Course Name:	**Elements of Electrical and Electronics Engineering**	**Semester:**	**I**
Date of Performance:	**20/09/2024**	**Batch No:**	**C5-3**
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Faculty Sign & Date:		**Grade/Marks:**	**/ 20**

Experiment No: 4

Title: Maximum Power Transfer Theorem

Aim and Objective of the Experiment:

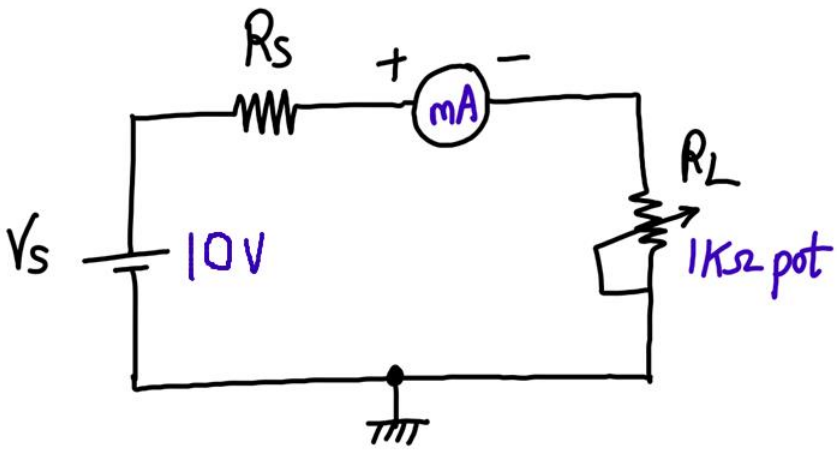
- To observe maximum power transfer across load resistor in a D.C circuit.

COs to be achieved:

CO1: Analyze resistive networks excited by DC sources using various network theorems.

Circuit Diagram:

V_S = 10 V and R_S = <u>470</u> Ω



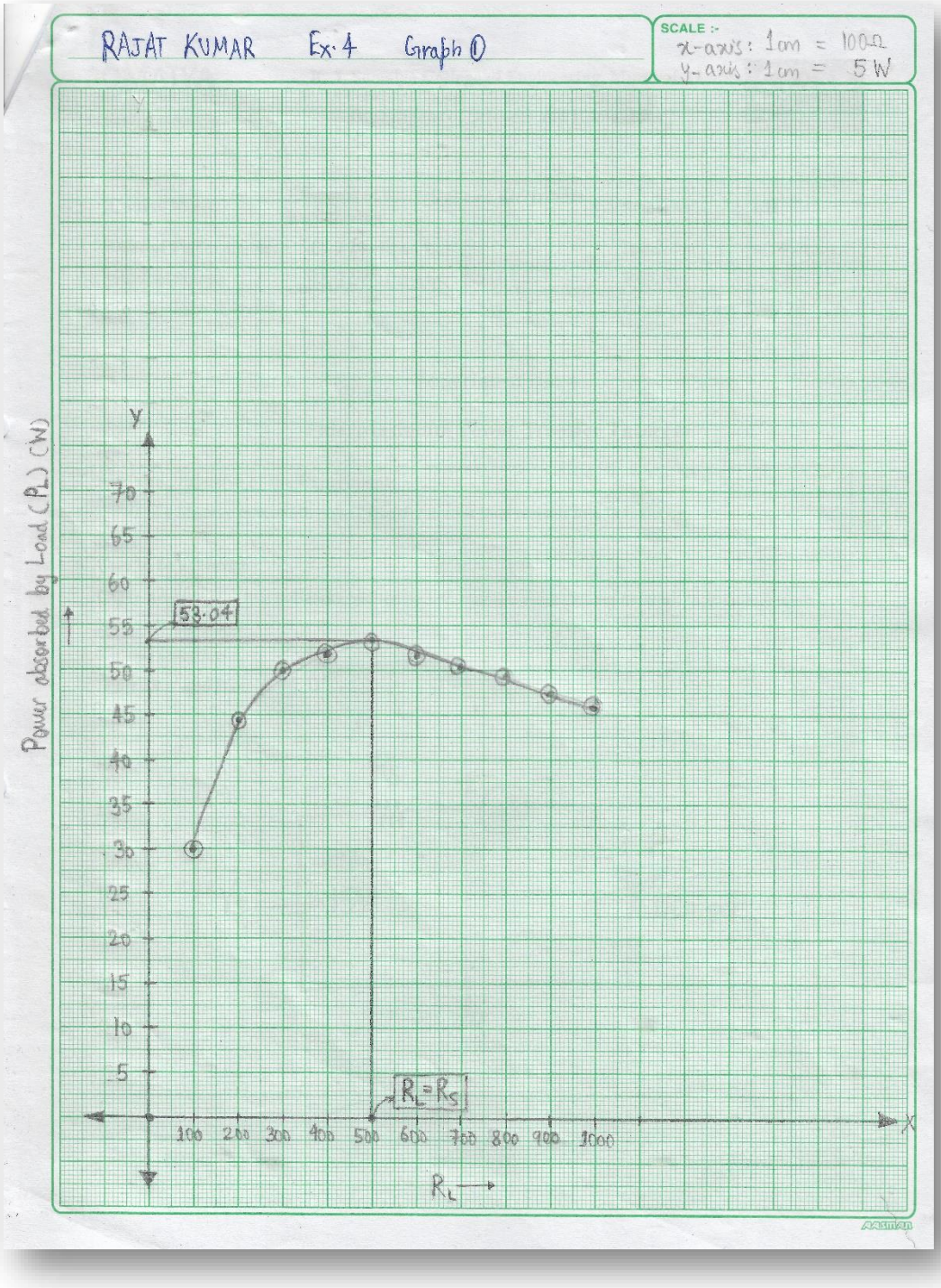
Stepwise-Procedure:

