Experiment No.( 13 )
Maximum Power Transfer Theorem

Aim of experiment: To prove Maximum Power Transfer theorem practically.

Apparatus
1. DC circuit training system
2. Set of wires.
3. DC Power supply
4. Digital A.V.O. meter

Theory
The power transferred from a supply source to a load is at its maximum when the resistance of the load is equal to the internal resistance of the source. On the other words" A resistive load will be consumptive maximum power from the supply when the load resister is equal to the equivalent (Thevenin) network resister"

\[ R_L = R_{th} \quad \ldots \text{For maximum power transfer.} \]

\[ I_L = \frac{V_{th}}{R_{th} + R_L} = \frac{V_{th}}{R_{th} + R_{th}} = \frac{V_{th}}{2R_{th}} \]

Where,
\[ P_{\text{max}} = I_L^2 R_L = \frac{V_{th}^2}{4R_{th}} \]

A graph of \( R_L \) against \( P \) is shown in Fig.(1), the maximum value of power which occurs when \( R_L = R_{th} \).
Procedure
1. Connect the circuit shown in figure below. From the circuit, we can note that $R_{th}=100\Omega$ and $V_{th}=5V$.
2. Change the value of $R_L$ in steps as shown in table.
3. Measure the voltage "$V_L$" and current "$I_L$" and record it in the table.
4. Repeat steps (2-3) by using $R_{th} = 150\Omega$

<table>
<thead>
<tr>
<th>$R(\Omega)$</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>150</th>
<th>180</th>
<th>220</th>
<th>300</th>
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</thead>
<tbody>
<tr>
<td>$I_L(mA)$</td>
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<td>$V_L$(volt)</td>
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<tr>
<td>Power</td>
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</table>
Discussion and calculation:
1. Plot the curve of the power against the load resistance and determine the maximum power.
2. Compare between the theoretical and practical results.
3. Comment on your results.
4. Find $R_L$ for the maximum power transfer in the circuit shown.