

ABHISHEK SHARMA.

Department of Computer Science and Engineering.

THIRD YEAR.

SECTION - 'I'

ROLL NO. : 01

ENROLLMENT NO. : 12019009001127.

ANALOG ELECTRONICS CIRCUIT LAB.

ASSIGNMENT - 2.

(Experiment No. : 02)

Date : 06.08.2021.

University of Engineering & Management, Kolkata.

Experiment No. : 2.

Title : Study of Zener Diode as a voltage Regulator

Aim :- To setup and study a zener diode shunt regulator and to plot its line and load regulation characteristics. Also, we are going to implement PN Junction diode and compare the line and load regulation with the corresponding zener diode.

Apparatus Required :- (i) PN Junction Diode

(ii) Zener Diode

(iii) DC power source.

(iv) Resistors (series and load)

(v) voltmeters.

(vi) connecting wires.

Procedure :- To make this experiment happen the following steps will be followed.

(a) Place the apparatus in the proper places as per the circuit diagram and connect the apparatus using the connecting wires.

(b) After placing the apparatus the voltmeters and ammeter (if required) are placed in the proper positions for taking the readings from the circuit.

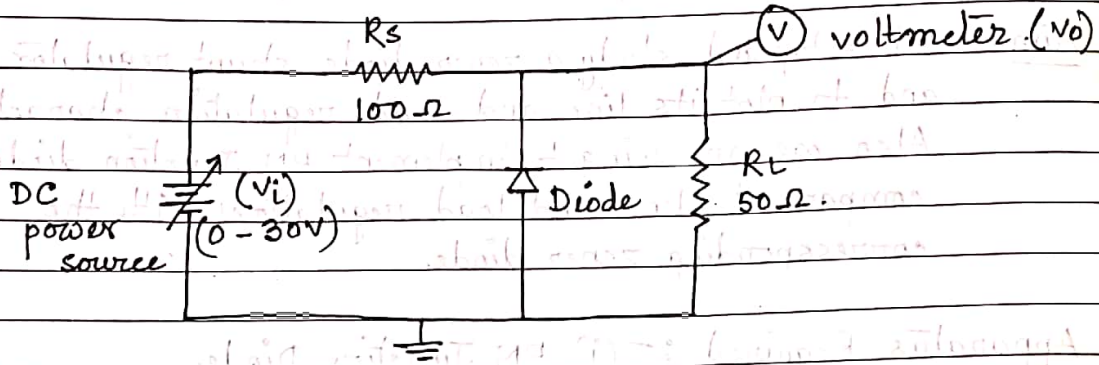
(c) Save the circuit, and then run the simulation for the readings.

(d) Make the tables with required parameters and plot the graphs for PN Junction diode and Zener diode in both cases for line and load regulation.

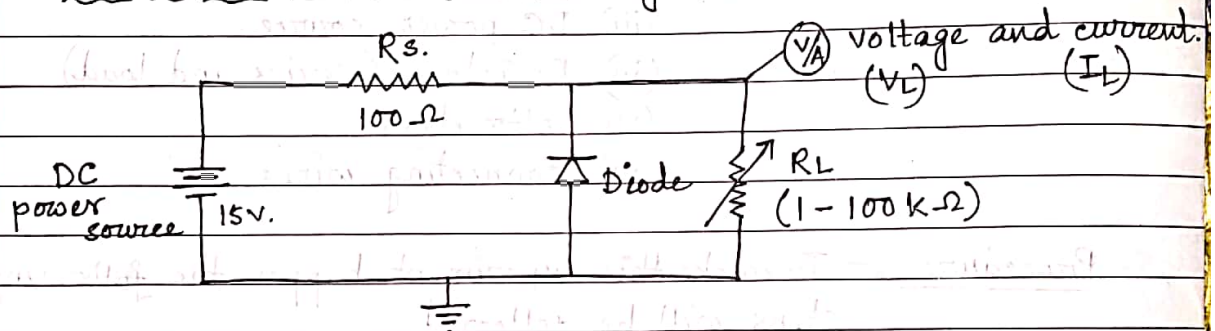
(e) Analyze the graph and from that conclusion and observation will be provided.

Circuit Diagram :-

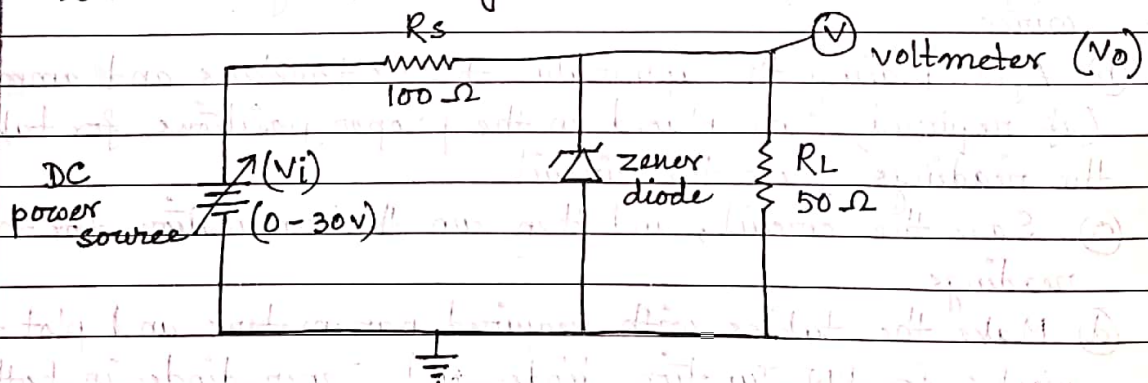
① PN Junction Diode for Line regulation :-



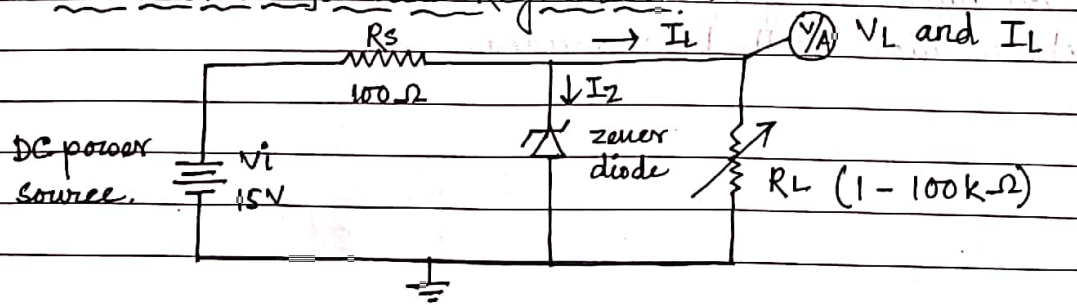
② PN Junction Diode for load regulation :-



③ Zener Diode for line regulation :-

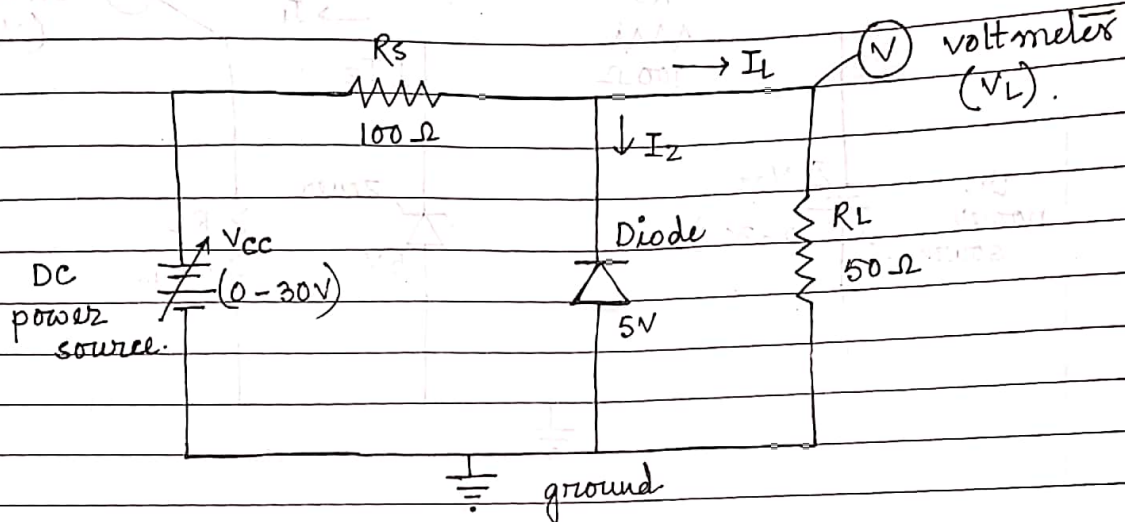


④ Zener Diode for Load Regulation :-



Circuit Simulation using Multisim Live :-

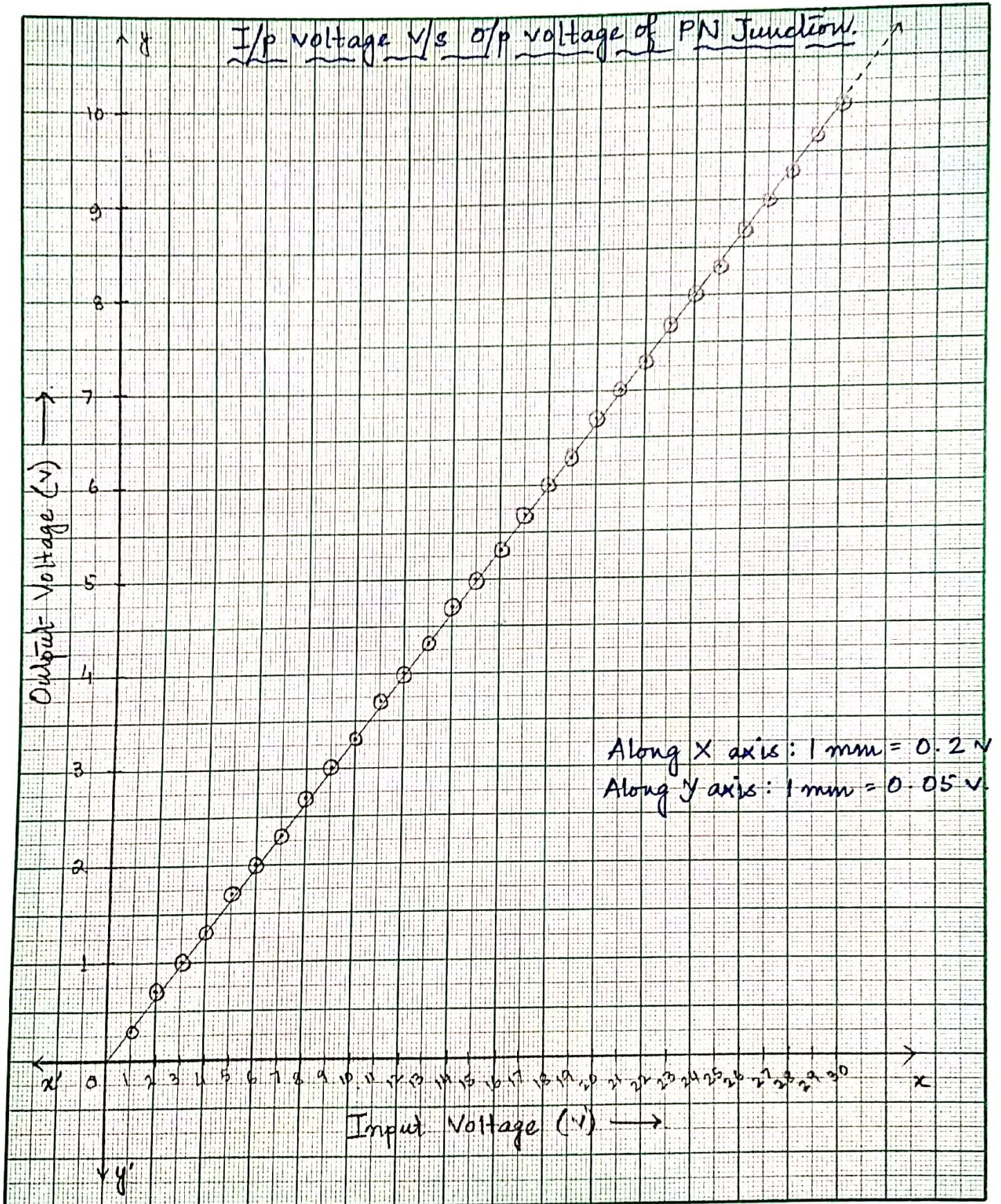
① PN Junction Diode for Line Regulation :-



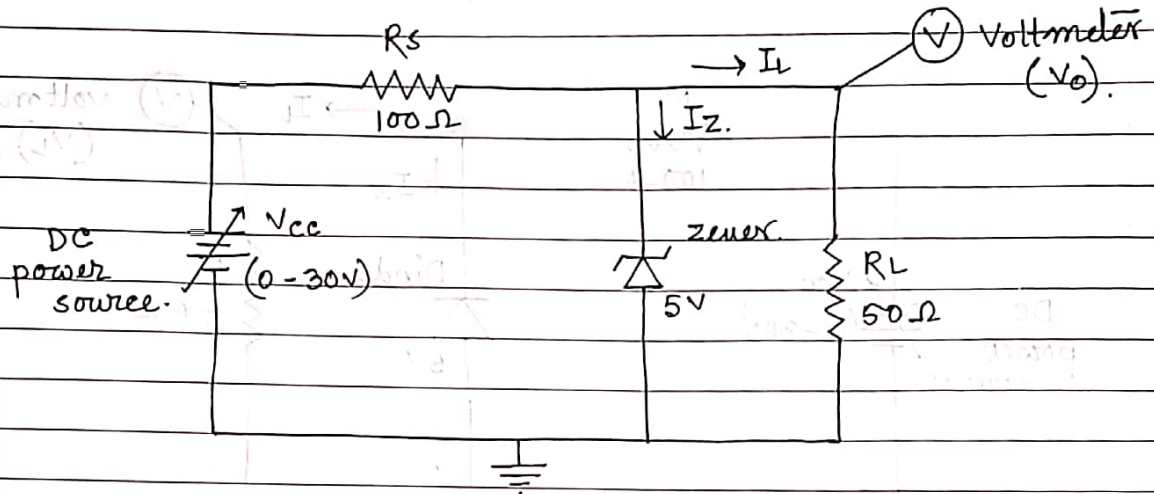
Observation table :-

① Table for Line Regulation of PN Junction diode. :-

Input voltage (V_i)	Output Volt (V_o)	Input Volt (V_i)	Output Volt (V_o)
0V	0V	16V	5.33V
1V	0.33V	17V	5.67V
2V	0.67V	18V	6.00V
3V	1.00V	19V	6.33V
4V	1.33V	20V	6.67V
5V	1.67V	21V	7.00V
6V	2.00V	22V	7.33V
7V	2.33V	23V	7.67V
8V	2.67V	24V	8.00V
9V	3.00V	25V	8.33V
10V	3.33V	26V	8.67V
11V	3.67V	27V	9.00V
12V	4.00V	28V	9.33V
13V	4.33V	29V	9.67V
14V	4.67V	30V	10.00V
15V	5.00V		



② Zener Diode of Line regulation :-



Observation table :-

② Table for the output voltage and input voltage for zener :-

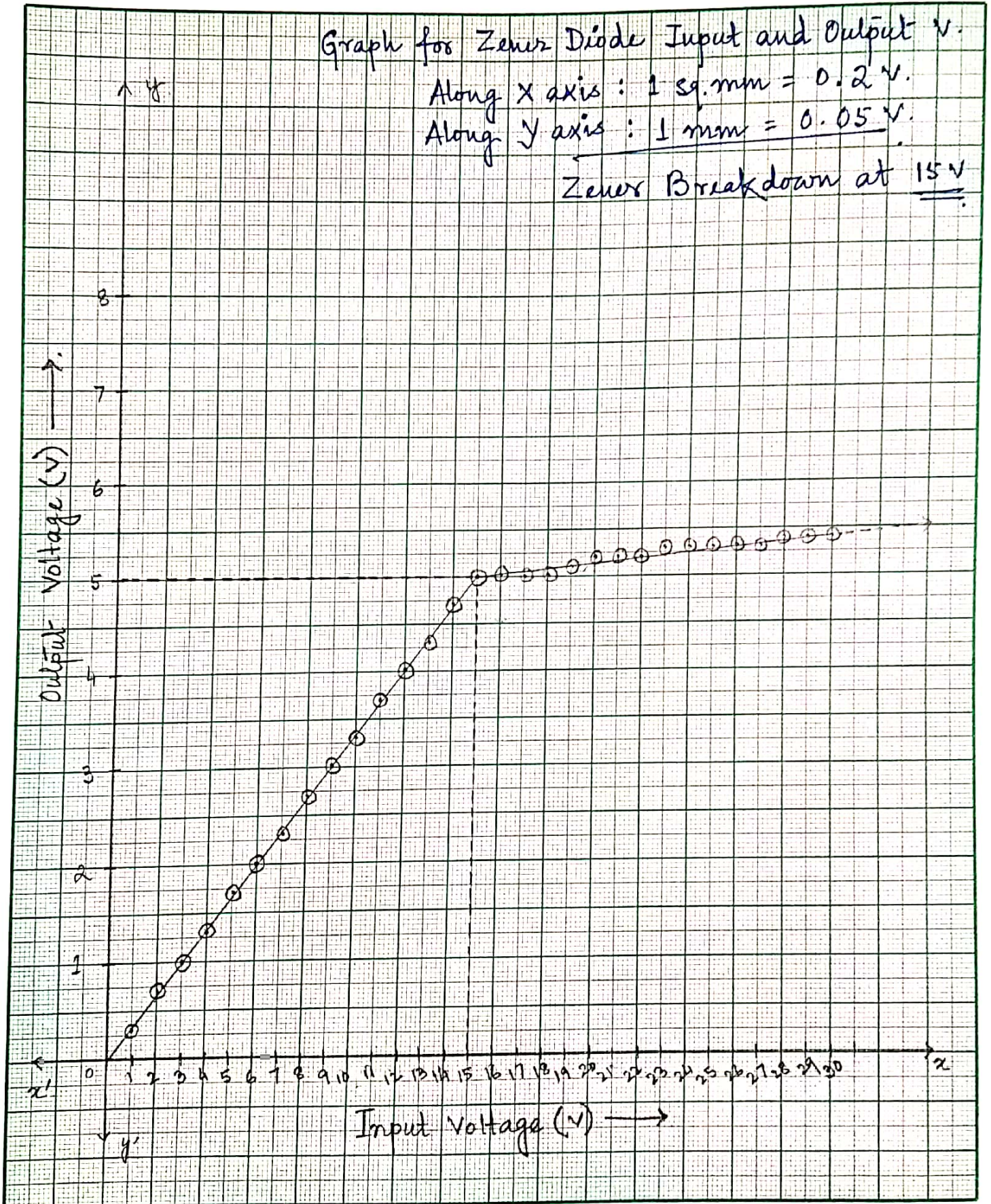
$V_{in} (V)$	$V_{out} (V)$	$V_{in} (V)$	$V_{out} (V)$
0V	0V	16V	4.99V
1V	0.33V	17V	5.00V
2V	0.67V	18V	5.00V
3V	1.00V	19V	5.01V
4V	1.33V	20V	5.02V
5V	1.67V	21V	5.02V
6V	2.00V	22V	5.02V
7V	2.33V	23V	5.03V
8V	2.67V	24V	5.03V
9V	3.00V	25V	5.03V
10V	3.33V	26V	5.03V
11V	3.67V	27V	5.04V
12V	4.00V	28V	5.04V
13V	4.33V	29V	5.04V
14V	4.67V	30V	5.04V
15V	4.95V		

Graph for Zener Diode Input and Output V.

