



**North South University**  
Department of Electrical & Computer Engineering

## **LAB REPORT**

**Spring 2021**

Course Code : EEE 111

Course Title: Analog Electronics - I

Section: 7

Experiment Number: 04

Experiment Name:

### **Zener Diode applications**

Experiment Date: 06 / 04 / 2021

Date of Submission: 19 / 04 / 2021

Course Instructor: Syeda Sarita Hassan

Submitted To: Fatema Zahra

Name of experiment:

Zener Diode Applications

Objective:

Study of the zener diode applications.

Equipments and Components:

- 1) Zener diode - 5 Volts - 1 piece
- 2) Resistor -  $220\Omega$ ,  $470\Omega$ ,  $1k\Omega$  - 1 piece each
- 3) POT -  $10k\Omega$  - 1 unit.
- 4) Trainer Board - 1 unit
- 5) DC power supply - 1 unit
- 6) Digital Multimeter - 1 unit
- 7) Cables and wire - as required.

Theory:

A zener diode is a silicon diode which does not get damaged during breakdown voltage. For this reason zener diodes are used in voltage regulator circuits. Zener diodes work both in forward and

reverse biasing.

There are two types of voltage regulators.

- i) Load regulation  $\rightarrow$  line voltage change.
- ii) Line regulation  $\rightarrow$  line voltage fixed.

Circuit diagrams:

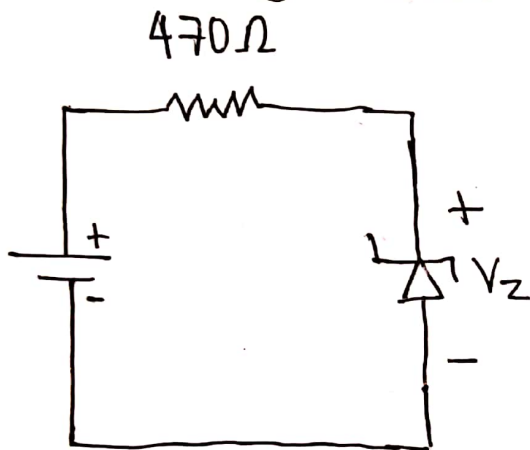


Fig-01

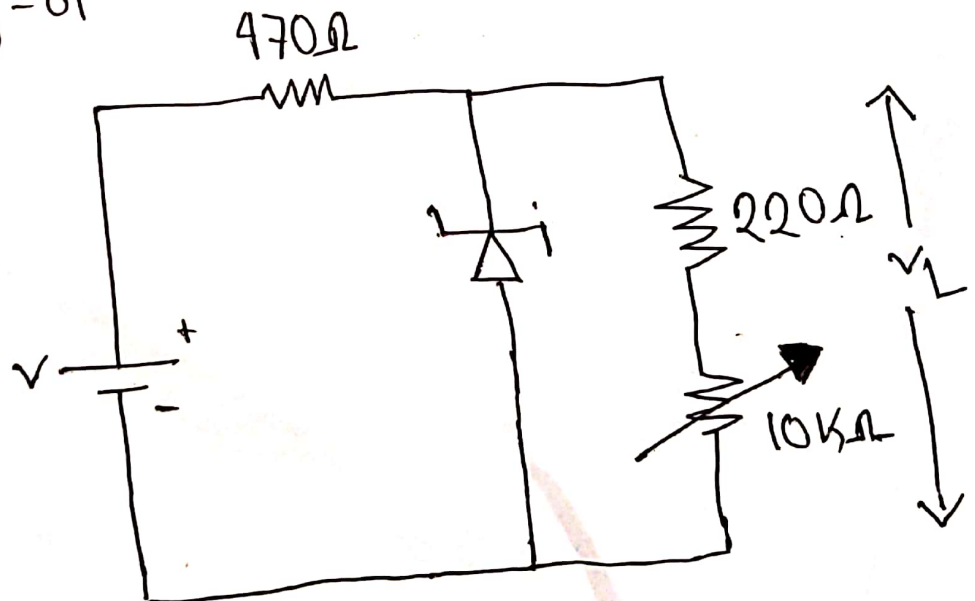


Fig-02

Table:

Data For I-V characteristics.

$V(\text{Volts})$	$V_R(\text{Volts})$	$V_Z(\text{Volts})$	$I_Z = V_R/R$ (mA)
0	$-4.42 \times 10^{-13} \text{V}$	$-4.42 \times 10^{-13} \text{V}$	$-4.38 \times 10^{-11} \text{mA}$
1	$1.43 \times 10^{-3} \text{V}$	1V	$3.05 \times 10^{-9} \text{mA}$
4	$5.74 \times 10^{-3} \text{V}$	4V	$1.34 \times 10^{-6} \text{mA}$
5	0.019V	4.98V	0.041 mA
6	0.918V	5.08V	1.95 mA
6.5	1.40V	5.09V	2.99 mA
7	1.89V	5.10V	4.04 mA
7.5	2.39V	5.106V	5.09 mA
8	2.88V	5.11V	6.14 mA
8.5	<del>3.38V</del> 3.38V	5.116V	7.19 mA
9	3.88V	5.119V	8.25 mA
9.5	4.37V	5.12V	9.31 mA
10	4.87V	5.126V	10.36 mA
11	5.86V	5.13V	12.48 mA
12	6.86V	5.136V	14.60 mA
14	8.85V	5.14V	18.84 mA

Data for regulation due to load variation.  
Base on 1V, 5V, 10V, 15V and 20V.

$V_{220}(mV)$	$V_L (Volts)$	$I_L (Amp)$
130 mV	0.72V	0.00659A
650 mV	3.60V	0.0029A
921 mV	5.11V	0.00419A
926 mV	5.14V	0.0042A
930 mV	5.15V	0.0043A

table:5.2

Data for regulating due to supply  
voltage variation.

$V (Volts)$	$V_L (Volts)$
5	4.78V
6	5.07V
7	5.09V
8	5.10V
9	5.12V
10	5.13V
11	5.133V
12	5.14V

table5.3



Question and Answers:

① Ans:

The zener breakdown voltage from the plot is 5.14 V (negative axis).

② Ans:

For table 5.2 (Load variation) the voltage regulation is

$$\begin{aligned} &= \frac{(5.15 - 5.14) \text{ V}}{(0.0043 - 0.0042) \text{ Amp}} \\ &= 100 \end{aligned}$$

③ Ans:

For table 5.3 (supply voltage variation) the voltage regulation is

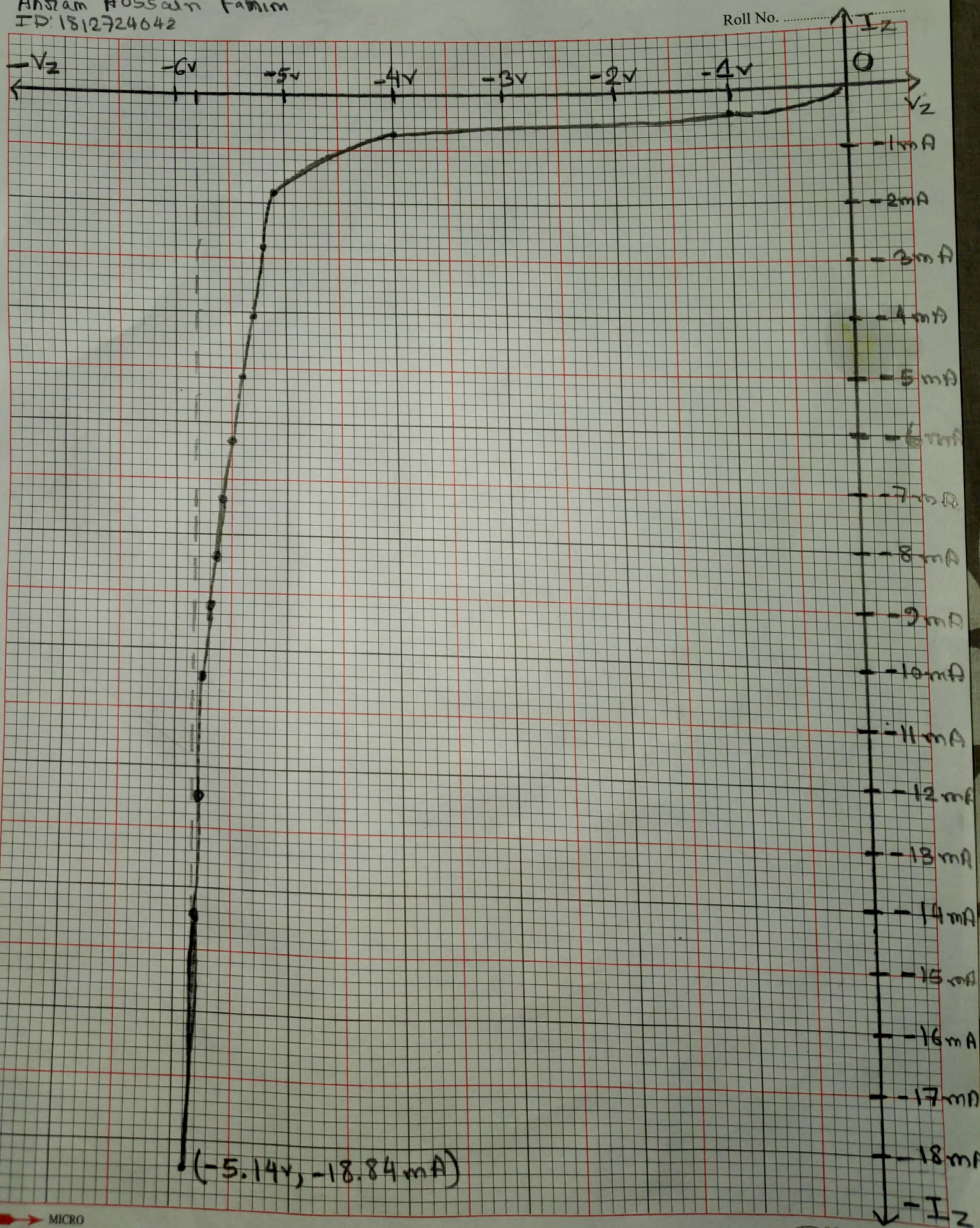
$$\begin{aligned} &= \frac{(5.14 - 5.133) \text{ V}}{(12 - 11) \text{ V}} \\ &= 7 \times 10^{-3} \end{aligned}$$

Discussion:

In this Lab we have learned about how a zener diode functions. And calculating the breakdown voltage of zener diode. We learned how load and line regulations work and how they operate with zener diode. The circuit was easy to implement in multisim. Didn't face any difficulties.

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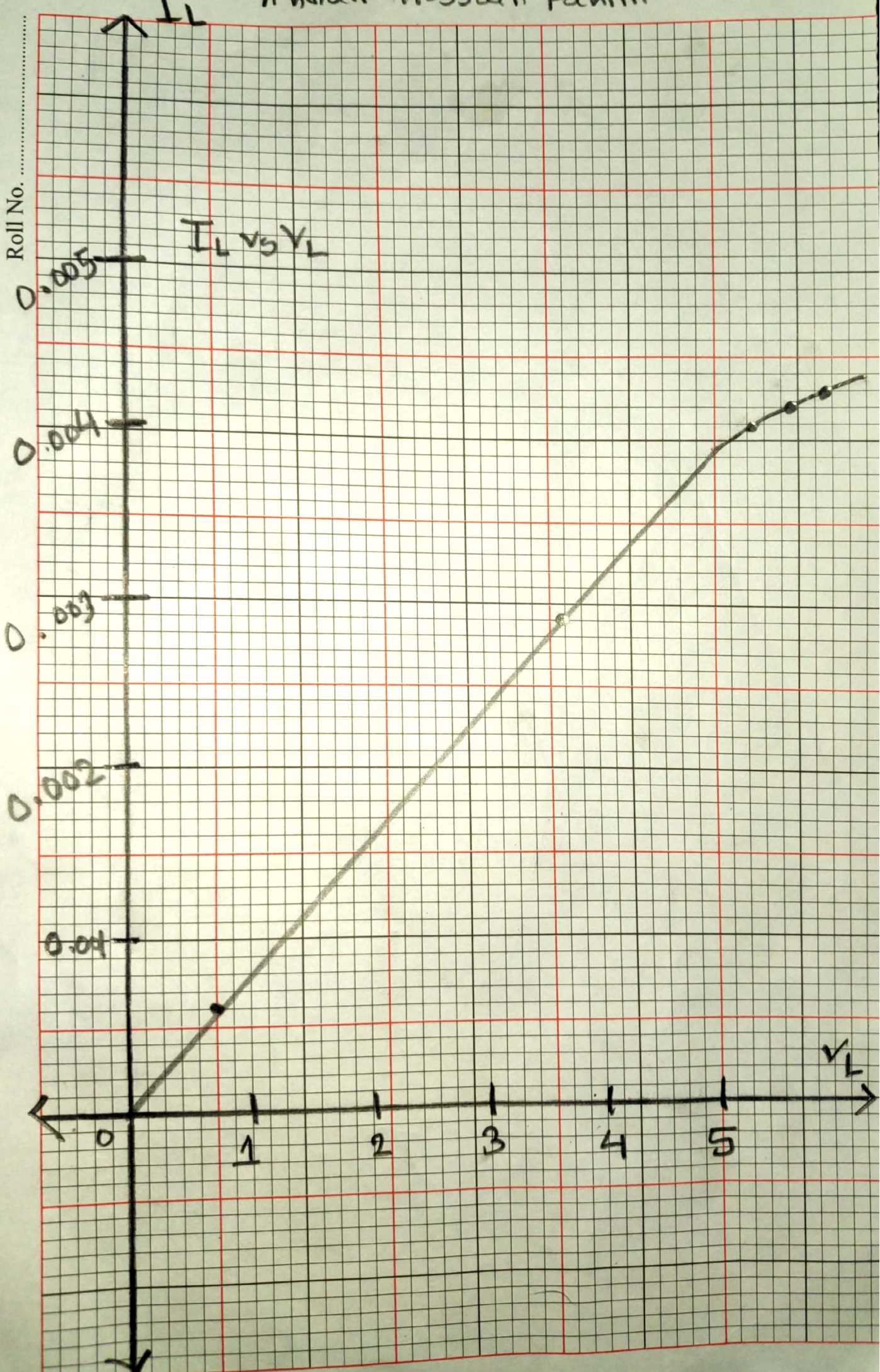
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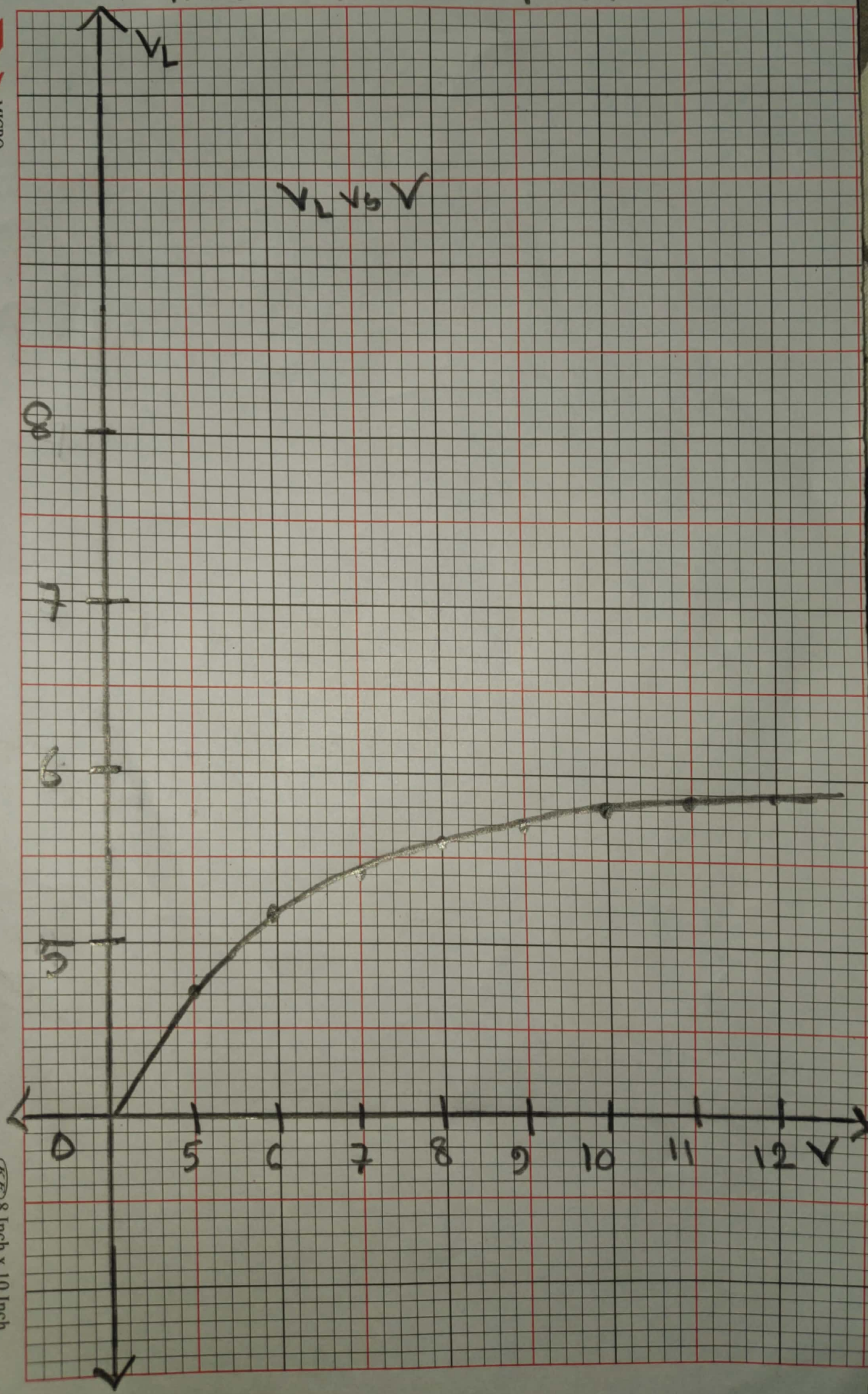


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$I_L$  vs  $V_L$

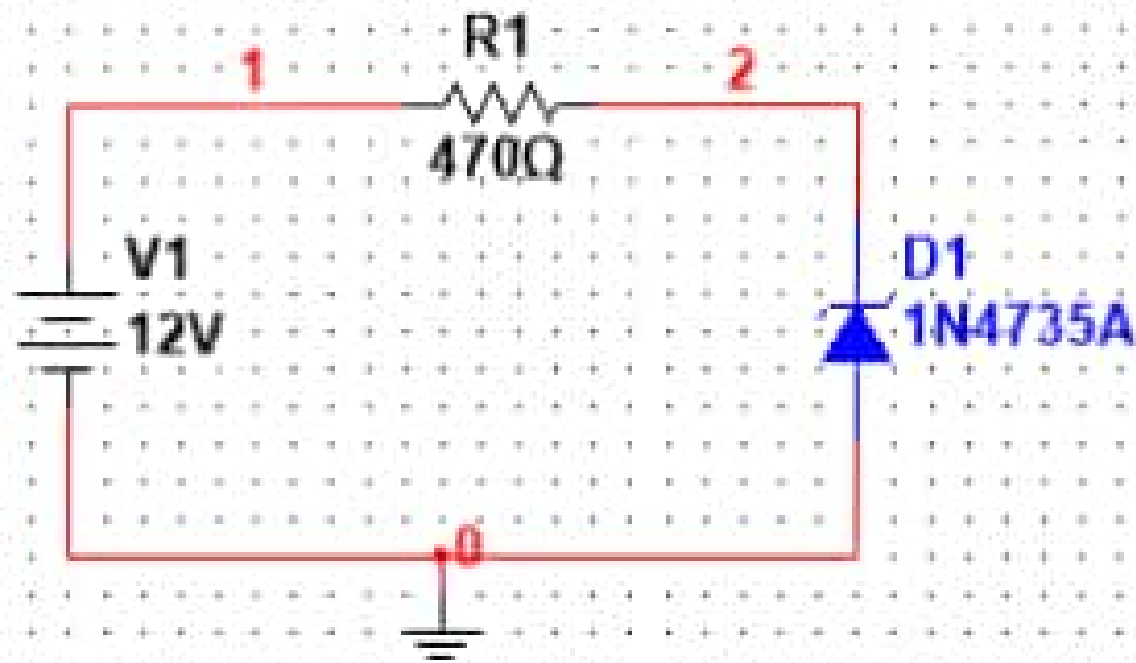






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