Verification of Maximum Power Transfer Theorem

Aim: Verification of maximum power transfer theorem (MPT).

Apparatus: DC Supply, ammeter, voltmeter, breadboard, various resistors and connecting leads

Theory: Maximum power transfer theorem states that in a network, a resistive load will abstract maximum power from a network when the load resistance is equal to the resistance of the network as viewed from the output terminals, with all energy sources replaced by their internal resistance.

Consider the circuit shown in fig. 1. The maximum power P_{max} delivered to the load resistance R_L is when $R_L = R_{TH}$ and given by eq. (1) and eq. (2).

$$P_{max} = \frac{V_{TH}^2}{4R_L} \tag{1}$$

$$P_{max} = I_L^2 R_L \tag{2}$$

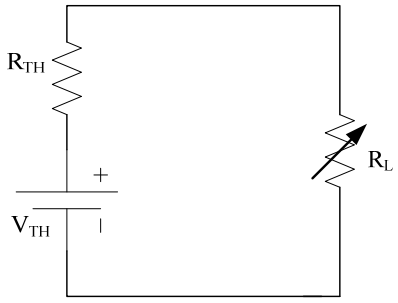

Fig. 1: Circuit to explain Maximum power transfer theorem

An example circuit to verify the maximum power transfer theorem is shown in fig. 2.

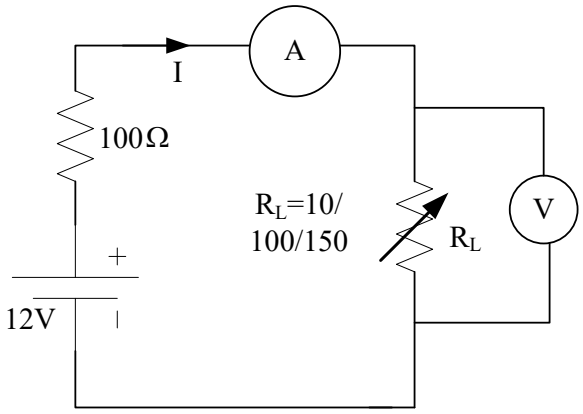

Fig. 2: An example circuit to verify the maximum power transfer theorem

OBSERVATION TABLE

S. no.	R_L (Ω)	I(mA)	V(volts)	P=VI	R_I (Ω)	V_{th} (volts)	$P_{max} = V_{TH}^2 / 4R_L$ calculated
1	50(Ω)				100(Ω)	12 V	
2	80(Ω)						
3	100(Ω)						
4	120(Ω)						

PROCEDURE:

i. Connect the circuit According to the fig.1
ii. Select the different value of R_L (Ω) as 50,80,100,120 R_L (Ω)
iii. Note down the reading of voltmeter to find V(volts)
iv. Note down the reading of ammeter to find I(mA)

PRECAUTION:

i. Do not make interconnection on the board with mains switched ON.
ii. As soon as mains is ON, the reading in the meters must be zero. If the reading in the meters is not zero, check the meters.

RESULT:

From the observation table, we can observe that the power delivered is maximum when the load resistance is equal to internal resistances. The maximum value of power is P_{max} = …….