EXPERIMENT NO. 4.a

Objective: To verify Thevenin's Theorem.

Apparatus Required:

Sr. No.	Apparatus	Quantity	Range/ Remark
1	D.C. Supply	1	(……..) V, (…….)A
2	D.C Voltmeter	2	Power Supply Voltmeter-1,(……)V
3	DC Ammeter	1	(……)mA
4	Rheostate	3	R1=……, R2=……., R3=…….
5	Multimeter	1	To Measure Resistance
6	Connecting wires	--	--

Circuit Diagram:

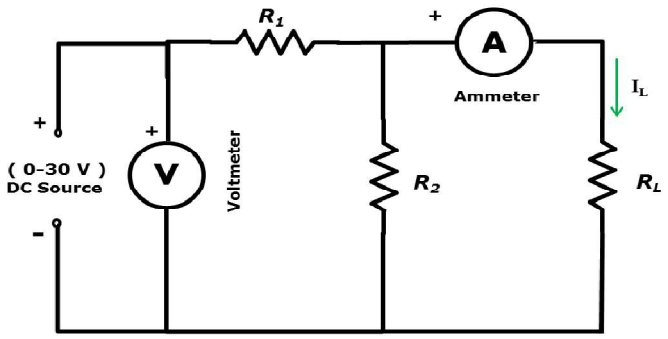

Fig 1: Circuit Diagram for Load Current

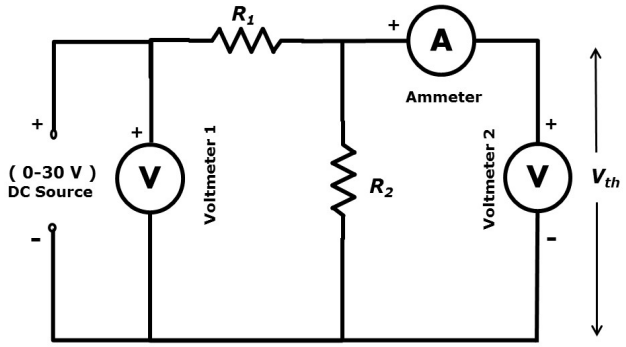

Fig 2: Circuit Diagram for Thevenin Voltage V_{th}

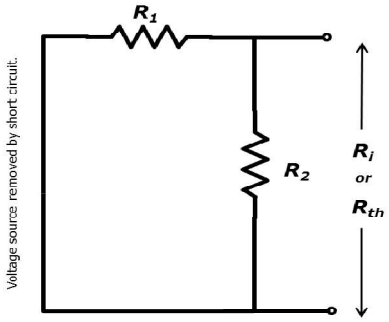

Fig 3: Circuit Diagram for R_{th}

Observation Table:

$\boldsymbol{R_1}$=…..Ω, $\boldsymbol{R_2}$=.....Ω, Load resistance $\boldsymbol{R_L}$=…….Ω, Thevenin resistance $\boldsymbol{R_{th}}$=…….Ω

S.N.	V (volts)	I_L (mA)	V_{th}(volt)	R_{TH}(Ω)	R_L (Ω)	$I'_L = \frac{V_{TH}}{R_{TH}+R_L}$	Error= $\frac{I_L - I'_L}{I_L} * 100$

Theory: The current flowing through a load resistance R_L connected across any two terminal A and B of a linear bilateral network is given by

$$I_L = \frac{V_{TH}}{R_{TH} + R_L}$$

Where Vth is the open circuit voltage (i.e. voltage across two terminals from where R_L is removed)

R_{TH} is the internal resistance of the network as the viewed back into open circuited network from terminal A and B with all voltage source replaced by their internal (if any) and current source by infinite resistance.

Procedure:

1. Connect the circuit as shown in the circuit diagram Fig.1.
2. Switch On the DC power supply.
3. Record the current I_L for varying supply voltage V in steps.
4. Replace the R_L with the voltmeter and record its valueas V_{th} by connecting the circuit as per fig.2
5. Give the supply voltage in steps of 5 and record the corresponding reading in V_{th} voltmeter
6. Short the supply (considering it an ideal voltage source) and record the resistance across A and B using multimeter as shown in Fig.3
7. Measure the values of R1,R2 and R3 using multimeter.
8. Calculate percentage error.

Result: The Thevenin's Theorem has been verified.

Precaution:

1. Make the connections properly.
2. Note the readings of voltmeters and ammeters properly avoid parallax
3. Connect the DC supply and ammeter with correct polarity.
4. Avoid loose connections and don't touch wire with wet hand.

EXPERIMENT NO. 4.b

Objective: **To verify Norton's Theorem.**

Apparatus Required:

S/N.	Apparatus	Quantity	Range/ Remark
1	D.C. Supply	1	(……..) V, (…….)A
2	D.C Voltmeter	1	Power Supply Voltmeter-1,(……)V
3	DC Ammeter	1	(……)mA
4	Rheostat	3	R1=……., R2=……., R3=…….
5	Multimeter	1	To Measure Resistance
6	Connecting wires	--	--

Circuit Diagram:

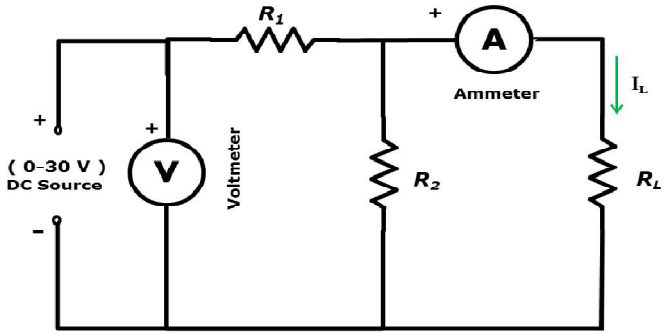

Fig 1: Circuit Diagram for Load Current I_N

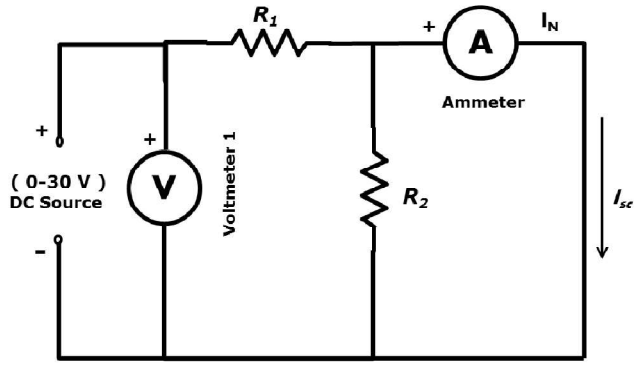

Fig 2: For Norton Current I_{SC} or I_N

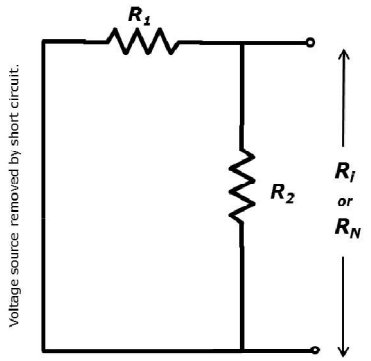

Fig3: For Norton resistanceR_N or R_i

Circuit Diagram for Norton Theorem

Observation Table:

$\boldsymbol{R_1}$=…..Ω, $\boldsymbol{R_2}$=.....Ω, Load resistance $\boldsymbol{R_L}$=…….Ω, Norton resistance $\boldsymbol{R_N or\ R_i}$=…….Ω

S.N.	V (volts)	I_L (mA)	I_N(A)	R_i (Ω)	R_L (Ω)	$I'_L = \frac{I_N * R_i}{R_i + R_L}$	Error= $\frac{I_L - I'_L}{I_L} * 100$

Theory: According to Norton's Theorem "Any two terminal active, linear network containingvoltage source and resistance when viewed from its output terminal is equivalent to a constant current source and a parallel resistance. The constant current is equal to the current which wouldflow in a short circuit placed across the terminals and parallel resistance is the resistance of thenetwork when viewed from these open circuited terminals after all voltage and current sources hasbeen replaced by their internal resistances". The load current

$$I'_L = \frac{I_N * R_i}{R_i + R_L}$$

Where I_N = Norton current, R_i= Norton's Resistance (Ω), R_L= Load Resistance (Ω)

Procedure:

1. Connect the circuit as shown in the circuit diagram Fig.1.
2. Switch On the DC power supply
3. Record the current I_L for varying supply voltage V in steps.
4. Replace the R_L with short circuit as per fig.2 and by varying supply voltage V in steps and take reading of I_N
5. Give the supply voltage in steps and record the corresponding reading of voltmeter as $V_{th.}$
6. Short the supply (considering it an ideal voltage source) and record the resistance across A and B using multimeter as shown in Fig.3
7. Measure the values of R_1,R_2 and R_3 using multimeter.
8. Calculate percentage error.

Result: The Norton's Theorem has been verified.

Precaution:

1. Make the connections properly.
2. Note the readings of voltmeters and ammeters properly avoid parallax
3. Connect the DC supply and ammeter with correct polarity.
4. Avoid loose connections and don't touch wire with wet hand.