Course Name:	**Elements of Electrical and Electronics Engineering**	**Semester:**	**I**
Date of Performance:	**15 / 11 / 2022**	**Batch No:**	**C2-2**
Faculty Name:	**Jyoti Varavedkar**	**Roll No:**	**16010122109**
Faculty Sign & Date:		**Grade/Marks:**	**/ 25**

Experiment No: 4

Title: Thevenin's Theorem & Norton's Theorem.

Aim and Objective of the Experiment:

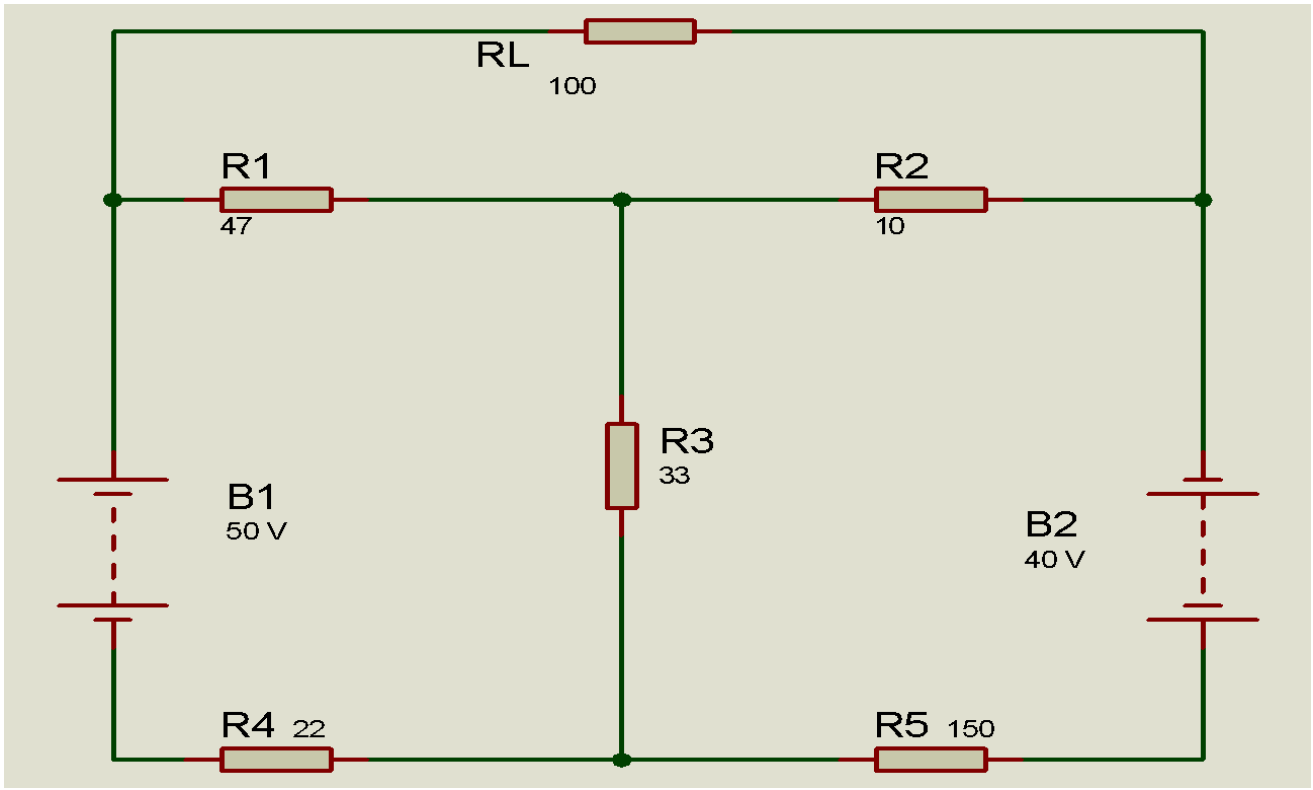
- To Verify for Thevenin Theorem for the circuit
- To Verify Norton Theorem for the Circuit.

