American International University- Bangladesh
Department of Electrical and Electronic Engineering
EEE 2109: Introduction to Electrical Circuits Lab

Title: Study of Thevenin's Theorem
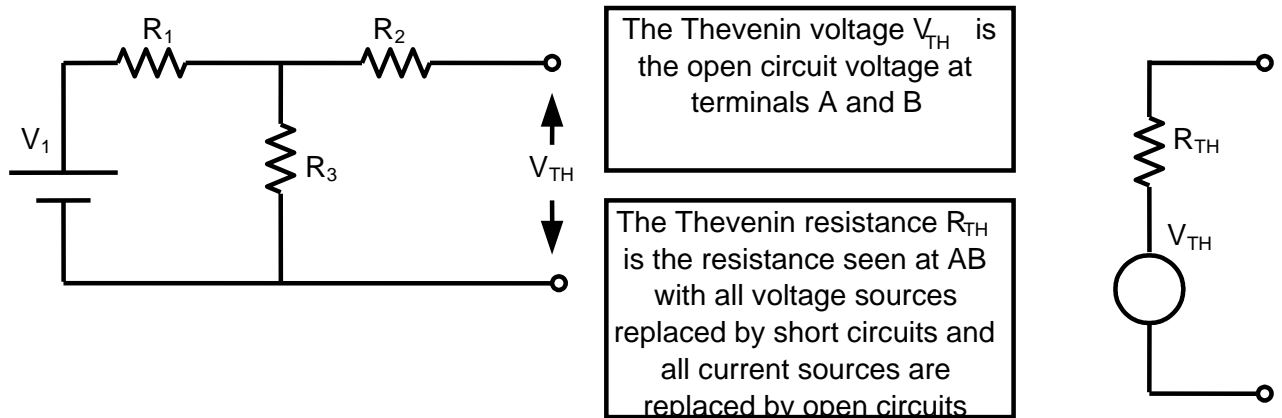
Introduction:

Thevenin's theorem is a very powerful circuit analysis technique. It can convert complex circuit to a simpler series equivalent circuit for easier analysis. Analysis involves removing part of the circuit across two terminals to aid calculation, later combining the circuit with the Thevenin equivalent circuit.

The purpose of this experiment is to-
1. find the Thevenin equivalent circuit
2. measure the load voltage and load current from the given network

Theory and Methodology:

The Thevenin Theorem is a process by which a complex circuit is reduced to an equivalent series circuit consisting of a single voltage source, V_{TH}, a series resistance R_{TH} and a load resistance, R_L. After creating the Thevenin equivalent circuit, you may then easily determine the load voltage V_L and the load current I_L.

The Thevenin voltage V_{TH} is the open circuit voltage at terminals A and B

The Thevenin resistance R_{TH} is the resistance seen at AB with all voltage sources replaced by short circuits and all current sources are replaced by open circuits

Pre-Lab Homework:

Study Thevenin's Theorem from any book or websites; perform the simulation using Multisim and MUST present the simulation results to the instructor before the start of the experiment.

Apparatus:

1. Trainer Board
2. Voltmeter
3. Ammeter
4. AVO meter or Multimeter
5. DC source
6. Resistors   :1kΩ [2 pcs], 2kΩ [2 pcs], 3kΩ [2 pcs]

Precautions:

i) Do not short any connections. Short connection can produce heat (due to high current flow) which is harmful for the components.
ii) Carefully connect the ammeter in series.

Experimental Procedure:

1. Remove the portion of the circuit for which Thevenin's equivalent circuit will be determined.
2. Remove the voltage source by a short circuit and replace the current source by an open circuit
3. Determine the Thevenin equivalent resistance R_{TH} for the load.
4. Now return the sources to their original position and determine the open circuit voltage between the terminals A and B.
5. Verify the Thevenin's theorem

Simulation and Measurement:

Compare the simulation results with your experimental data and comment on the differences (if any).

Data Table:

Thevenin Equivalent Voltage (E_{th})		Thevenin Equivalent Resistance (R_{th})	
Measured Value (Experimental)	Calculated Value/ Simulate Value	Measured Value (Experimental)	Calculated Value/ Simulated Value

Questions for report writing:

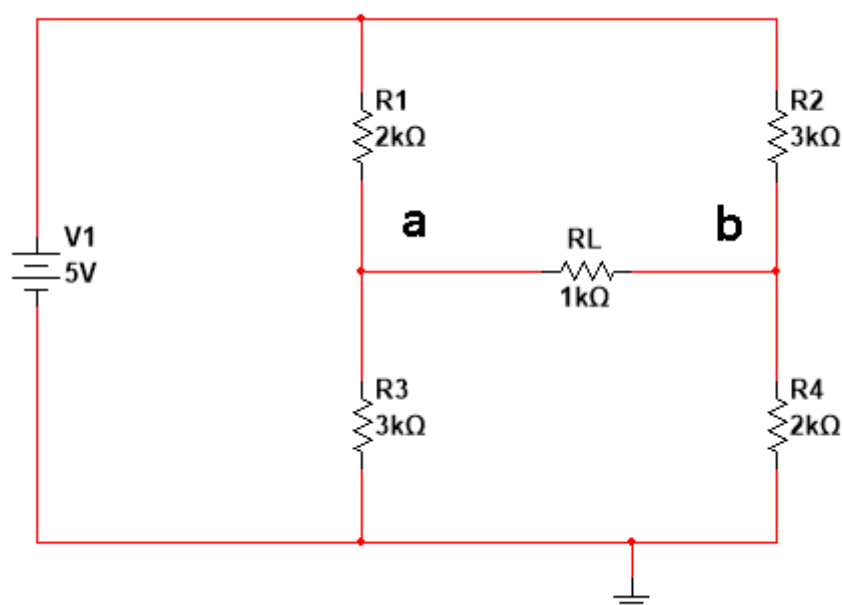1. Verify Thevenin Theorem for the following circuit.

Fig B

2. Verify the measured value of total circuit current with theoretical value. Show necessary calculation.
3. Comment on the result as a whole.

<u>Discussion and Conclusion:</u>

Interpret the data/findings and determine the extent to which the experiment was successful in complying with the goal that was initially set. Discuss any mistake you might have made while conducting the investigation and describe ways the study could have been improved.

<u>Reference(s):</u>

1. Robert L. Boylestad, "Introductory Circuit Analysis", Prentice Hall, 12th Edition, New York, 2010, ISBN 9780137146666.