DATE:

EXP NO: 6

VERIFICATION OF MAXIMUM POWER TRANSFER THEOREM

AIM:

To measure the power absorbed in a load and to verify that the power absorbed in a load is maximum only when load resistance is equal to the source resistance.

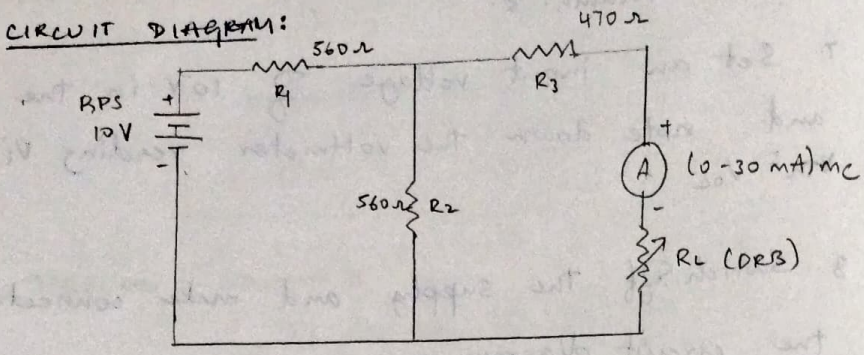
APPARATUS REQUIRED:

SNO	NAME OF APPARATUS	RANGE/ RATING	QUANTITY
1	Voltmeter	(0-15) MC	1
2	Ammeter	(0-500) mA MC	1
3	Resistor	560 Ω, 470 Ω	2, 1
4	RPS [DC supply]	15 V	1

PROCEDURE:

1. Make connections as per the circuit diagram.
2. Change the resistors R_L whose value close to R_{TH}, measure the corresponding V_L, I_L and calculate the power P_L and enter into the table (2).
3. Plot a graph between R_L and P_L and find the R_L corresponding to maximum power transfer
4. Verify the measured values of R_L at maximum power transfer as same as calculated and found graphically.

CIRCUIT DIAGRAM:



MODEL GRAPH:

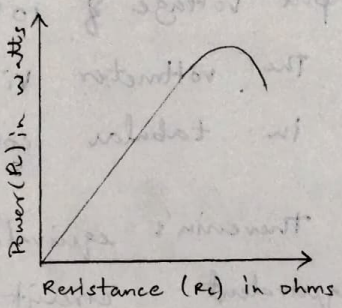


TABLE (i): FOR PRACTICAL CALCULATION:

Sno	Load Resistance (R_L) in ohm.	Load current (I_L) in mA	Load voltage (V_2) in volts	Load power in watts.
1	1 KΩ	2.96 mA	2.96 V	8.76 mW
2	150Ω	5.53 mA	0.995 V	5.504 mW
3	100 KΩ	6.00 mA	0.6 V	3.6 mW
4	470Ω	4.13 mA	1.94 V	8.01 mW
5	5.1Ω	0.85 mA	4.335 V	3.684 mV

CALCULATION:

$$V_{TH} = \frac{V \times R_2}{R_1 + R_2} = \frac{10 \times 500}{2(560)} = 5\,V$$

$$R_{TH} = \frac{560 \times 560}{2(560)} + 470 \Rightarrow 280 + 470 = 750\,\Omega$$

$$\therefore R_L = R_{TH}$$

$$P_L = \frac{(V_{TH})^2}{4(R_{TH})} = \frac{(5)^2}{4 \times 750} = \frac{25}{3000} = 0.083\,W$$

$$= 8.38\,mW$$

RESULT:

Thus Maximum Power transfer theorem is verified practically and theoretically.

$$I_L = \frac{V_{Th}}{R_{Th} \times R_L} = \frac{5}{1500} = 0.0333\,A$$

$$I_L = 3.33\ mA$$

$$V_L = I_L \times R_L$$

$$= 3.33 \times 10^{-3} \times 750$$

$$\boxed{V_L = 2.5\ V}$$