COs to be achieved:

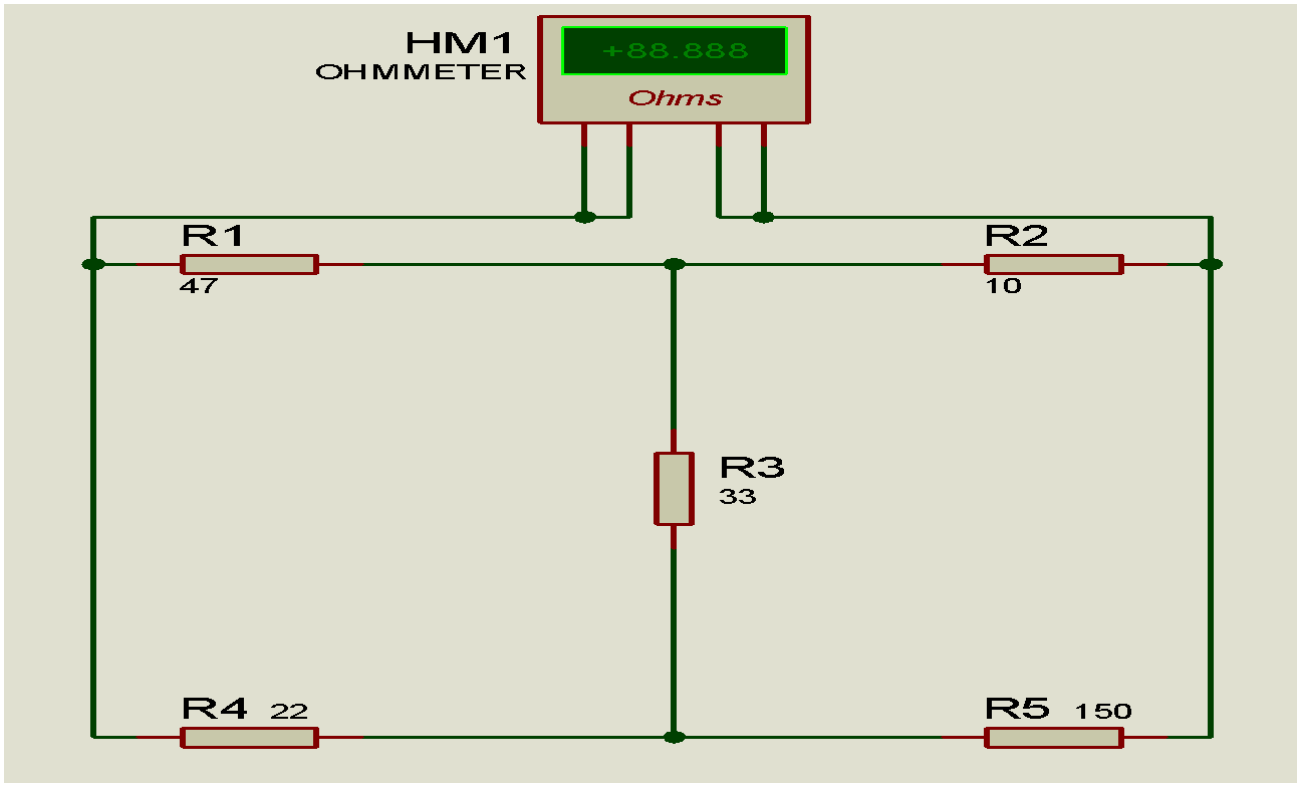
CO1: Analyze resistive networks excited by DC sources using various network theorems. .

Circuit Diagram/ Block Diagram:

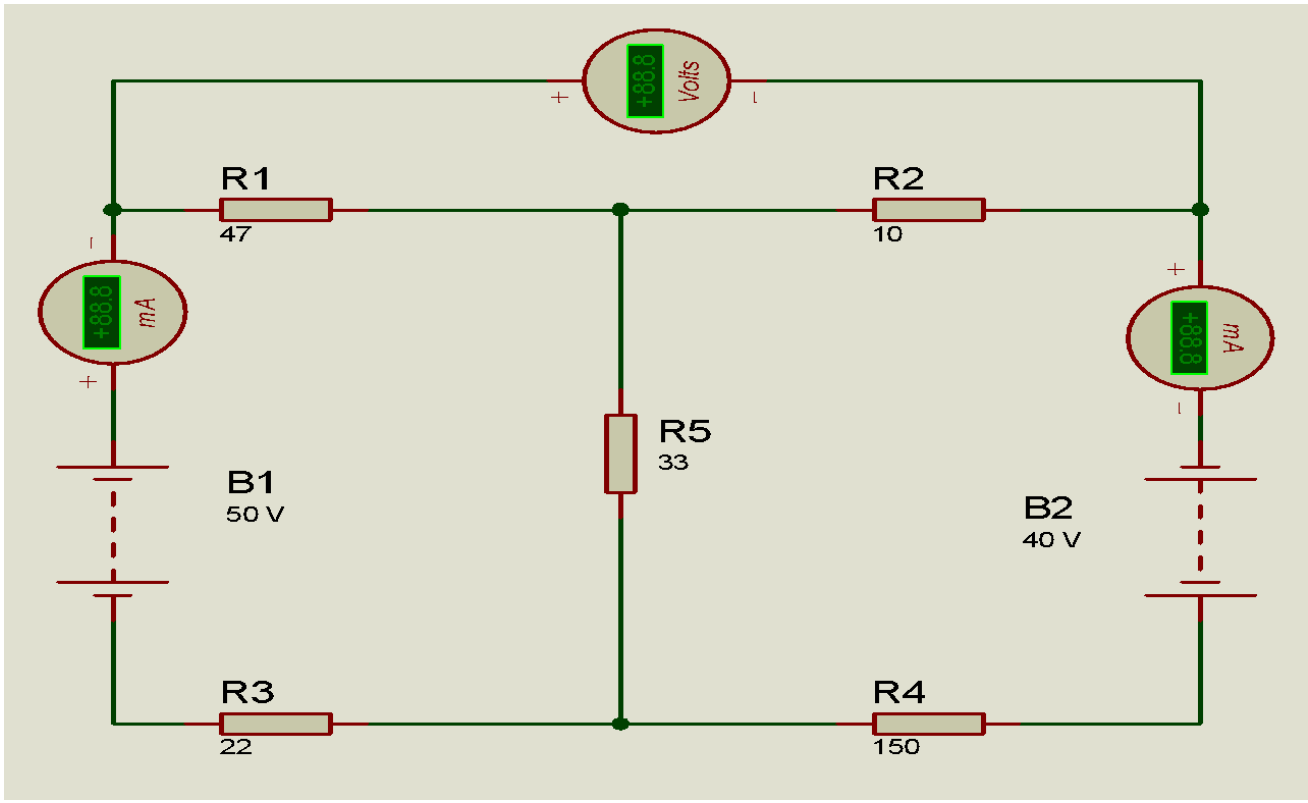
Circuit Diagram:



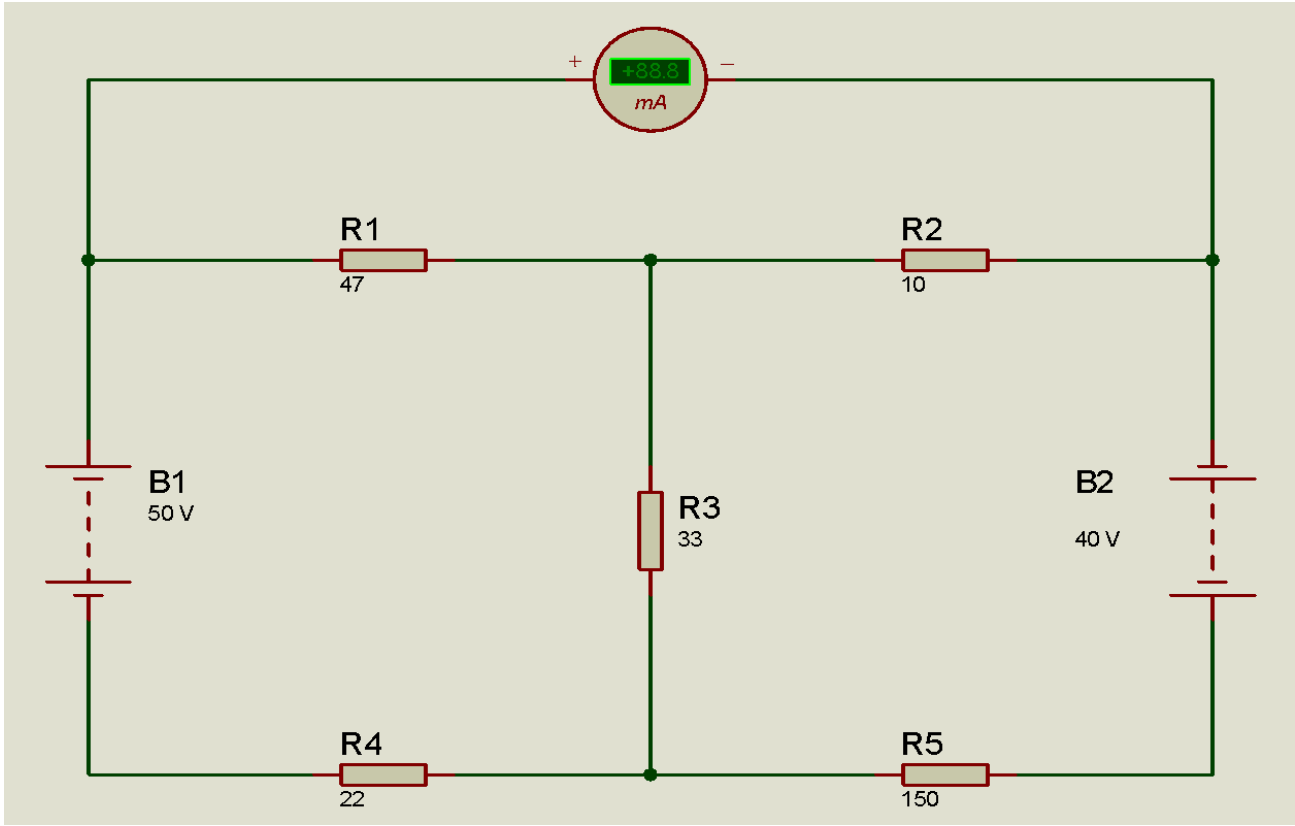
Task 1: Circuit Diagram to measure R_{TH}/R_N:



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 V1, V2 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.

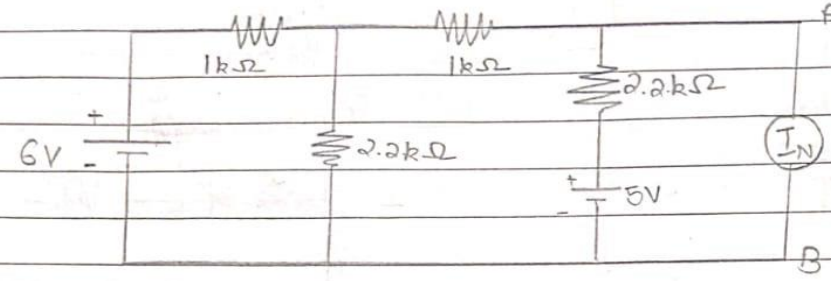
Norton's Theorem:

1. Connect the circuit as shown in the circuit diagram.
2. Set the voltages V_1, V_2
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

Sample Calculations:

Page No.
Date

Theveni's Theorem & Norton's Theorem



1) Measurement of V_{th} :
- Open ckt R_L and measure V_{th} bet^n A & B.

2) Measurement of R_{th} :
- Remove R_L, short ckt both^n supplies and calculate R_{th} theoretically & also measure practically.

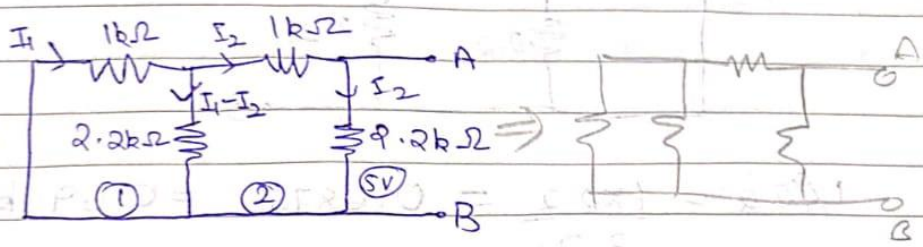
3) Measurement of I_N for Norton's Theorem :
- Remove R_L and short ckt bet^n A and B and calculate I_N theoretically value. Practically measure I_N by connecting multimeter in current mode in A & B.

- Observation Table:

	V_{th}	R_{th}	I_N
Theoretical value	4.95 V	0.955kΩ	4.71 mA
Practical value	4.85 V	0.93 kΩ	4.82mA

Page No.
Date

Resultant ckt for R_{th}



mesh (1)

$6 - 1I_1 - 2.2(I_1 - I_2) = 0$

$3.2I_1 - 2.2I_2 = 6$

$32I_1 - 22I_2 = 60$

$16I_1 - 11I_2 = 30$

$176I_1 - 121I_2 = 330$ (1)

mesh (2)

$+2.2(I_1 - I_2) - I_2 - 2.2I_2 - 5 =$

$2.2I_1 - 2.2I_2 - I_2 - 2.2I_2 =$

$2.2I_1 - 5.4I_2 = 5$

$22I_1 - 54I_2 = 50$

$11I_1 - 27I_2 = 25$

$176I_1 - 432I_2 = 400$ (2)

$176I_1 - 121I_2 = 330$

$176I_1 - 432I_2 = 400$

$311I_2 = 70$

$I_2 = \frac{70}{311} = 0.225$ A

$16I_1 - \frac{770}{311} = 30$

$16I_1 = 30 + 2.475$

$16I_1 = \frac{9330 + 770}{311} = \frac{10100}{31}$

$I_1 = \frac{10100}{31 \times 16}$

$I_1 = 2.03$ A

$I_1 = 2.03$ A

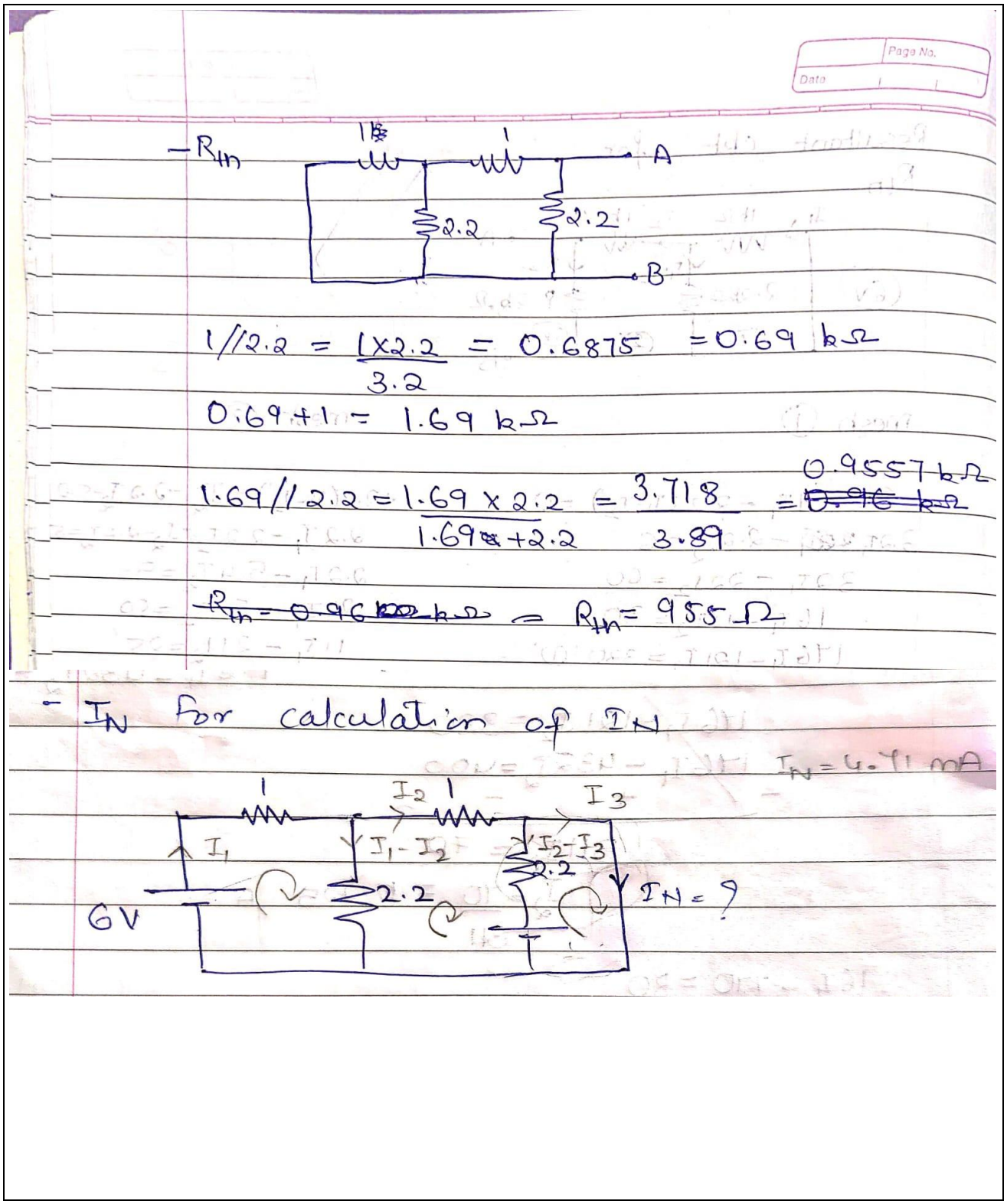
$I_2 = 0.225$ A

$I = 2.25$ A

$V_{th} = IR$

$V_{th} = 2.25 \times 2.2$

$V_{th} = 4.95$ V

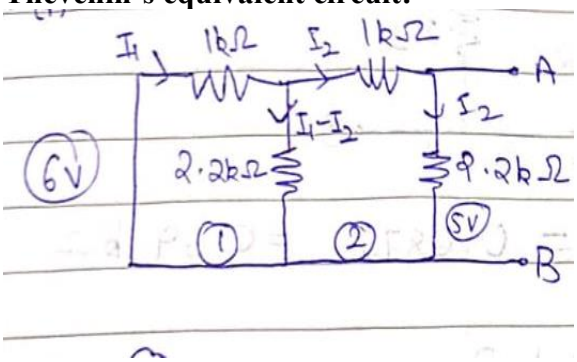

Page No.
Date
R_{Th}
1
1
A
2.2
2.2
B
$1//2.2 = \frac{1 \times 2.2}{3.2} = 0.6875 = 0.69\ k\Omega$
$0.69 + 1 = 1.69\ k\Omega$
$1.69//2.2 = \frac{1.69 \times 2.2}{1.69 + 2.2} = \frac{3.718}{3.89} = 0.9557\ k\Omega$
$R_{Th} = 955\ \Omega$
I_N for calculation of I_N
$I_N = 4.91\ mA$
1
I_2
1
I_3
I_1
$I_1 - I_2$
$I_2 - I_3$
2.2
6V
$I_N = ?$

Observation Table:

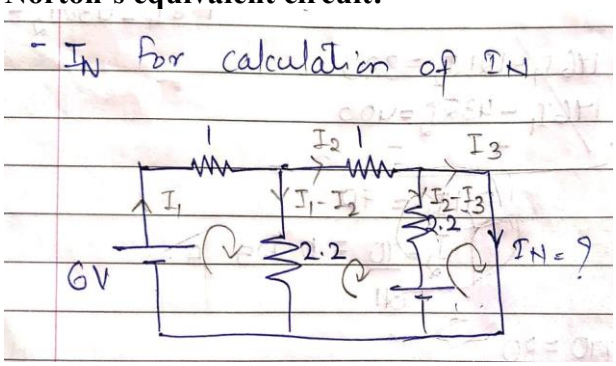
	V_{TH} In volts	R_{TH} / R_N In Ω	I_N in mA
Theoretical value	**4.95**	**955**	**4.71**
Practical value	**4.85**	**950**	**4.82**

Screenshot of Output (Thevenin's and Norton's method):

Thevenin's equivalent circuit:



Norton's equivalent circuit:



R_{TH}/R_N :

950 ohms

O/P for I_N:

4.82 mA

Conclusion:

By this experiment we get to know about the Thevenin Theorem and Norton Theorem for the circuit.

Signature of faculty in-charge with Date: