DATE:

EXP: 04

VERIFICATION OF THEVENIN'S THEOREM

AIM:

To verify Thevenin's theorem practically and theoretically for the given DC circuit.

APPARATUS REQUIRED:

SNO	APPARATUS	SPECIFICATION	QNTY
1	Regulated Power Supply	(0-30) V	1
2	Voltmeter	(0-30 V) MC	1
3	Ammeter	(0-10 mA) MC	1
4	Resistor	470Ω, 560Ω, 1KΩ	2,1,1
5	Bread board		1
6	Multimeter		1

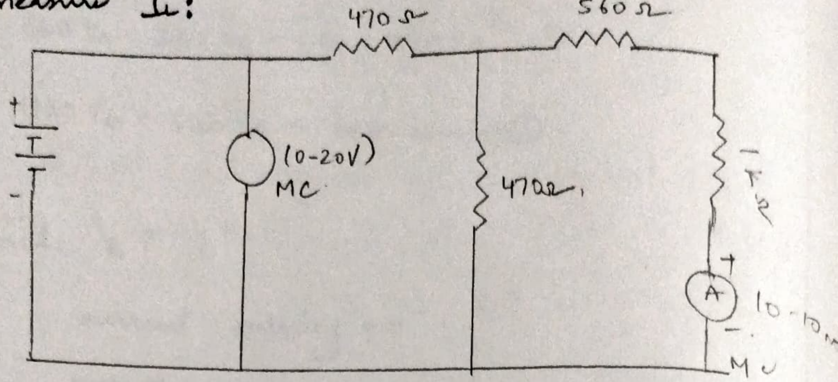
PROCEDURE:

1. Make the connections as per the circuit diagram 1.
2. Vary the RPS and set an input voltage of 10V.
3. Note down the voltmeter reading (vi) and ammeter reading (Ai) in tabular column 1.
4. Switch off the supply and make connections for circuit diagrams 2.
5. Measure the Thevenin's resistance
   R_{Th} = Norton's Resistance R_N
6. Switch off the supply and make connection for circuit diagram 3.
7. Set an input voltage of 10V in the RPS and note down the voltmeter readings Vi and V_{th} in

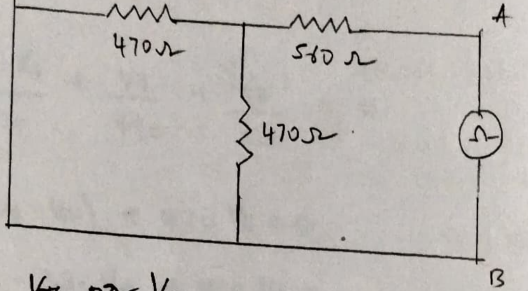
CIRCUIT DIAGRAMS :

VERIFICATION OF THEVENIN'S THEOREM :

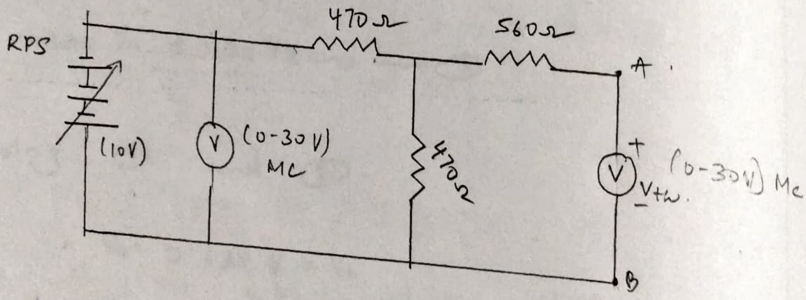
To measure I_L:



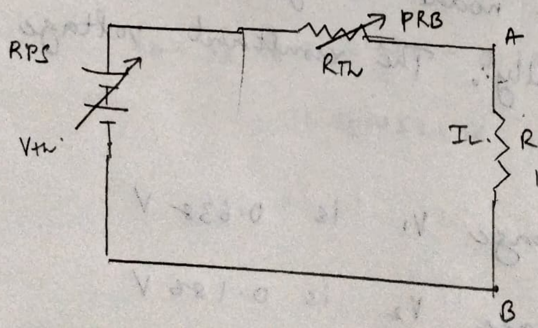
To measure R_{th} or R_N



To measure V_{th} or V_{oc}.



Thevenin's Equivalent circuit:



TABULAR COLUMN:1

To measure I_L

V_1 (Volt)	I_L (amp)
10	2.86 mA.

8. Switch off the supply and make connection for circuit diagram 4.

9. Set an input voltage of 10 V in the RPS and note down the voltmeter reading Vi and ammeter reading $I_N = I_{sc}$ in tabular column 4.

10. Draw the Thevenin's equivalent circuit diagrams and Norton's equivalent circuit.

11. Calculate the I_L value using the formula

$$I_L = V_{Th} / (R_{Th} + R_L)$$

Norton's theorem.

$$I_L = I_N * R_N (R_N + R_L)$$

RESULT:

Thus thevenin's theorem is verified practically and theoretically.

TABULAR COLUMN: 2:

To measure R_{TH} or R_N.

~~Vi (volt)~~	R_{TH} (Ω) = R_N
10V	= 773 Ω

TABULAR COLUMN: 3

To measure in ~~ampere~~ V_{TH} or V_{OC}

Vi (volt)	V_{TH} (volts) ~~(amps)~~
10	~~6.38 mA~~ 5 V.

MODEL CALCULATION:

Practical value of I_1 (from tabulation)

= 2.3 mA.

Verification of Thevenin's theorem

$$I_L = \frac{V_{TH}}{(R_{TH}+R_L)} = 2.22\,mA.$$

Theoretical calculation of I_1, R_{TH} (R_N) and V_{TH} for the given circuit.

CALCULATION:

By voltage division rule:

$$V_{TH} = \frac{V_S \times R_3}{R_1 + R_3}$$ [No current will flow through R_2 when R_2 is open circuited]

$$V_{TH} = \frac{10V \times 470\Omega}{1420 + 470\Omega} = 5V.$$

$V_{TH} = 5V$

R_{Th} = R_1 and R_3 in parallel when voltage source is short circuited.

$$R_{Th} = \frac{470 \times 470}{470 + 470} + 560 = 255 + 560$$

$$= 795\,\Omega$$

$$\boxed{R_{Th} = 795\,\Omega}$$

Finding I_L:

R_{Th} in series with R_L

$\therefore$ $R_{eq} = R_L + R_{Th} = 1.795\ k\Omega$.

$$I_L = \frac{V}{R_{eq}} = \frac{5V}{1.795 \times 10^{3}\,\Omega} = \underline{2.79\ mA}$$