VERIFICATION OF THEVENIN’S AND MAXIMUM POWER TRANSFER
THEOREM

**Aim:** Verification of Thevenin’s and Maximum Power Transfer theorem.

**Apparatus required:** Resistors, DC supply, ammeter and multimeter.

**Theory:**

**Thevinin’s Theorem** states that “Any linear, bilateral, two terminal network can be replaced by a voltage source in series with a resistance, where value of voltage source is equal to open circuited voltage between the load terminals and the resistance is equal to the resistance looking from the open circuited terminals replacing all the source by their internal resistances if any”.

Let \( V_{OC} \) be the open circuited voltage across the load resistance,

\( R_{TH} \) be the Thevenin’s resistance of the circuit.

Then, current through the load resistance is given by,

\[ I_L = \frac{V_{OC}}{R_{TH} + R_L} \]

**Maximum Power Transfer Theorem** states that “In any linear, bilateral network the maximum power will be transferred from the circuit to the load if and only if load impedance is complex conjugate of the internal impedance”

OR

For DC circuit it states that “.In any linear, bilateral network the maximum power will be transferred from the circuit to the load if and only if load resistance is equal to the internal resistance”

Let \( V_{OC} \) be the open circuited voltage across the load resistance,

\( R_I \) be the internal resistance of the circuit.

Then, maximum power will be delivered to the load resistance is given by,

\[ P_{\text{max}} = \frac{V_{OC}^2}{4R_I} \]
Procedure:

Thevinin’s Theorem

1. Make the connections as shown in the Fig.1
2. Adjust the DC supply voltage using multimeter.
3. Note the current flowing through the load resistor.
4. Switch off the DC source; remove the load resistor from the terminals (open circuit).
5. Switch on DC source and note $V_{OC}$ across the open circuited terminals (Fig. 2).
6. Make connections as shown in the Fig. 3 and find $R_{TH}$.
7. Make connections as shown in the Fig. 4 to obtain Thevinin’s equivalent circuit and
adjust $V_{OC}$ and $R_{TH}$ as obtained in steps 5 and 6.
8. Note the current flowing through the load resistor.
9. Verify the current obtained in step 3 and 8.

Maximum Power Transfer Theorem

1. Make the connections as shown in the Fig.1
2. Adjust the DC supply voltage using multimeter.
3. Vary the load resistance from 100 ohm to 1kohms.
4. Note the current corresponding to each value of load resistance.
5. Calculate the power and verify the load resistance at which the power will be maximum.
Thevenin’s theorem

Circuit Diagram:

Circuit to find $V_{oc}$:

Circuit to find $R_{th}$:

Maximum Power transfer theorem

Circuit Diagram

To find $V_{oc}$:
\[ P_{\text{max}} = \frac{V_{oc}^2}{4R_L} \]

To find internal resistance \( R_{\text{in}} \) at which power transfer to the load \( R_L \) is maximum:

To obtain a plot of power Vs \( R_L \):

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>( R_L ) in Ohms</th>
<th>( I_L ) in mA</th>
<th>( P_L ) in mW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>