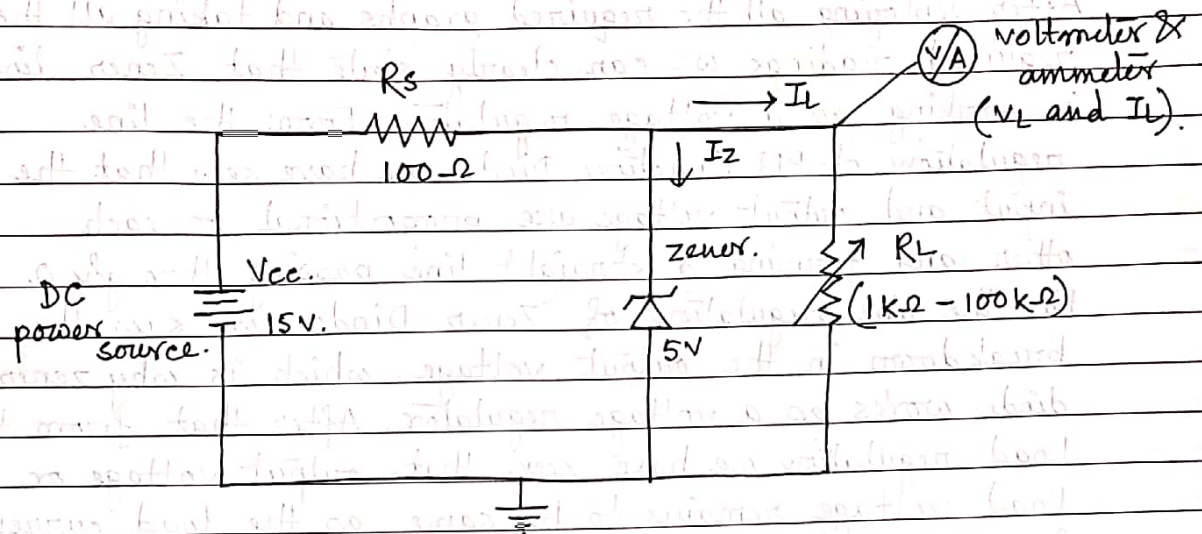
Along X axis : 1 sq. mm = 0.2 V.

Along Y axis : 1 mm = 0.05 V.

Zener Breakdown at 15 V.



