ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE: PHY 4242 (PHYSICS – II LAB)

EXPERIMENT NO. 3 (A)

NAME OF THE EXPERIMENT: VERIFICATION OF THEVENIN'S THEOREM

OBJECTIVE:

i) To be familiar with the Thevenin's theorem and know its applicability.
ii) To verify this theorem with the help of simple network.

Theory:

It is often desirable in circuit analysis to study the effect of changing a particular branch element while all other branches and all other sources in the circuit remain unchanged. Thevenin's theorem is a technique to this end. It states that, 'any two terminal linear bilateral network can be replaced by an equivalent circuit consisting of a voltage source, V_{th} and a series resistance, R_{th}.'

The value of V_{th} is the open circuit voltage across the terminals and R_{th} is the resistance measured between the terminals with all the sources eliminated. The voltage sources are eliminated by shorting their terminals and the current sources are eliminated by opening their terminals.

Apparatus:

- Four resistors (2.2KΩ, 2.2KΩ, 2.2KΩ, 3.3KΩ, 560Ω)
- One ammeter and multimeter
- Project board
- Connecting wires.

Block diagram:

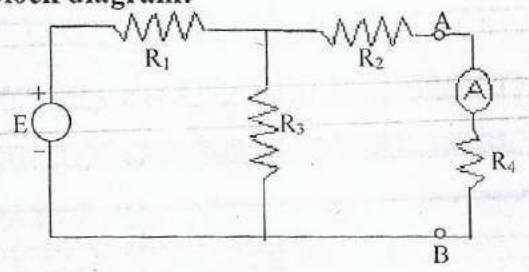

Fig. 3(a)

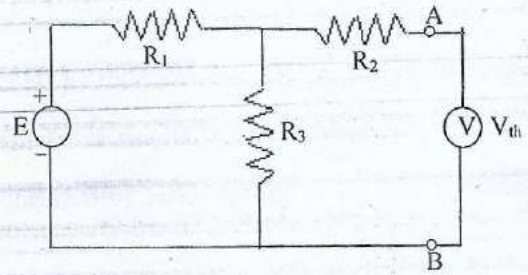

Fig. 3(b)

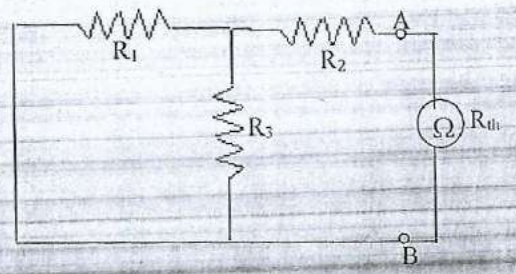

Fig. 3(c)

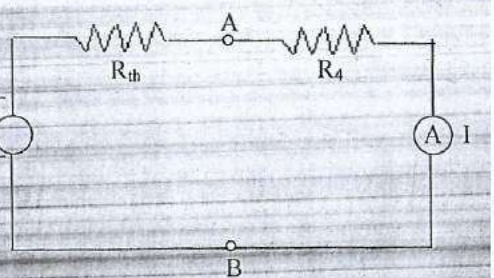

Fig. 3(d)

Procedure:

i) Implement the circuit of **Fig. 3(a)** on the bread board taking E=10V, R1=2.2K, R2=2.2K, R3=2.2K, R4=560Ω. Take reading of current I through R4.

ii) Open the terminals A, B. Connect a voltmeter across the terminals as shown in **Fig. 3(b)**. Take the reading, V_{th}.

iii) Eliminate the source and short the terminals C, D and place an ohmmeter across the terminals A, B as shown in **Fig. 3(c)**. Take the reading, R_{th}.

iv) By using the voltage V_{th} and resistance R_{th}, implement the circuit as in **Fig. 3(d)**. Take the reading of I. If the reading of I of **Fig. 3(a)** is same that of **Fig. 3(d)**, then the Thevenin's theorem will be verified.

v) From the exact values of R1, R2, R3, R4 and E, calculate I theoretically. Compare this value with that of practical value.

Data table:

Observation No.	I (ma) Theoretical	V_{th} volts	R_{th} ohm	I (ma) Practical

Report:

1. Show the table to your teacher.
2. Comment on the obtained results and discrepancies (if any) in your discussion.

EXPERIMENT NO. 3 (B)

NAME OF THE EXPERIMENT: VERIFICATION OF SUPERPOSITION THEOREM

OBJECTIVE:

iii) To be familiar with the superposition theorem and know its applicability.

iv) To verify this theorem which is an analytical technique of determining currents in a circuit with more than one source.

THEORY:

It states that, 'in any linear, bilateral network consisting of more than one source of emf, the current through or voltage across any element is equal to the algebraic sum of the currents or voltages produced independently by each source.'

While the current due to a particular source of emf is being found the other emf sources are rendered inactive and if any branch element is in series with those sources that remain intact.

APPARATUS:

- DC power supplies of suitable ratings
- Four resistors (6.8K, 3.3K, 2.2K, 560Ω)
- One ammeter, one multimeter
- Project board
- Connecting wires

BLOCK DIAGRAM:

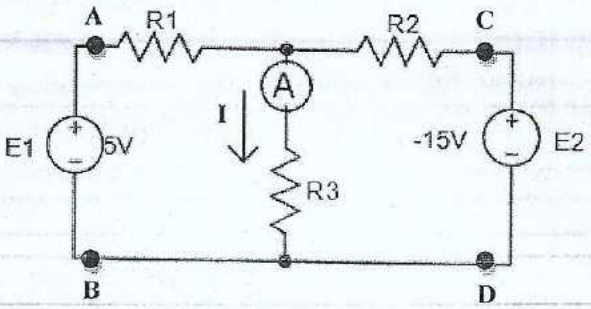

Fig. 1

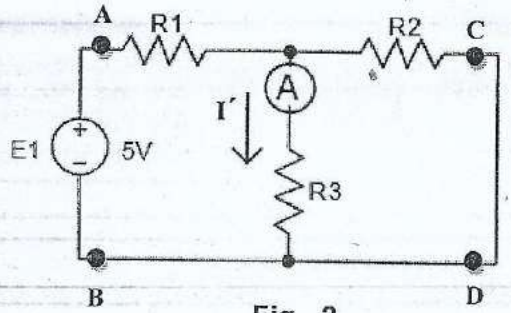

Fig. 2

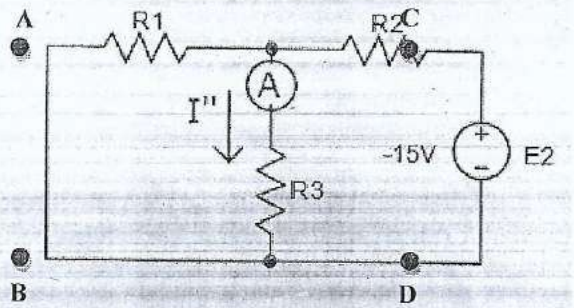

Fig. 3

PROCEDURE:

1. Connect the circuit as shown in **Fig. 1**. In this circuit, keep both sources active. Apply +5 volt from E1 and -15 volts from E2 and R1 = 2.2K, R2 = 3.3K, R3 = 560Ω.
2. Measure the current I using ammeter and record it in the given table along with the current direction (upward or downward).
3. Now remove E2 source, short the terminals C, D as shown in **Fig. 2**. Measure the current I′ in the branch R3 using ammeter. Record in the table.
4. Now remove E1 source, short the terminals A, B and reconnect E2 as shown in **Fig. 3**. Measure the current I′′ in the branch R3 using ammeter. Record in the table.
5. Verify I = I′ + I′′ (algebraic sum) which would validate the superposition theorem for this particular circuit.

DATA TABLE:

Observation No.	**Values of R1, R2, R3 (ohms)** kΩ	**I (ma)**	**I′ (ma)**	**I″ (ma)**	**I = I′ + I″ (ma)**

REPORT:

1. Show the table.
2. Comment on the obtained results and discrepancies (if any).
3. Find theoretically the current I with the reference to **Fig. 1** applying the superposition theorem considering E1=+5V and E2=–15V and R1, R2, R3 with their recorded values.