Course Name:	**Elements of Electrical and Electronics Engineering**	**Semester:**	**I/II**
Date of Performance:		**Batch No:**	**G3**
Faculty Name:	**Milind Marathe**	**Roll No:**	**16010421063**
Faculty Sign & Date:		**Grade/Marks:**	**/ 25**

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.

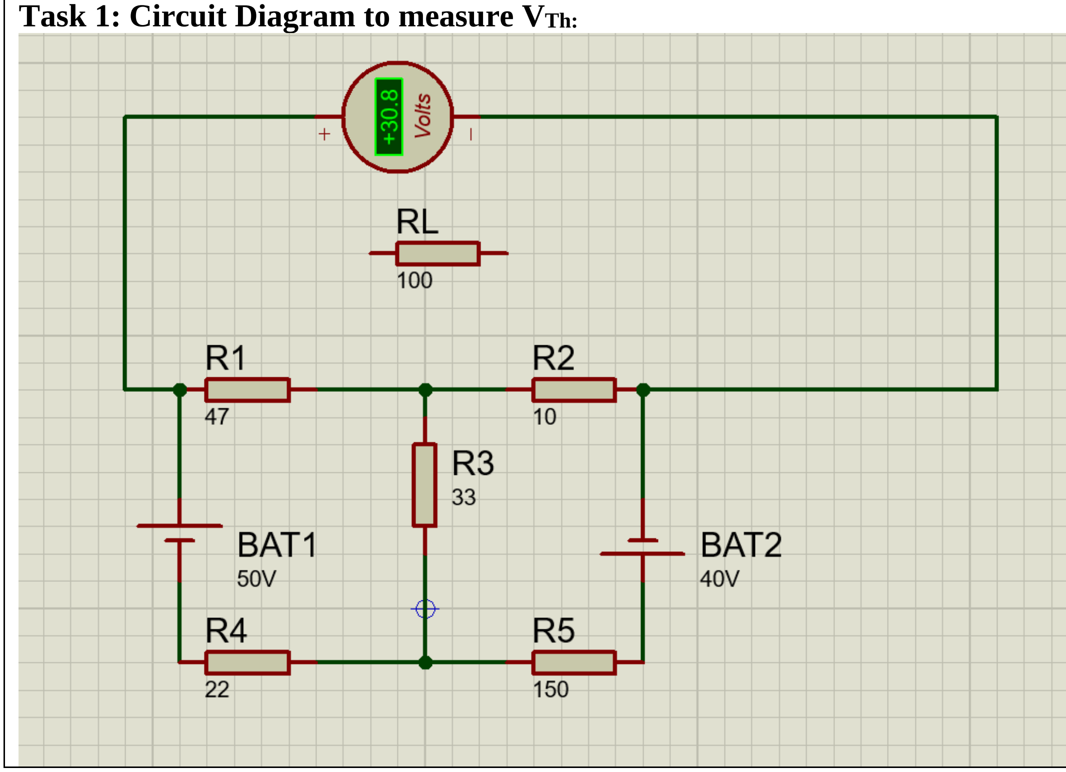
COs to be achieved:

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

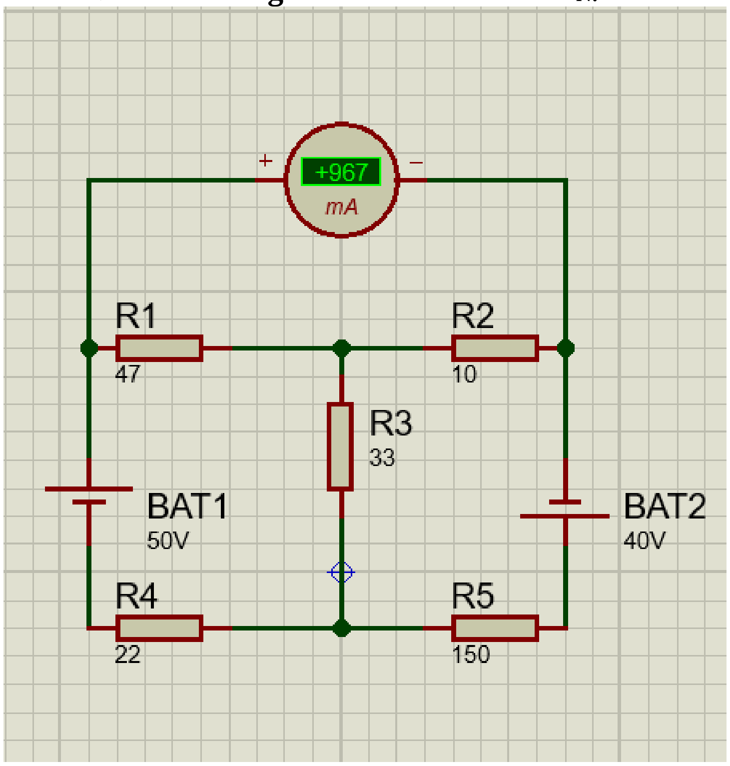
Circuit Diagram/ Block Diagram:

Circuit Diagram

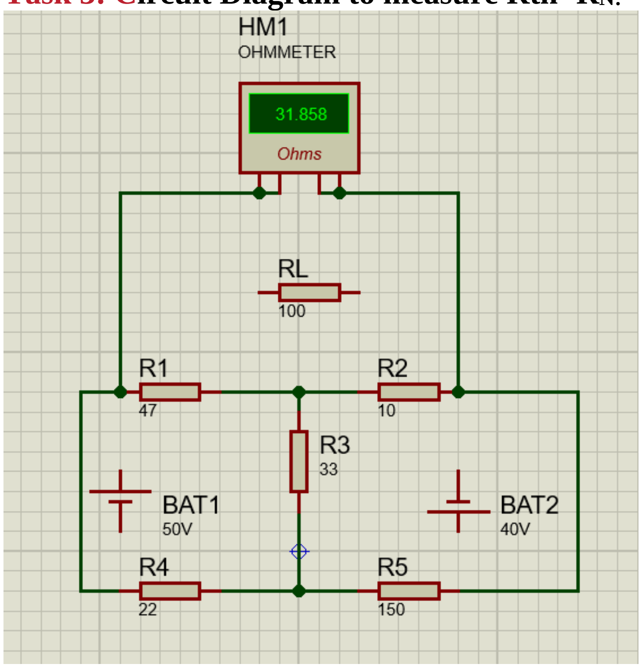
Task 1: Circuit Diagram to measure V_{Th}:



Task 2: Circuit Diagram to measure Isc=I_N:



Task 3: Circuit Diagram to measure Rth=R_N:



Stepwise-Procedure:
Thevenin's Theorm

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.

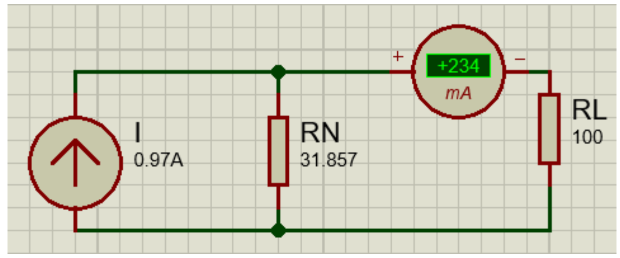
Norton's Theorem

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

Observation Table:

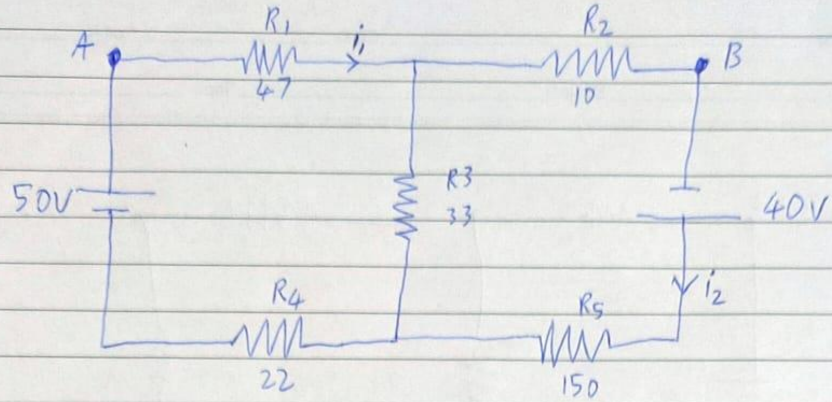
	I_{RL}
Practical value	0.23A
Theoretical value	0.23A

	Vth	Rth (Ω)	Isc (I_N)	I_{rl} Thevenin	I_{rl} ΩNorton
Practical value	30.8	31.858	0.967A	0.23A	0.234A
Theoretical value	30.805	31.857	0.9669A	0.2336A	0.2343A

Thevenin's equivalent circuit	Norton's Equivalent Circuit
	

Theoretical Calculation:

V_{th}:



$$50 = i_1(47+22) + 33(i_1 - i_2)$$

$$50 = 69i_1 + 33i_1 - 33i_2$$

$$50 = 102i_1 - 33i_2 \quad \text{— (1)}$$

$$40 = i_2(150+10) + (i_2 - i_1)33$$

$$= 160i_2 + 33i_2 - 33i_1$$

$$= 193i_2 - 33i_1 \quad \text{— (2)}$$

Solving (1) and (2)

$i_1 = 0.58988$ $\quad$ $i_2 = 0.30811$

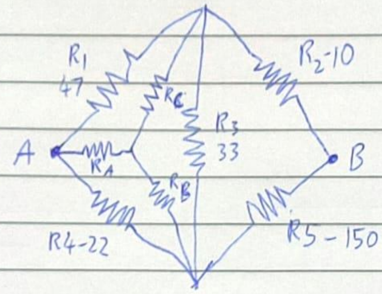
$$V_{TH} = V_{AB} = i_1 R_1 + i_2 R_2$$

$$= 0.58988 \times 47 + 0.30811 \times 10$$

$$= 27.72346 + 3.0811$$

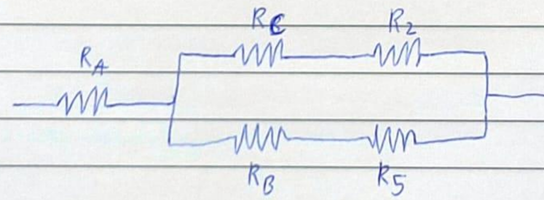
$$V_{TH} = 30.80546$$

R_{th}:



$$R_A = \frac{47 \times 22}{102} = \frac{1034}{102} \qquad R_B = \frac{22 \times 33}{102} = \frac{726}{102} \qquad R_3 = \frac{1551}{102}$$

$$R_A = 10.137 \qquad R_2 = 7.117 \qquad R_3 = 15.205$$



$$R_x = R_c + R_2 = 157.117$$
$$R_y = R_B + R_5 = 25.205$$
$$R_{x+y} = \frac{157.117 \times 25.205}{(157.117 + 25.205)} = 21.7205$$

$$R_{TH} = 10.137 + 21.7205$$
$$\boxed{R_{TH} = 31.857\,\Omega}$$

I_{sc}:

$$I_{sc} = \frac{V_{TH}}{R_{TH}}$$

$$= \frac{30.805}{31.857}$$

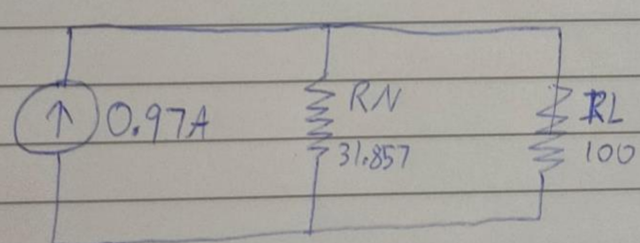
$$I_{sc} = 0.9669 \text{ A}$$

I_{RL}(Norton):

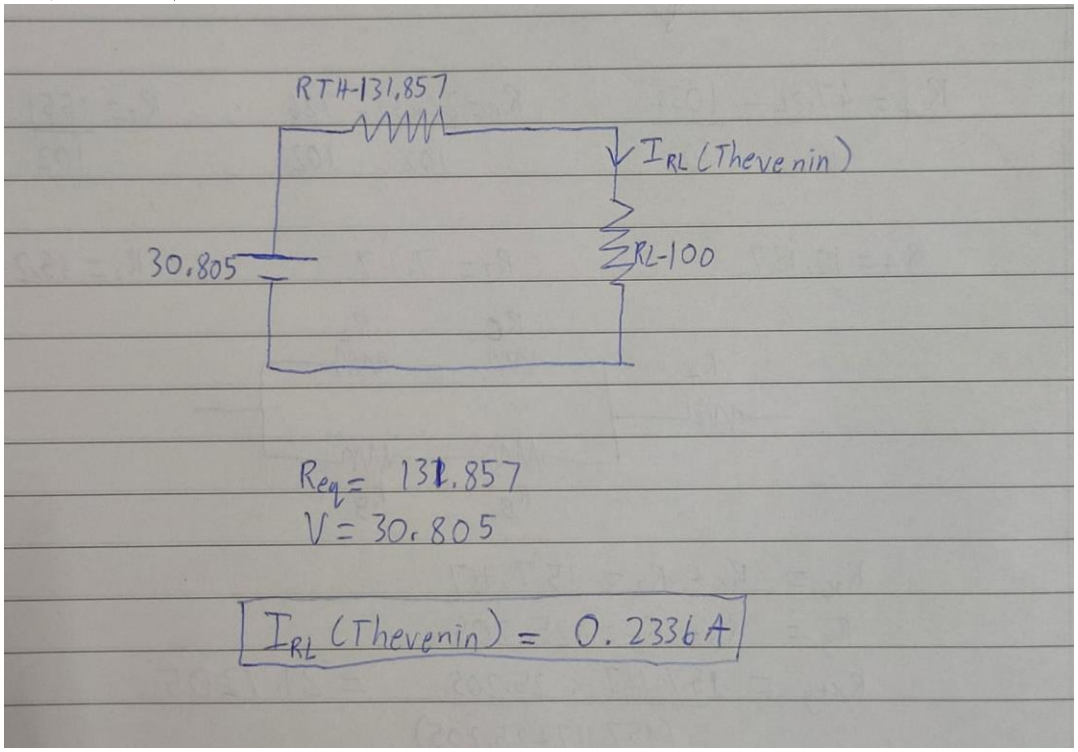
$$(I_{RL})100 = (0.97 - I_{RL})31.857$$
$$100 I_{RL} = 30.90129 - 31.857 I_{RL}$$

$$131.857 I_{RL} = 30.90129$$

$$I_{RL} = 0.2343A$$



I_{RL}(Thevenin):



Conclusion:

In this experiment we understand the use of Thevenin and Norton's theorem to get the value of $\mathbf{I_{RL}}$ in the circuit.

Signature of faculty in-charge with Date: