$= 4.6\,\Omega$$

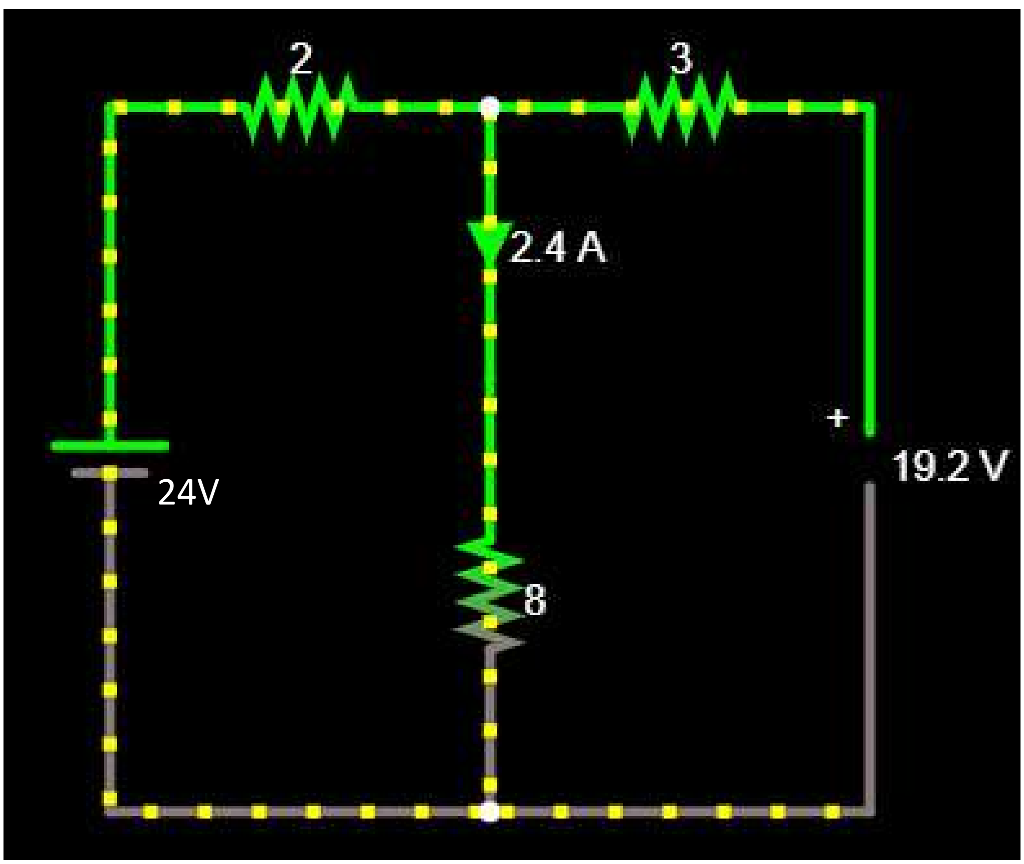
→ Now shorting 2 Ω and 8 Ω as shown in fig(2)

→ Now for V_{TH}, we remove the short and put back the 24 V supply. Now, since 3 Ω is open no current passes through it.

→ Thus we'll find voltage difference across 8 Ω resistor.



2
3
8
4.6Ω



2
3
2.4 A
+
19.2 V
24V
8

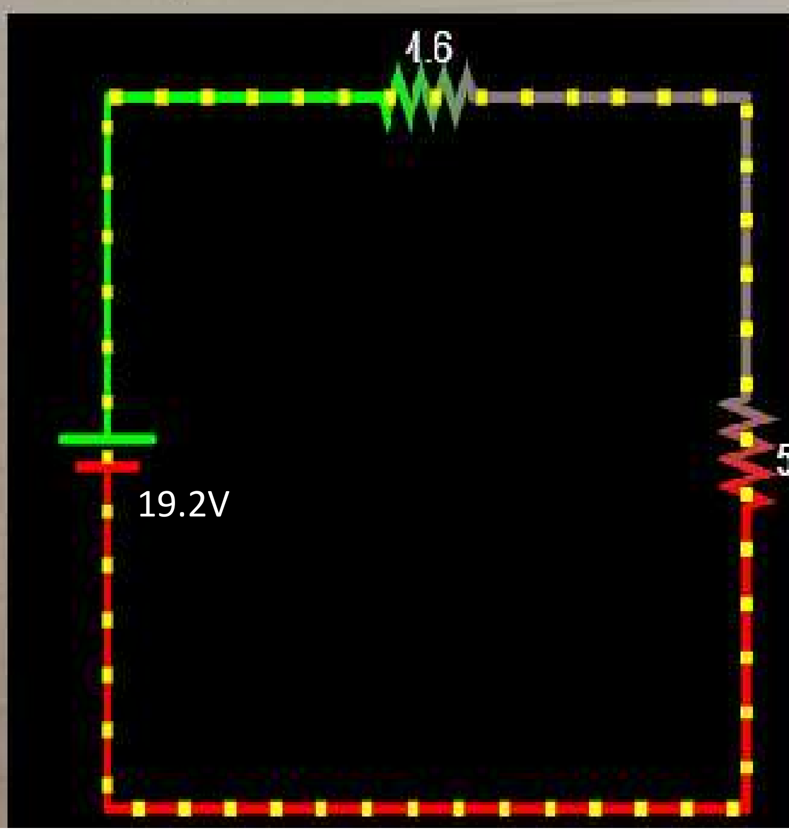
Assume current (I) through the circuit (mesh say)

$$\therefore \; I = \frac{24}{10} = 2.4A$$

$$\therefore \; V_{Th} = V_8 = I \times 8 = 2.4 \times 8 = \underline{\underline{19.2V}}$$

Thus we see thevnins ~~current~~ voltage is 19.2V and resistance is 4.6Ω

Thevnins equivalent circuit:-



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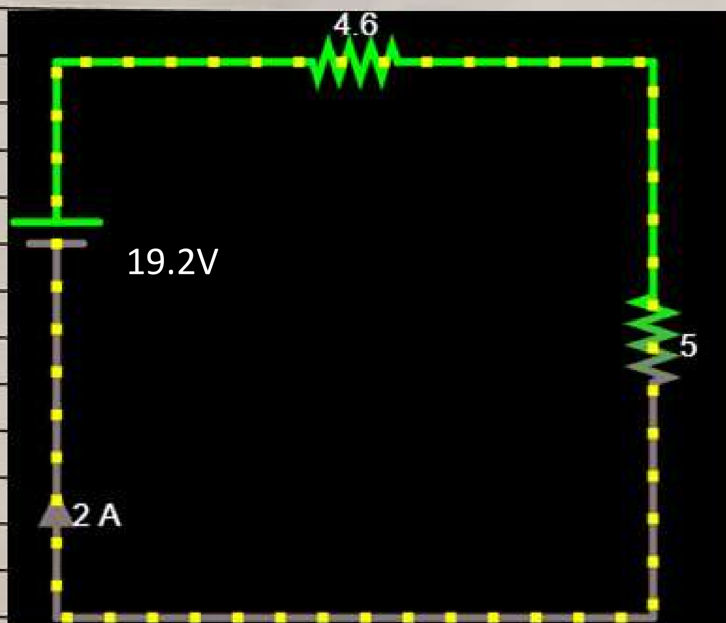
$$I_L = \frac{V_{TH}}{R_{TH}+R_L} = \frac{19.2}{5+4.6} = \frac{19.2}{9.6} = 2A$$

Thus Thevnins theorem is verified.



Teacher's Sign. :

EXPERIMENT: No. 6(b) Verification of Thevnins Theorem

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Thevnins problem using dependent source.

→ Find the thevnin equivalent of the folowing circuit about a-b.

assume a current $ "I".

Applying KVL to find V_0

$$V_{10k} + V_{20k} + 4V_0 = 70$$

$$10k(I) + 20k(I) + 4V_0 = 70$$

$$10k(I) + 20k(I) + 4(10k)(I) = 70$$

$$I(70k) = 70$$

$$I = \frac{1}{1000} \cancel{A}\ A.$$

$$I = \cancel{100}\ 1\times10^{-3} A$$

$$\therefore V_0 = 10^{-3} \times 10\times10^3$$

$$\boxed{V_0 = 10V}$$

$$V_{ab} = 70V - V_0$$

$$= 70V - 10V$$

$$V_{ab} = 60V.$$

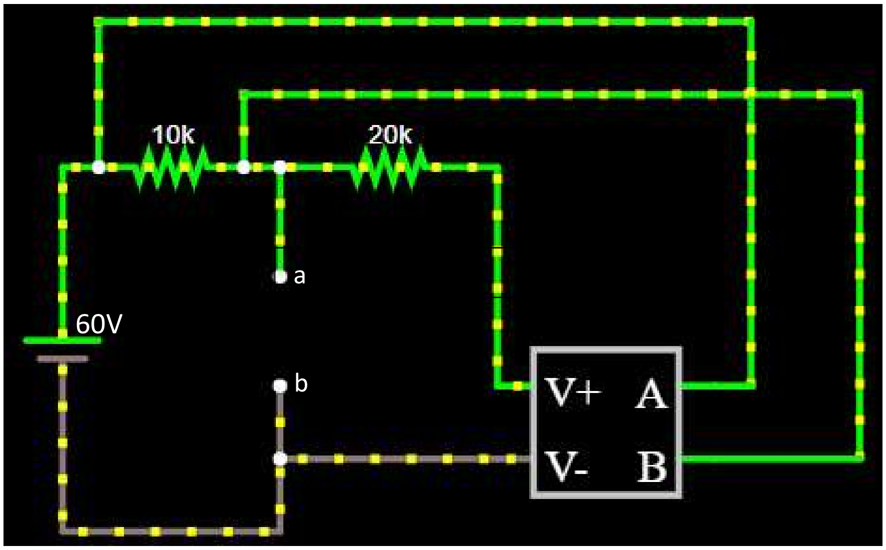
Thus, Thevnins equivalent voltage is 60V

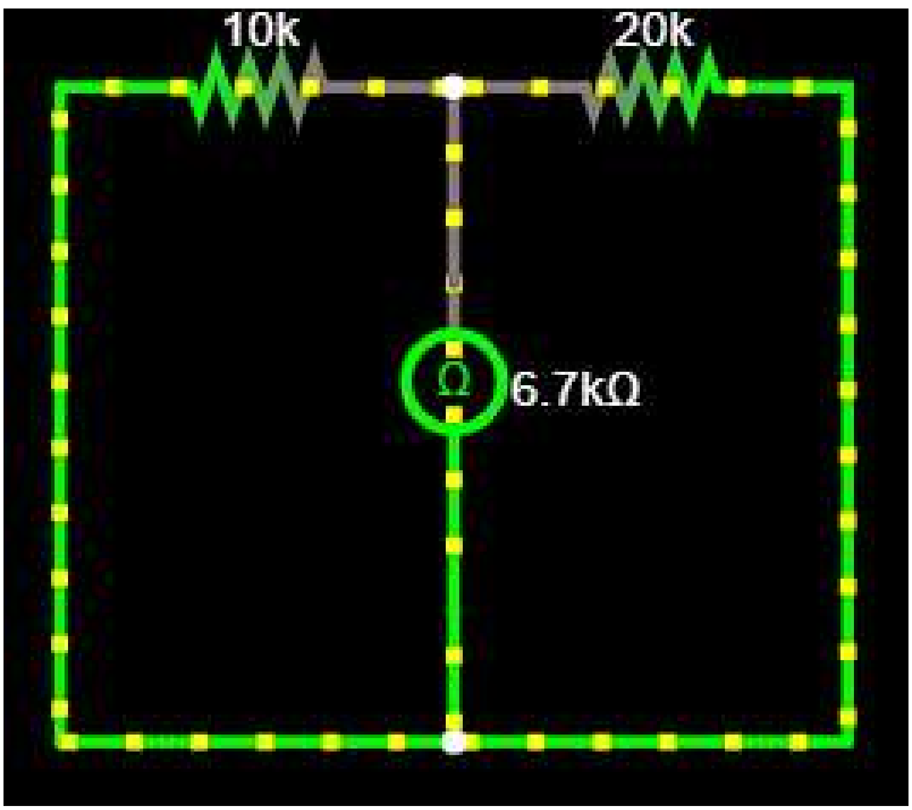
Shorting all the voltage source and finding $R_{net} (R_{Th})$

$$R_{Th} = \left(\frac{1}{20k} + \frac{1}{10k}\right)^{-1}$$

$$= \frac{200}{30} k = \underline{6.67k}$$

Teacher's Sign. :


10k
20k
a
60V
b
V+
A
V-
B


10k
20k
Ω
6.7kΩ

Thus, Thevenins, resistance is 6.67K Ω

$$I_{th} = \frac{V_{th}}{R_{th}} = \frac{60}{6.67K} = \underline{9 mA}$$

$\therefore I_{th} = 9 mA$

Thus, Thevenins theorem is verified