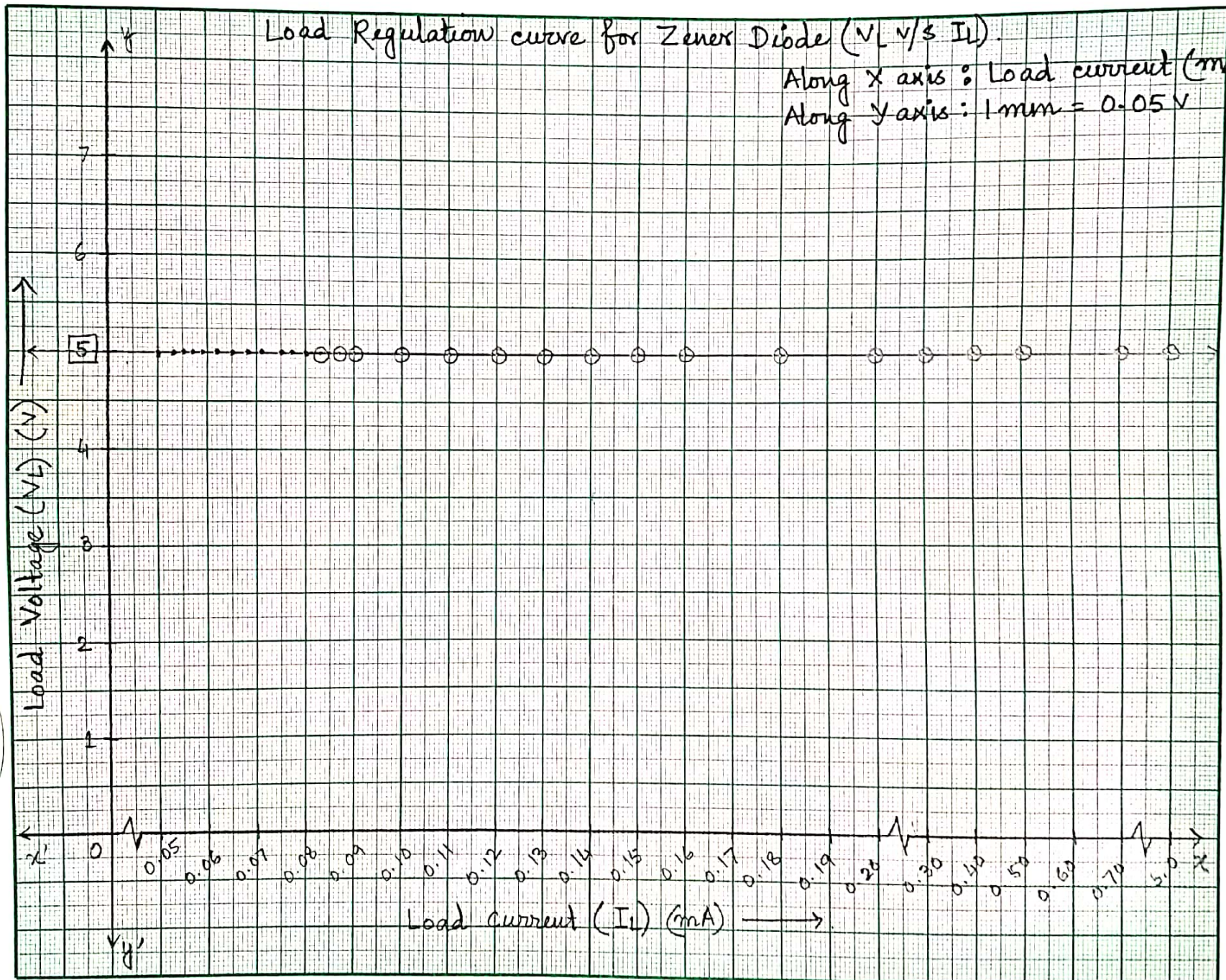
③ Zener Diode for Load Regulation :-



Observation Table :-

③ Table for V_L , I_L and R_L for the zener diode (load regulation) :-

R_L (k-Ω)	V_L (V)	I_L (mA)	R_L (k-Ω)	V_L (V)	I_L (mA)
1	5	5.0	50	5	0.10
4	5	1.3	54	5	0.09
7	5	0.7	57	5	0.088
10	5	0.5	60	5	0.083
14	5	0.4	64	5	0.078
17	5	0.3	67	5	0.075
20	5	0.3	70	5	0.071
24	5	0.2	74	5	0.068
27	5	0.18	77	5	0.065
30	5	0.16	80	5	0.062
34	5	0.14	84	5	0.059
37	5	0.13	87	5	0.057
40	5	0.12	90	5	0.055
44	5	0.11	94	5	0.053
47	5	0.10	97	5	0.051
			100.	5	0.050.



Conclusion :-

After deploying all the required graphs and taking all the required readings we can clearly state that, Zener diode is working as a voltage regulator. From the line regulation of PN Junction Diode we have seen that the input and output voltage are proportional to each other and forming a straight line passing through 0. For the line regulation of Zener Diode, we saw the breakdown in the output voltage, which is why zener diode works as a voltage regulator. After that, from the Load regulation we have seen that, output voltage or Load voltage remains to be same as the load current increases, and making curve parallel to x-axis. Hence, we can conclude that, Zener Diode as Voltage Regulator.

f_L (Hz)	V_L (V)	I_L (mA)	R_L (k Ω)	V_L (V)	I_L (mA)	f_L (Hz)
1	2	20	2	2	20	0.0
4	2	20	2	2	20	0.0
7	2	20	2	2	20	0.0
10	2	20	2	2	20	0.0
14	2	20	2	2	20	0.0
17	2	20	2	2	20	0.0
20	2	20	2	2	20	0.0
24	2	20	2	2	20	0.0
27	2	20	2	2	20	0.0
30	2	20	2	2	20	0.0
34	2	20	2	2	20	0.0
37	2	20	2	2	20	0.0
40	2	20	2	2	20	0.0
44	2	20	2	2	20	0.0
47	2	20	2	2	20	0.0
50	2	20	2	2	20	0.0