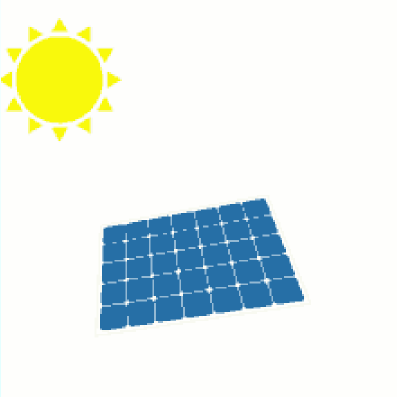
Maximum Power Transfer Theorem



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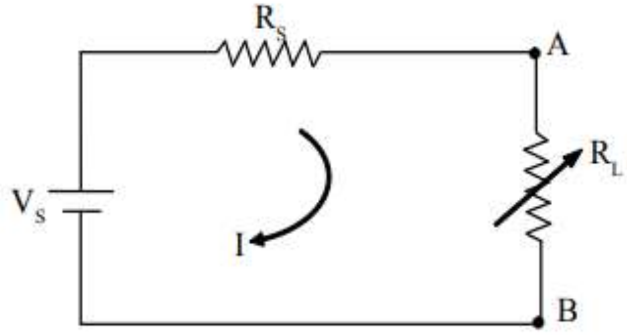
Maximum Power Transfer Theorem

Statements :

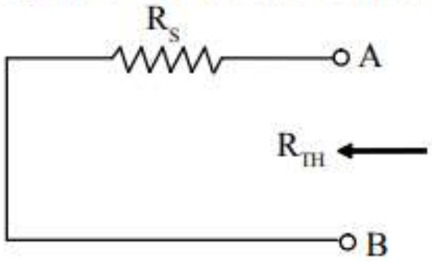
In d.c. circuits, maximum power is transferred from a source to the load when the load resistance is made equal to the resistance of the network as review from the load terminals with load removed and all the sources replaced by their internal resistances for finding the thevenins resistance.

Proof :



For proving the maximum power transfer theorem, consider the circuit shown in above figure.

The looking back resistance i.e., thevenins resistance at terminals AB is, $R_{TH} = R_S$ ------(19)



For finding the thevenin's resistance, the voltage source is short circuited.

From the circuit, $I = \dfrac{V_S}{R_S + R_L}$ --------(20)

The power delivered to the load is, $P_L = I^2 R_L$

$$P_L = \left(\frac{V_S}{R_S + R_L}\right)^2 R_L \qquad \text{--------(21)}$$

$$R_L = R_{TH}$$

$\therefore$ The load resistance must be equal to the thevenin's resistance for maximum power transfer.

$$P_m = I^2 R_L = \frac{V_S^2 R_L}{(R_S + R_L)^2} = \frac{V_S^2 R_L}{(R_{TH} + R_{TH})^2} = \frac{V_S^2 R_L}{4R_L^2} \Rightarrow P_m = \frac{V_{TH}^2}{4R_L}$$

Thank You