1. Set D.C. supply voltage V_S = 10V
2. Vary R_L in the range 100 Ω - 1 KΩ in steps of 100 Ω
3. Note down I_L *and* V_L for each value of R_L. Where I_L *and* V_L are current through R_L and voltage across R_L respectively.
4. Prepare observation table showing readings of R_L *Vs power* $P = I_L \ . V_L$
5. Plot graph of P *Vs* R_L
6. Locate the point of maximum value of power P and note down corresponding value of R_L. Verify the results theoretically.

Observation Table:

Sr. No.	R_L Ω	Circuit Current (I_L) in mA		Voltage (V_L) in Volts	Power absorbed by load (P_L) in W $P_L = I_L^2.R_L$	
		Theoretical	Practical		Theoretical	Practical
1.	100	17.50 mA	17.00 mA	1.75 V	30.60 W	29.00 W
2.	200	15.00 mA	14.90 mA	3.00 V	44.40 W	45.00 W
3.	300	13.00 mA	12.90 mA	3.87 V	50.00 W	50.70 W
4.	400	11.50 mA	11.70 mA	4.60 V	52.80 W	54.70 W
5.	500	10.30 mA	10.50 mA	5.15 V	53.04 W	55.10 W
6.	600	9.34 mA	9.50 mA	5.60 V	52.30 W	54.10 W
7.	700	8.54 mA	8.80 mA	6.00 V	51.00 W	54.02 W
8.	800	7.87 mA	8.00 mA	6.30 V	49.10 W	51.20 W
9.	900	7.30 mA	7.50 mA	6.56 V	47.80 W	50.60 W
10.	1 K	6.80 mA	7.00 mA	6.80 V	46.20 W	49.00 W

Graph: Draw a graph showing effect of variation in R_L on P_L using observation table. Take R_L on X – axis and P_L on Y- axis. (Use a graph paper)



Conclusion-

In this experiment, we confirmed that maximum power, up to 50%, is transferred when the load resistance matches the source's internal resistance. This result aligns with the Maximum Power Transfer Theorem, emphasizing the importance of impedance matching for optimal power delivery in D.C. circuits.

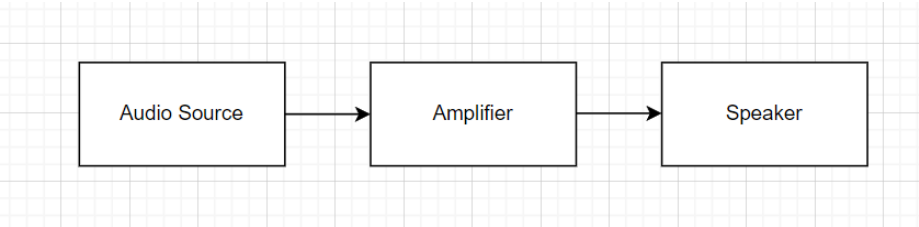
Post-Lab Questions:

1. **Explore one practical application where Maximum Power Transfer Theorem is used.**

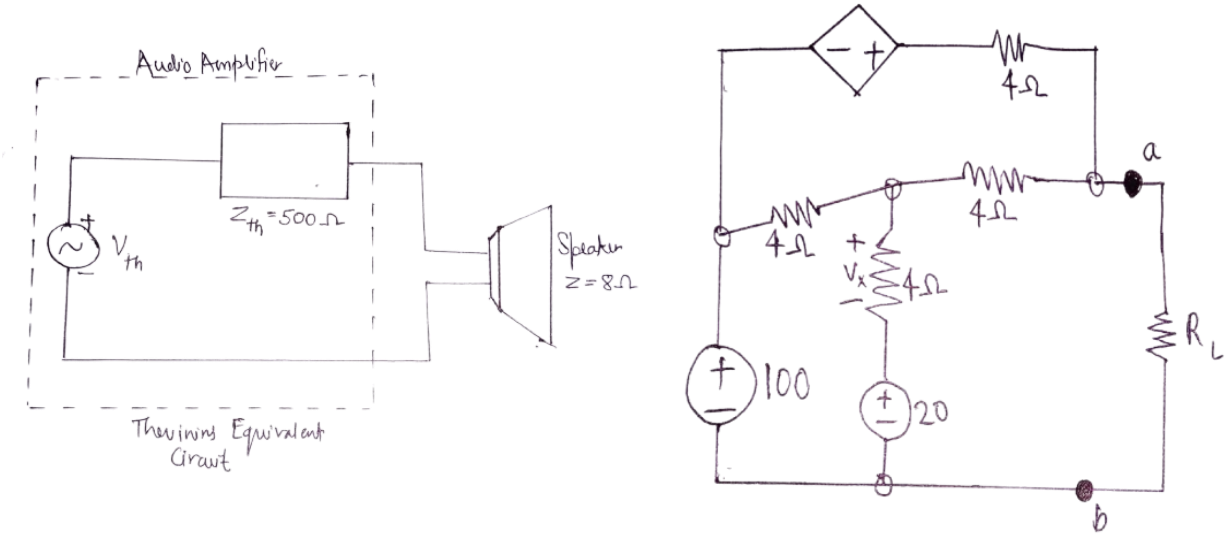
Ans: One of the many practical applications of the **Maximum Power Transfer Theorem** is in **audio amplifiers**. This theorem is used to match the **internal impedance** of the **amplifier** to the **impedance** of the **speaker, ensuring maximum power** is delivered to the **speaker**.

2. **Draw a block diagram or circuit diagram of this application.**

Ans: a) Basic Block Diagram-



b) Schematic Circuit Diagram (Example)-



3. Explain in brief.

Ans: The **Maximum Power Transfer Theorem** states that **maximum power** is delivered to the load when the **load resistance equals** the **internal resistance** (or **impedance**) of the **source**. In audio systems, if the **impedance** of the **amplifier** and **speaker** are **matched**, the sound output is **maximized** without loss of power in the circuit. This ensures **efficient** sound production with **minimal distortion**.

Signature of faculty in-charge with Date: