Course Title: Basic Electrical Engineering Lab
Course Code: CSE 124

Submitted By

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Submitted To

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EXPERIMENT NO: 05

NAME OF THE EXPERIMENT:

Study of the Thevenin Theorem

OBJECTIVE:

- To verify Thevenin’s theorem for a given circuit.
- To learn how to simplify a complex circuit into an equivalent one without affecting output.

THEORY:

The **Thevenin theorem** states that any linear two-terminal circuit can be replaced by an equivalent circuit consisting of a voltage source (**Vth**) in series with a resistor (**Rth**).

- **Vth** is the open-circuit voltage at the terminals.
- **Rth** is the equivalent resistance seen from the terminals when independent sources are turned off.

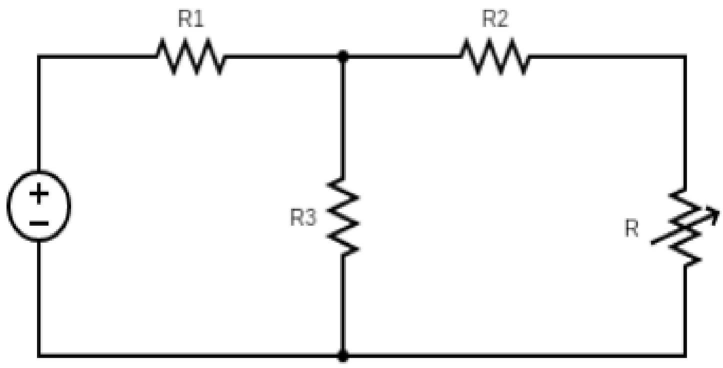
To turn off sources:

- Voltage Source → Short Circuit
- Current Source → Open Circuit

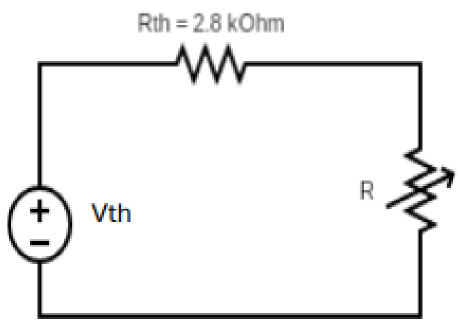
APPARATUS:

- Power Supply
- Connecting Wires
- Digital Multi-meter
- 3 Resistors
- 1 Varistor (Variable Resistor)

CIRCUIT DIAGRAM:



Primary Circuit



Simplified circuit using Thevenin theorem

Observation	Source Voltage (V)	Vth (V)	Rth (kΩ)	IL Calculated (mA)	IL Measured (mA)
01	12	4.25	3.105	1.02	1.0
02	18	5.90	3.105	1.42	1.4

✅ CALCULATIONS

Given Resistor Values:

- R1 = 1.5 kΩ

- R2 = 1.0 kΩ
- R3 = 1.8 kΩ

- **Calculation of Rth:**

$$R_{th} = \left(\frac{1}{R1} + \frac{1}{R3}\right)^{-1} + R2$$
Rth=(R11+R31)−1+R2

$$= \left(\frac{1}{1.5} + \frac{1}{1.8}\right)^{-1} + 1.0 = \left(0.6667 + 0.5556\right)^{-1} + 1.0 = (1.2223)^{-1} + 1.0 = 0.818k\Omega + 1.0k\Omega$$
$$= 1.818\ k\Omega\ (theoretical)$$
=(1.51+1.81
)−1+1.0=(0.6667+0.5556)−1+1.0=(1.2223)−1+1.0=0.818kΩ+1.0kΩ=1.818 kΩ (theoretica
l)

Using measured value:

$R_{th} \approx 3.105\ k\Omega$Rth≈3.105 kΩ

- **For Supply Voltage 12V:**
  - Vth = 4.25V
  - Load resistor = 1.05 kΩ

$I = \frac{V_{th}}{R_{th} + R} = \frac{4.25}{3.105 + 1.05} = \frac{4.25}{4.155} \approx 1.02\ mA$I=Rth+RVth=3.105+1.054.25=4.1554.25
≈1.02 mA

- **For Supply Voltage 18V:**
  - Vth = 5.90V

$I = \frac{V_{th}}{R_{th} + R} = \frac{5.90}{3.105 + 1.05} = \frac{5.90}{4.155} \approx 1.42\ mA$I=Rth+RVth=3.105+1.055.90=4.1555.90
≈1.42 mA

DISCUSSION:

To simplify the circuit using Thevenin’s theorem, we first measured the open-circuit voltage across the load terminals, giving us **Vth**. Then, we turned off the voltage source (shorted it) and calculated the equivalent resistance seen from the open terminals,

giving us **Rth**.
Using these, we created the simplified Thevenin equivalent circuit and measured current across the load. The measured current values closely matched the calculated ones, verifying the theorem.

Thank You, Sir.