Course Name:	**Elements of Electrical and Electronics Engineering**	**Semester:**	**I**
Date of Performance:	**/ / 2023**	**Batch No:**	**C5_3**
Faculty Name:		**Roll No:**	**16010123325 (53)**
Faculty Sign & Date:		**Grade/Marks:**	**/ 25**

Experiment No: 5

Title: Maximum Power Transfer Theorem

Aim and Objective of the Experiment:

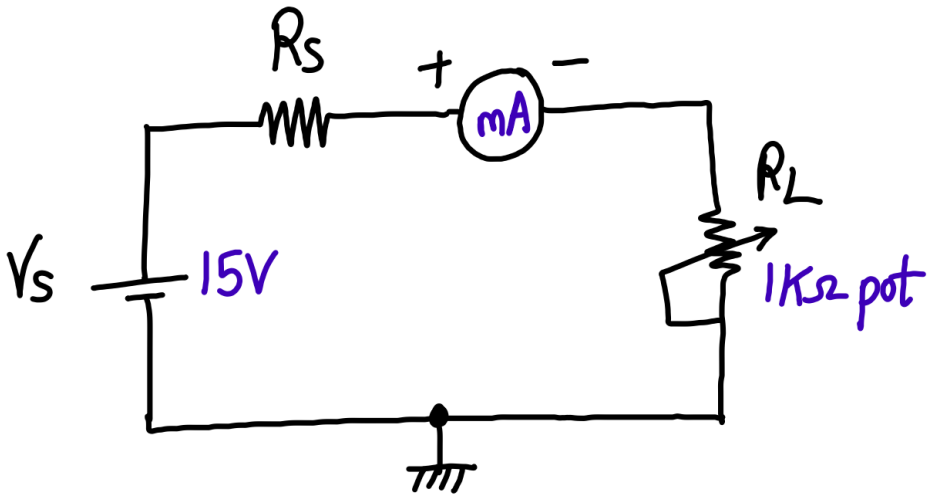
- To observe maximum power transfer across load resistor in a D.C circuit.

COs to be achieved:

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

Circuit Diagram:

V_S = 15 V and R_S = 560 Ω



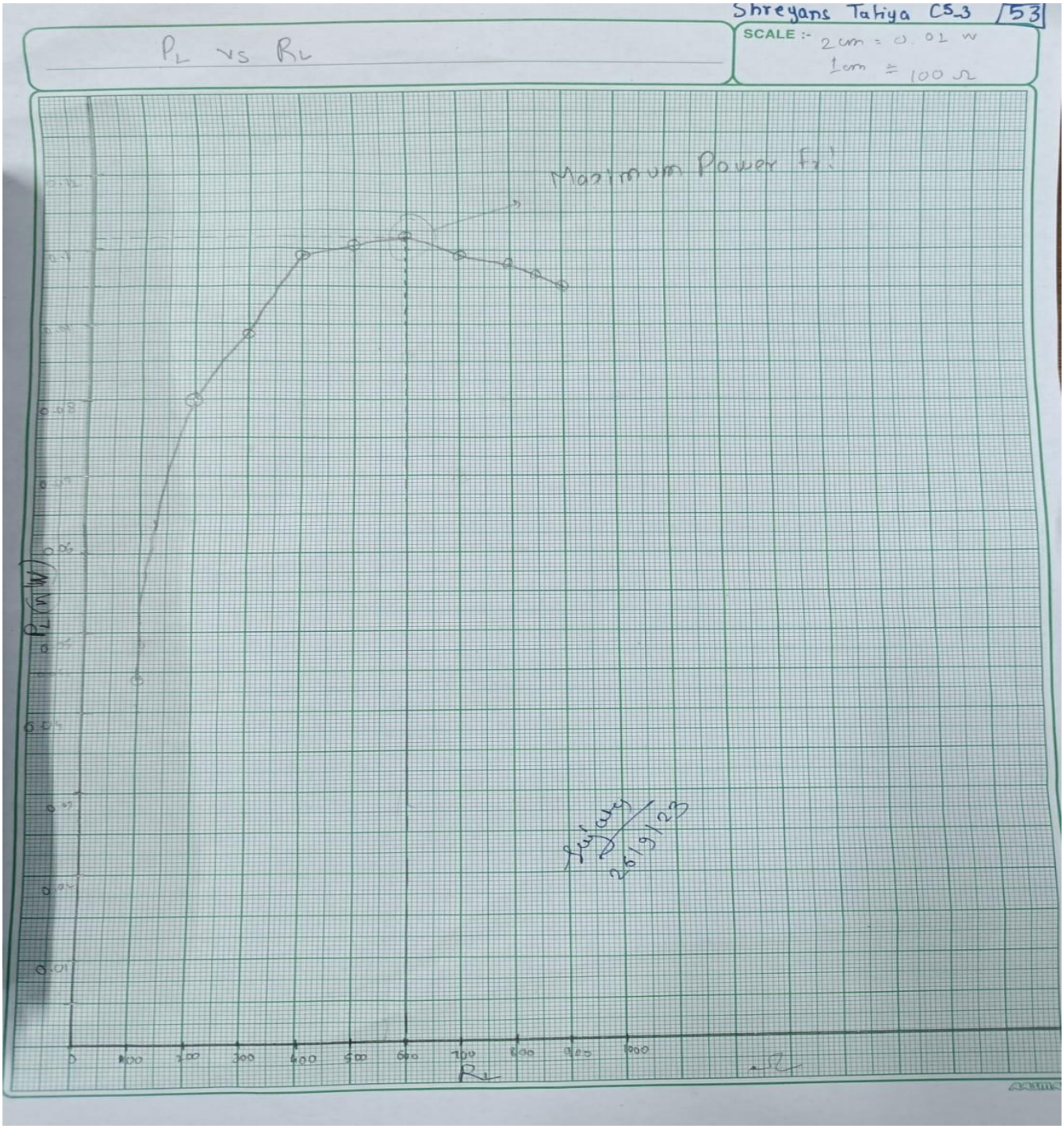
Stepwise-Procedure:

1. Set D.C. supply voltage V_S = 15 V
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	0.0227	0.022	2.10	0.0515	0.0441
2.	200	0.0197	0.018	4.00	0.07761	0.080
3.	300	0.0174	0.016	5.16	0.0908	0.088
4.	400	0.0156	0.014	6.32	0.0973	0.099
5.	500	0.01415	0.014	7.09	0.1001	0.1005
6.	560	0.0133	0.012	7.52	0.1004	0.1009
7.	600	0.01293	0.012	7.78	0.08496	0.1008
8.	700	0.01190	0.010	8.26	0.09912	0.097
9.	800	0.01102	0.010	8.78	0.09715	0.096
10.	900	0.01027	0.010	9.20	0.0953	0.094
11.	1 K	0.00961	0.009	9.65	0.0924	0.093

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-

This theorem states that the maximum power that can be transferred from source to load is 50%, which occurs when source impedance is exactly matched to load impedance.

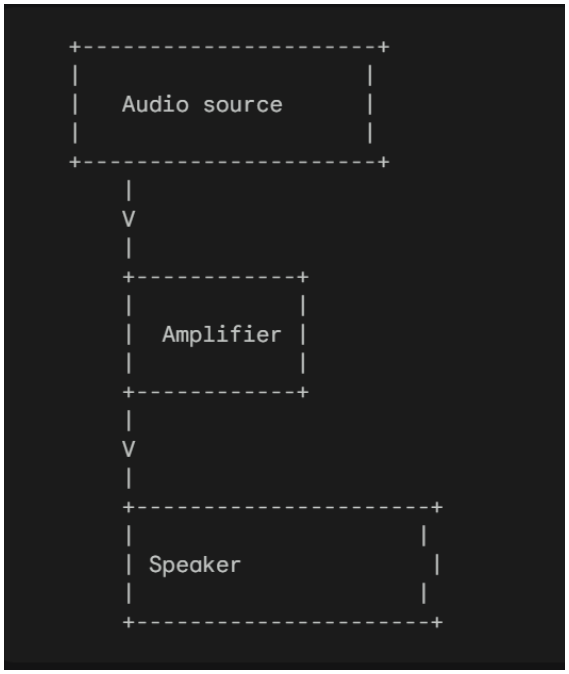
Post-Lab Questions:

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

   Ans:
   The Maximum Power Transfer Theorem finds practical application in audio systems, where it helps optimize the matching of amplifier output impedance with speaker input impedance, ensuring efficient power transfer and high-quality sound reproduction.

