Electrical and Electronics Engineering Lab Report

Exp No: *05*
Exp Name: ***Verification of Thevenin's Theorem.***
Equipmets: 1.Ammeter 2.Voltmenter 3.Bread borad 4.Three resistance 5.DC power supply 6.Connecting wires

Theory: Thevenin's theorem states that a linear two-terminal circuit can be replaced by an equivalent circuit consisting of a voltage source V_{th} in series with a resistor R_{th} where V_{th} is the open-circuit at the terminals and R_{th} is the input or equivalent resistance at the terminals when the independent sources.

Circuit diagram: The circuit diagram looks like the following figure below.

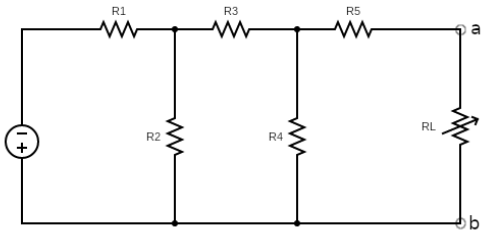

Fig 5.1: A circuit diagram

Calculation:

Calculating R_{th}:

$$\begin{aligned} R_{th} &= (((R_1||R_2)+R_3)||R_4)R_5 \\ &= (((9.9||9.9)+9.8)||10)||9.9 \\ &= 15.859\Omega \end{aligned}$$

Calculating V_{th}: At loop 1:

$$\begin{aligned} & -V + I_1R_1 + R(I_1 - I_2) = 0 \\ \Rightarrow\ & I_1(R_1+R_2) - I_2R_2 = V \\ \Rightarrow\ & 19.8I_1 - 9.9I_2 = 2 \qquad \ldots \qquad \ldots \qquad \ldots(1) \end{aligned}$$

At loop 2:

$$\begin{aligned} & R_2(I_2 - I_1) + I_2R_3 + R_4I_2 = 0 \\ \Rightarrow \quad & I_2(R_2 + R_3 + R_4) - I_1R_2 = 0 \\ \Rightarrow \quad & 29.7I_2 - 9.9I_1 = 0 \qquad ... \qquad ... \qquad ...(2) \end{aligned}$$

Now solving equation (1) and (2) we get, $I_1 = 0.121A, I_2 = 0.0404A$
therefore, $V_{th} = 0.0404 \times 10 = 0.404V$
again,

$$19.8I_1 - 9.9I_2 = 3 \qquad ... \qquad ... \qquad ... \ (3)$$

solving equation (3) and (2) we get, $I_1 = 0.18181A, I_2 = 0.0606A$
therefore, $V_{th} = 0.0606 \times 10 = 0.606V$

Data table:

$s.n$	V	$V_{th}(m)$	$V_{th}(cal)$	$R_{th}(m)$	$R_{th}(cal)$	$Error_{(V_{th})}$	$Error_{(R_{th})}$
1	2	$0.509V$	$0.404V$	16Ω	15.859Ω	20.62%	0.889%
2	3	$0.061V$	$0.606V$	16Ω	15.859Ω	9.14%	0.889%

Result: The experimental results indicates that according to Thevenin's theorem we've solved the above circuit.Though there are some problems in electronics elements of the experiment and these the cause of error.

Discussion: Thevenin's theorem is very esesntial law for electrical circuit for solving complex circuit diagram. From this experiment we have verified the law if there work accuracy was better. Though there are a little error, we've verified this law though there are a little error.