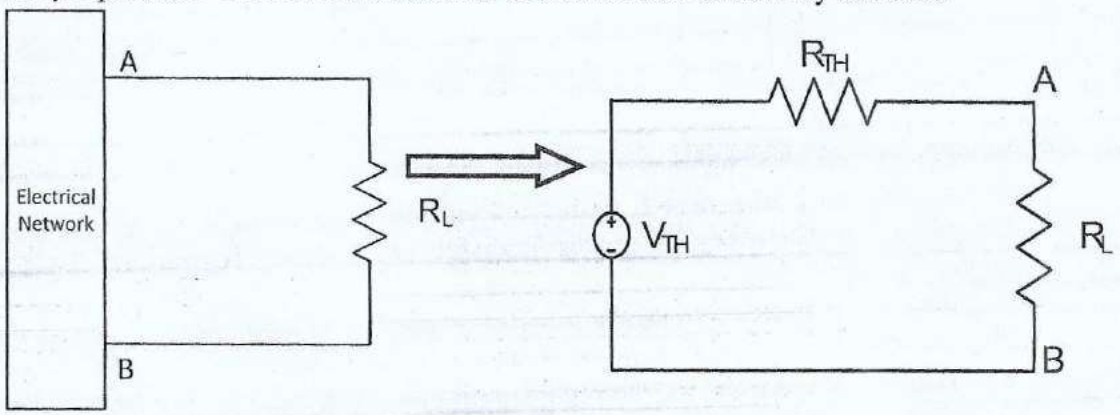
ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE: PHY 4242 (PHYSICS – II LAB)

EXPERIMENT NO. 4
NAME OF THE EXPERIMENT: VERIFICATION OF MAXIMUM POWER TRANSFER THEOREM

OBJECTIVE: The objective of this experiment is to verify maximum power transfer theorem.

THEORY: "A resistive load receives maximum power when its total resistive value exactly equals the **Thevenin's** resistance of the network as seen by the load."

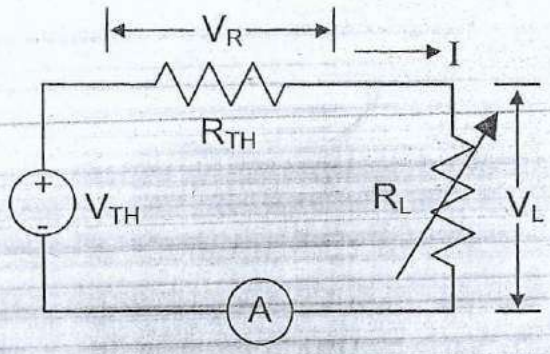


So, maximum power is transferred when $R_L = R_{TH}$

APPARATUS:

- One 10K Potentiometer
- Two resistors (1.5K, 3.3K)
- One ammeter, one multimeter
- Project board
- Connecting wires

CIRCUIT DIAGRAM:



LABORATORY TASKS:

1. Construct the above circuit and set DC source voltage V_{TH} = **15 V** and R_{TH} = **3.3K**.
2. Vary R_L from minimum to maximum value and record V_R, V_L, I.
3. Complete the columns 2, 3, 4, 5, 6 and 8 during Lab and show it to your instructor.

DATA:

1	2	3	4	5	6	7	8	9	10
No. Of Obs.	R_L (Variable Resistor)	V_{TH}	V_R	V_L	I	$P_{IN}=V_{TH}.I$	$P_{OUT}=V_L.I$	$R_L=V_L/I$ (Calculated)	$R_{TH}=V_R/I$
1									
2									
3									
5									

REPORT:

1. Define **efficiency of power transfer** and **voltage regulation**.
2. Calculate the **efficiency of power transfer** and **voltage regulation** for maximum power transfer condition.
3. Calculate the efficiency of power transfer, voltage regulation and power loss for every observation.
4. Plot P_{OUT} vs. R_L, %η vs. R_L, %voltage regulation vs. R_L and
5. Where maximum power transfer is used?
6. Would you suggest using maximum power transfer technique in all cases?

FORMULAE:

$$\text{Efficiency} = \frac{P_{OUT}}{P_{IN}} \times 100$$

$$\text{Voltage regulation} = \frac{V_{TH} - V_L}{V_L} \times 100$$

$$\text{Power Loss} = P_{IN} - P_{OUT} = IV_R$$