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

   Ans:



3. **Explain in brief.**

   Ans: The Maximum Power Transfer Theorem is commonly applied in the design and analysis of electrical circuits, especially in the context of audio systems. For instance, in

audio amplifiers, the theorem helps optimize the matching of the output impedance of the amplifier with the input impedance of the speaker. When these impedances are well matched, the power transfer from the amplifier to the speaker is maximized, resulting in efficient energy utilization and improved audio quality. This application ensures that the electrical power generated by the amplifier is efficiently delivered to the speaker, producing clear and high-quality sound for various audio systems, including home theaters, music systems, and public address systems.

OR

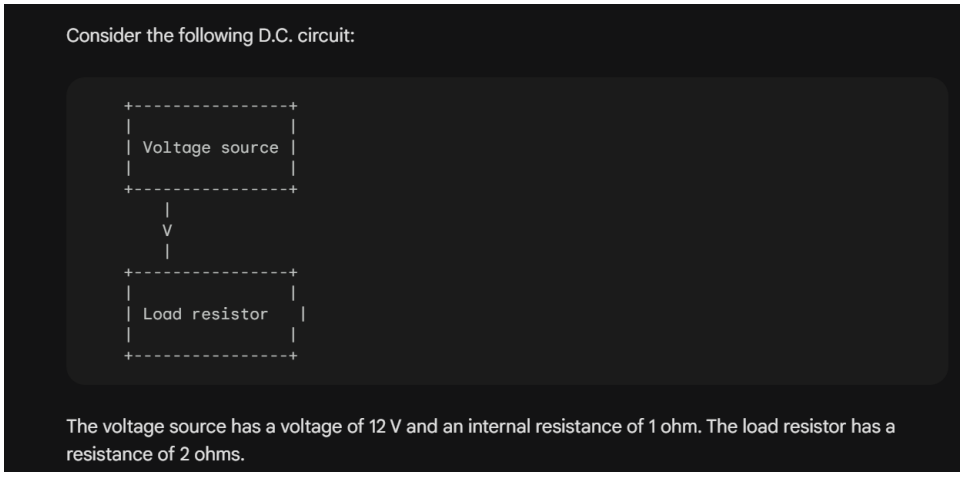
Answer the following:

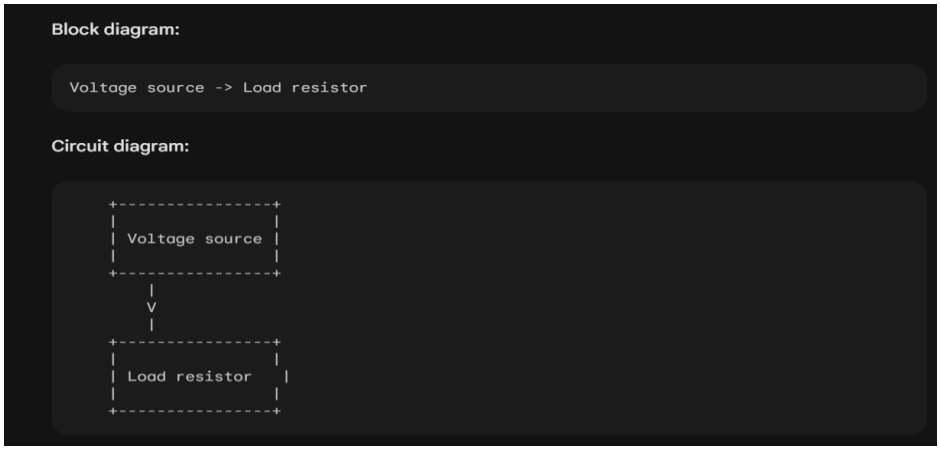
4. **Do you apply Thevenin's Theorem to calculate Maximum Power across load resistor in a D.C. circuit?**

   Ans: Yes, Thevenin's Theorem can be used to calculate the maximum power across a load resistor in a D.C. circuit.

5. **Take a sample problem. Draw a block diagram or circuit diagram of this sample problem.**

   Ans:





6. **Explain the solution in brief.**

Ans:

The maximum power transfer is achieved when the load resistance is equal to the Thevenin resistance. In this case, the load resistance is already equal to the Thevenin resistance. Therefore, the maximum power that can be dissipated across the load resistor in this circuit is 96 W.

Signature of faculty in-charge with Date: