CHITTAGONG UNIVERSITY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING
CHITTAGONG-4349, BANGLADESH.

Course No. EEE-182

Course Title: Basic Electrical Engineering Sessional

Experiment No. 6

VERIFICATION OF THEVENIN'S THEOREM

PRELAB WORK:

- **Read this laboratory manual carefully before coming to the laboratory class, so that you know what is required.**
- Try to **follow** the lecture notes of **EEE 111.**
- **DONOT** copy others blindly!!!
- **Submit your lab report before the roll call.**

OBJECTIVE:

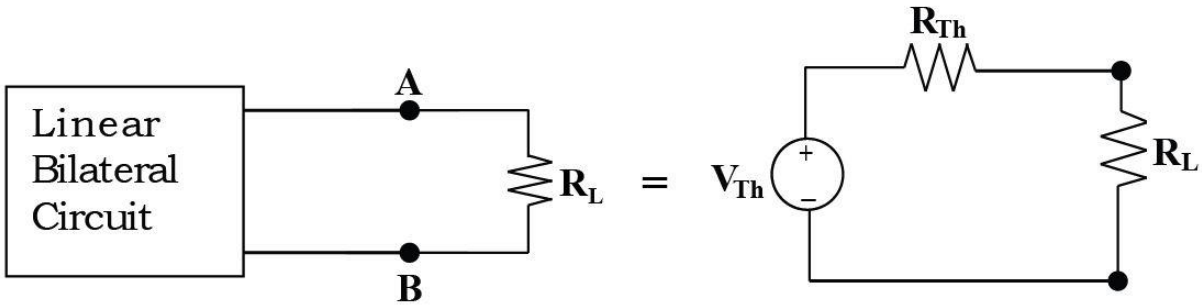
The Objective of this experiment is to determine the value of V_{Th} and R_{Th} from our experimental circuit across the desired portion of the network and thus verify the Thevenin's theorem by replacing the network across the terminal with the Thevenin's equivalent circuit and compare the equivalent circuit with the original one.

THEORY:

It is often desirable in circuit analysis to study the effect of changing a particular branch element while all other branches and all the sources in the circuit remain unchanged. Thevenin's theorem is a technique to this end and it reduces greatly the amount of computations which we have to do each time a change is made. Using Thevenin's theorem the given circuit excepting the particular branch to be studied is reduced to the simplest equivalent circuit possible and then the branch to be changed is connected across the equivalent circuit.

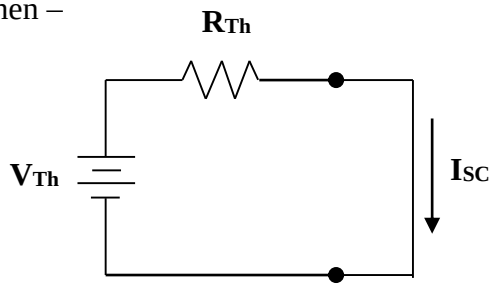
The Thevenin's theorem states that any two terminal linear bilateral network containing sources and passive elements can be replaced by an equivalent circuit consist of a voltage source V_{Th} in series a resistor $\mathbf{R_{Th}}$ where –

$\mathbf{V_{Th}}$ = The open circuit voltage (V_{OC}) at the two terminals **A & B**.
$\mathbf{R_{Th}}$ = The resistance looking into the terminals A and B of the network with all sources removed.



There are several methods for determining Thevenin resistance $\mathbf{R_{Th}}$. An attractive method for determining $\mathbf{R_{Th}}$ is: (1) Determine the open circuit voltage, and (2) Determine the short circuit current I_{SC} as shown in the figure; then –

$$R_{TH} = \frac{V_{OC}}{I_{SC}}$$



APPARATUS:

1. Four Rheostats.
2. Ammeter (0~5A).
3. Voltmeter (0~300V).
4. DC Power Supply.
5. Three SPST Switches.

PROCEDURE:

For Original Circuit:

1. Arrange the original circuit as shown in Fig. 1. Keep the rheostats R_1, R_2 & R_3 at maximum position. (or at least above 20Ω each). Apply 30V DC from DC power supply.
2. Measure V_L, I_L for three values of R_L & record the data in the table.

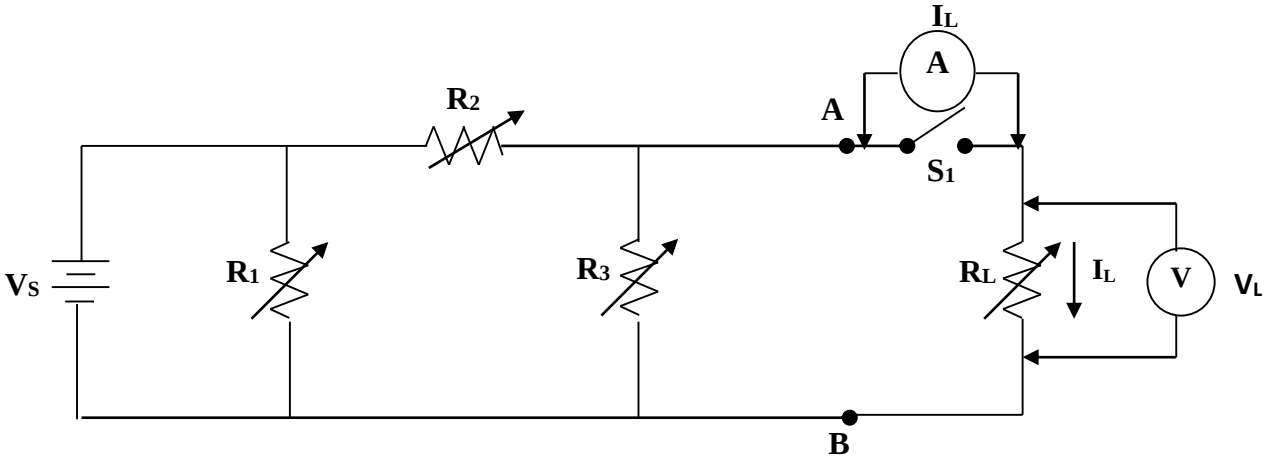


Figure 1: Original circuit.

Finding V_{Th} & R_{Th}:

3. Remove the load resistance R_L and find the open circuit voltage between terminals **A & B**. This voltage is Thevenin voltage i.e. $V_{Th}=V_{OC}$.

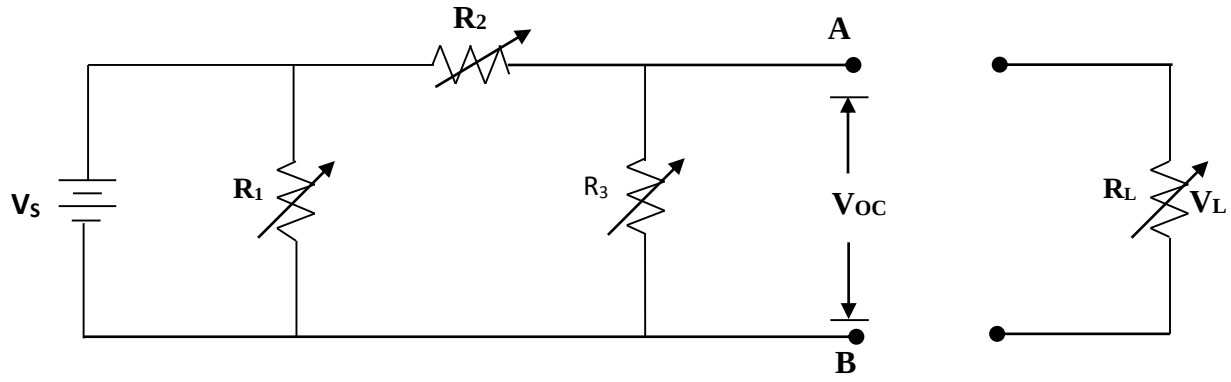


Figure 2: Circuit for finding V_{OC}.

4. Place a short circuit between terminals **A & B** and find the short circuit current I_{SC}. Divide The open circuit voltage by the short circuit current to find the Thevenin resistance R_{Th} i.e. –

$$R_{TH} = \frac{V_{OC}}{I_{SC}}$$

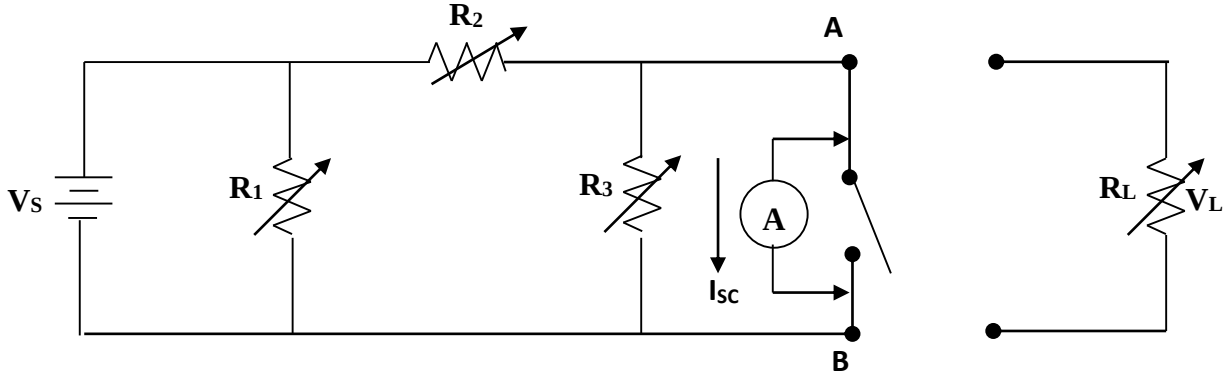


Figure 3: Circuit for finding I_{SC}.

For Thevenin Equivalent Circuit:

5. Construct the Thevenin's equivalent circuit as shown in Fig. 4 setting the power supply at V_{Th} volts and the rheostat at R_{Th} ohms. Now measure the load current I_L and the load voltage V_L for the values of R_L determined in step 2. Compare these values with previous values.

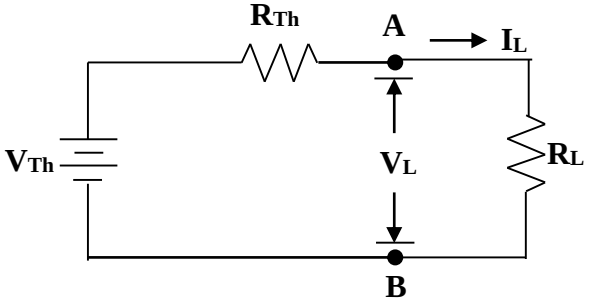


Figure 4: Thevenin Equivalent Circuit of Circuit in Fig. 1.

EXPERIMENTAL DATA:

Table1: Data for Original circuit R_1= , R_2= , R_3= , V_S=

No. of Obs.	R_L ohms	V_L volts	I_L amps

V_{Th} = , R_{Th} =

Table2: Data for Thevenin equivalent circuit

No. of Obs.	R_L ohms	V_L volts	I_L amps

REPORT:

1. Find theoretically the Thevenin equivalent circuit for the values of R_1, R_2 and R_3 & V_S recorded in table. Also find I_L and V_L.
2. Show the results in tabular form.
3. Comment on the results obtained and discrepancies (if any).

CAUTION:

1. Do not switch on the supply until the circuit has been checked by your teacher.
2. Take care of the apparatus.
3. Do not touch any open ended wire or cable with applying voltage supply at the other end.

HOME TASK:

1. Define unilateral, bilateral & equivalent circuit.
2. Describe other methods for determining Thevenin resistance.
3. Mention the advantages of using Thevenin Theorem.