Course Name:	**Elements of Electrical and Electronics Engineering Laboratory**	**Semester:**	**I/II**
Date of Performance:	7 / 10 /2024	**Batch No:**	C4 (01)
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Faculty Sign & Date:		**Grade/Marks:**	/ 20

Experiment No: 3

Title: Thevenin's Theorem & Norton's Theorem

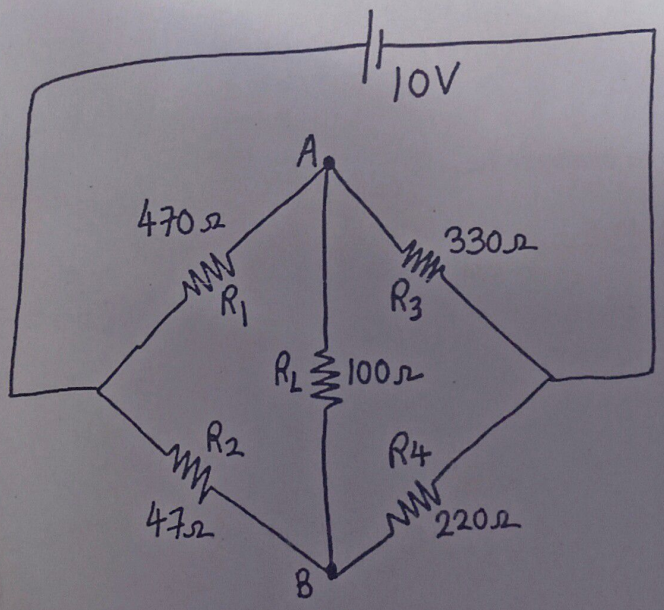
Aim and Objective of the Experiment:

- To Verify for Thevenin's Theorem for the circuit
- To Verify Norton Theorem for the Circuit.

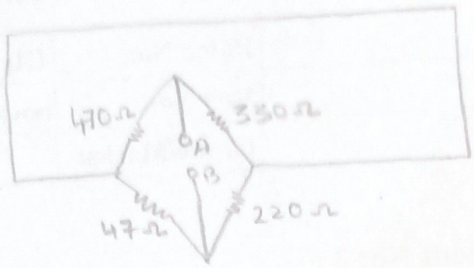
COs to be achieved:

CO1: Analyze resistive networks excited by DC sources using various network theorems.

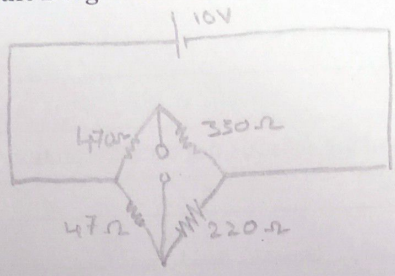
Circuit Diagram:



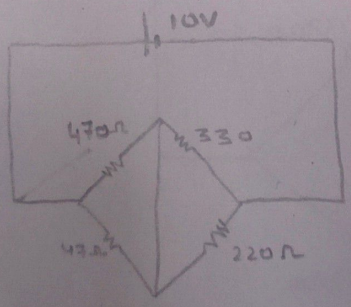
Task 1: Circuit Diagram to measure R_{TH}/R_N:



Task 2: Circuit Diagram to measure V_{TH}:



Task 3: Circuit Diagram to measure I_{SC}:



Stepwise-Procedure:

Thevenin's Theorem:

1..Connect the circuit as shown in the circuit diagram.
2. Set 10V and measure open circuit voltage V_{Th} across load terminals A and B.
3. Replace all voltage sources by Short circuit and measure R_{Th} across terminals A and B as per the circuit diagram shown in the figure.
4. Draw Thevenin's equivalent circuit and determine the value of load current from it.
5. Verify the results theoretically.

Norton's Theorem:

1. Connect the circuit as shown in the circuit diagram.
2. Set the voltages 10V
3. Remove the load resistance and measure the short circuit current I_{SC} through A and B terminals.
4. Replace all the voltage sources by Short circuit and measure R_{Th} across terminals A and B as per the circuit diagram shown in the figure.
5. Draw Norton's equivalent circuit and determine the value of load current.
6. Verify the results theoretically

Calculations:

Applying KVL on mesh (i)

$-10 - 330I_1 - 470I_1 = 0$

$-10 - 800I_1 = 0$

$-80I_1 = 1$

$I_1 = -1/80 = 0.0125\ A$

Applying KVL on mesh (ii)

$-470(I_2 - I_1) - 330(I_2 - I_1) - (220 + 47)I_2 = 0$

$800I_1 - 800I_2 - 267I_2 = 0$

$-10 - 1067I_2 = 0$

$I_2 = -10/1067 = 9.372 \times 10^{-3}$

$= 0.009372\ A$

Using Norton's theorem

Applying KVL in loop (1)

$-47I_1 - 470(I_1 - I_3) = 0$ - (i)

Applying KVL in loop (2)

$-330(I_2 - I_3) - 220I_2 = 0$ (ii)

Applying KVL in loop (3)

$-10 - 470(I_3 - I_1) - 330(I_3 - I_2) = 0$ (iii)

From (i), (ii) & (iii)

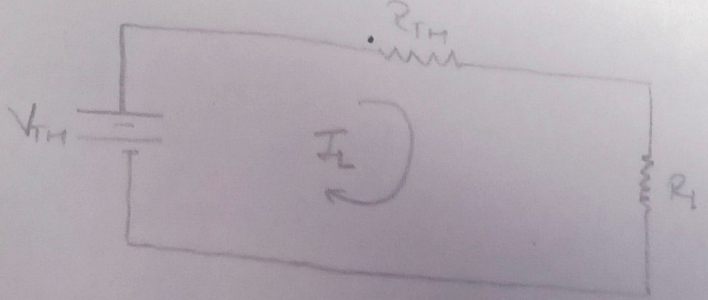
$I_1 = 0.0520A$, $I_2 = 0.0343A$, $I_3 = 0.0572A$

$I_{sc} = I_1 - I_2 = -0.0177A = -17.7mA$

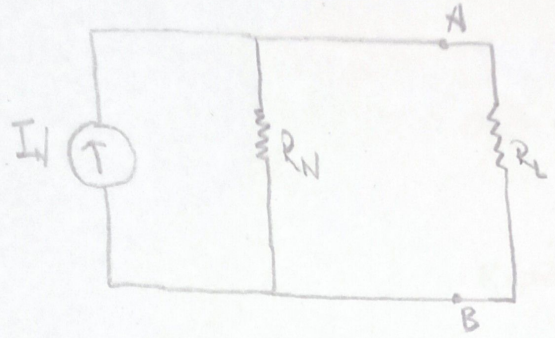
Observation Table:

	V_{TH} (V)	R_{TH} / R_N (Ω)	I_N (mA)	I_L (mA)
Theoretical value	-4.1 V	232.60Ω	-17.68mA	-12.3mA
Practical value	-4.05V	228Ω	-17.5mA	-13.5mA

Draw Thevenin's Equivalent circuit



Draw Norton's Equivalent circuit



Conclusion:

The following experiment helps us in understanding the steps to verify Thevenin's & Norton's theorem for the circuit. Thevenin resistance & Norton Resistance are eq. Any linear circuit can be simplified to an equivalent circuit consisting of a single voltage source with a series resistance connected to the load. The exp also helped us to examine resistive networks excited by DC sources using various network theorems.

Signature of faculty in-charge with Date: