AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH

Assignment Cover Sheet

Students must complete all details except the faculty use part.

Please submit all assignments to your subject lecturers or the office of the concerned lecturer.

Assignment Title: Study of Zener Diode

Assignment Number: 04 Due Date: _____ Semester: Fall 22-23

Subject Code: _____ Subject Name: ED Lab Section: C

Course Instructor: Dr. MD. Shidyaman Degree Program: EEE

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Total Marks: _____ **Marks Obtained:** _____

Faculty comments _____

Title: Study of Zener Diode

Abstract: A Zener Diode is a diode that allows current to flow in forward direction in the same way that an ideal diode does, but also allows it to flow in the reverse direction when a voltage exceeds a certain value known as the breakdown voltage Zener knee voltage Zener voltage avalanche point or peak inverse voltage.

Introduction: The main object is to study the voltage-current characteristics of Zener diode and Observe the voltage regulation characteristics of a Zener Diode.

Theory and Methodology: The fundamental purpose of a Zener diode is to maintain a particular voltage across its terminals within specified limitations of line or load variation. It is typically used to provide a steady reference voltage for power supply and other device.

A zener diode is similar to a regular diode with the difference that it is put in the circuit in reversed biased and functions in reverse breakdown. The optimal range of a zener is illustrated by this typical characteristics curve. It is worth nothing that it's forward properties are identical to those of standard diode.

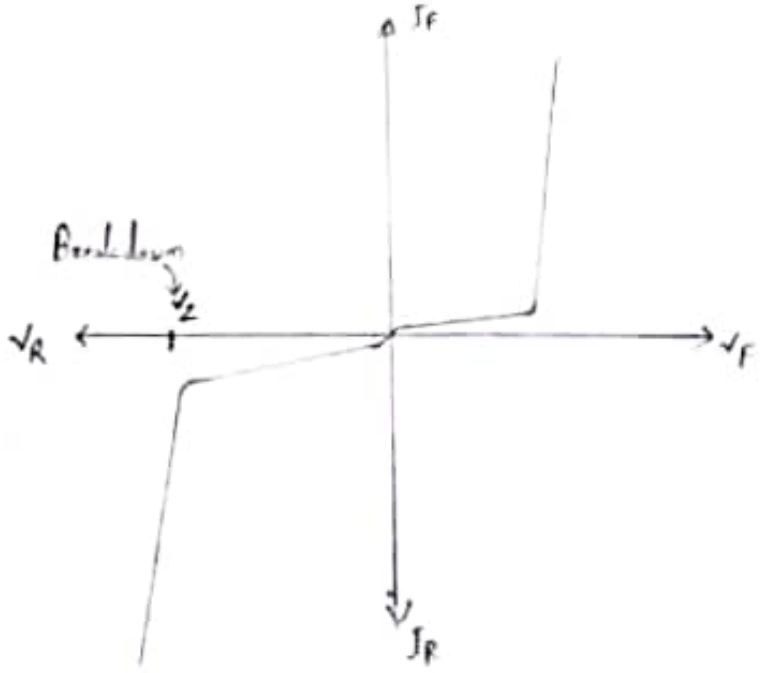


Figure: The normal operating for a zener diode is shaded.

The breakdown properties of the zener diode are determined by the doping procedure. Zener with a

voltage less than 5V operate in the Zener breakdown region. Those intended to function at more than 5V are generally in the avalanche breakdown range. Zener with voltage breakdowns ranging from 1.5V to 200V are available.

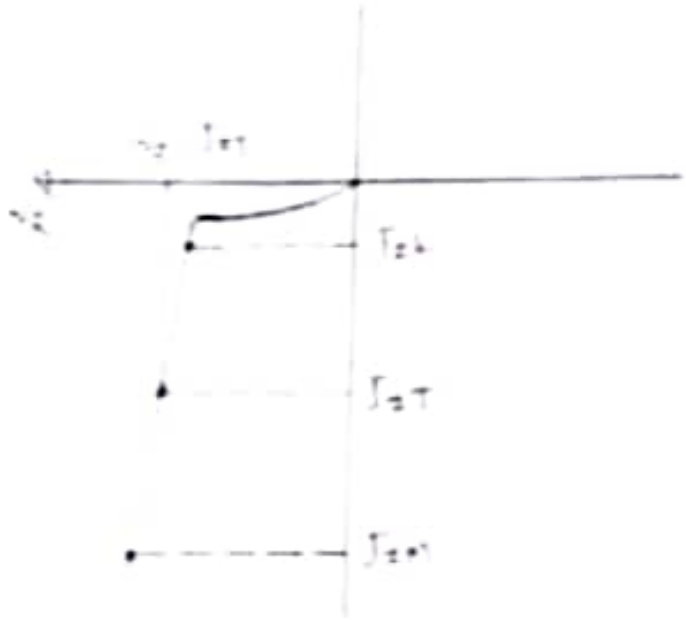


Figure: This curve illustrates the minimum and maximum ranges of current operation that the Zener can effectively maintain its voltage.

A voltage regulator is intended to maintain the output voltage of a circuit constant at a circuit irrespect of the input voltage and the load current.

The simplest version of such a voltage regulation circuit depicted in figure in the circuit Diagram section. is a Zener diode linked in parallel to the load. When the voltage across the load attempts to climb the Zener diode draws more current. This increase in current through the resistor produces a rise in the voltage dropped across the resistor, causing the voltage across the load to stay constant. Similarly if the voltage across the load attempts to decline the zener diode draws less current. Both current through the resistor and the voltage across the resistor decrease. The voltage across the load stays unchanged

Apparatus:

1) Zener Diode
2) Trainer Board
3) Resistors (100Ω, 220Ω, 470Ω)
4) Oscilloscope
5) Multimeter
6) chord
7) POT 100kΩ
8) DC power supply.

Circuit diagram:

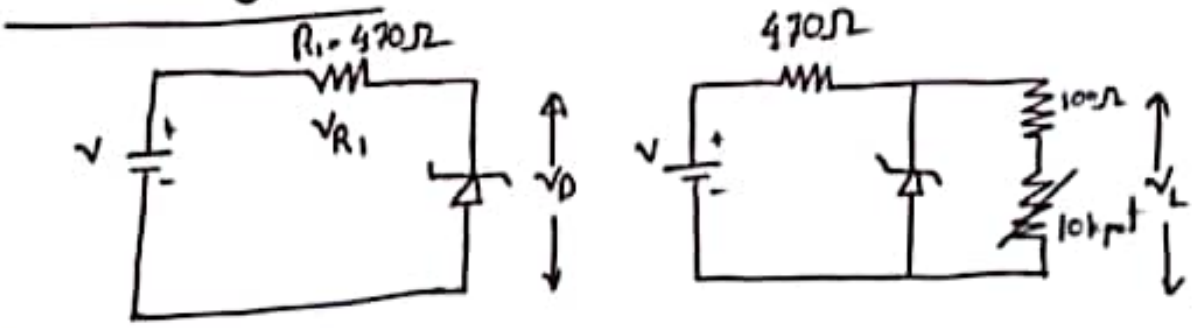


Figure: Zener circuit

Experimental Procedure:

1. All the circuit were connected as shown in the diagram
2. By varrying the supply voltage necessary data was taken to complete table 1.
3. The POT was kept at maximum resistance position and the circuit was powered up
4. The POT resistance was gradually decreased and then table 2 was complete
5. The pot was kept at lowest resistance position when varying the supply voltage and reading for table number 3 was taken.

V	V_{R_1}	V_z	$I = (V_{R_1}/R_1)$
3.5	0	3.61	0
4.5	0	4.53	0
5.5	.01	5.55	0.00002
6.5	.93	5.62	0.0041
7.5	1.95	5.63	0.0062
8.5	2.91	5.64	0.0071
9.5	3.94	5.65	0.0104
10.5	4.9	5.65	0.0121
11.5	5.7	5.66	0.0136
12.5	6.70	5.67	0.0142
13.5	7.83	5.68	0.0169

Table: Data for V-I characteristics.

V_R (mV)	100	300	500	700
V_L	5.65	5.64	5.64	5.65
$I_L = (V/R_1)$	1.522	1.934	1.986	2.125

Table: Data for regulation due to load voltage

V	16	12	9	6
V_R	.10	.10	.10	.10
V_L	5.69	5.66	5.64	5.59

Table: Data for regulation due to supply voltage regulation.

Simulation & Measurement:

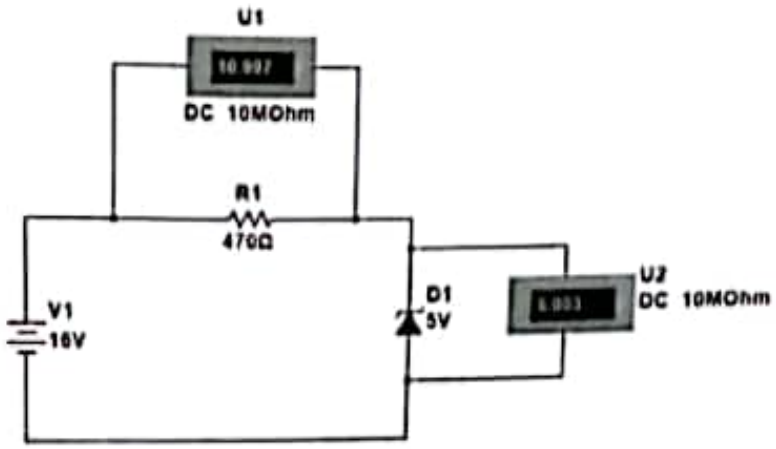


Figure 1

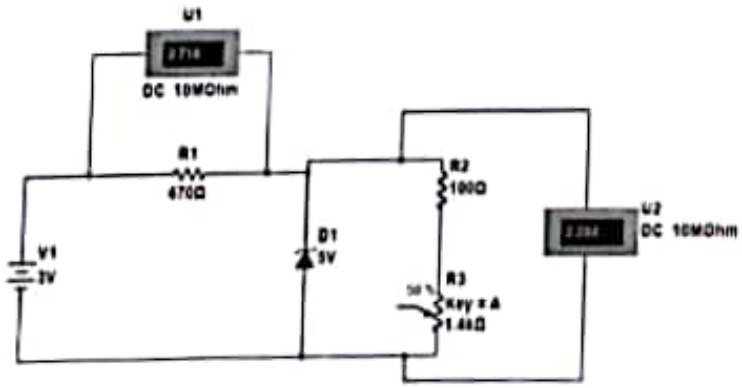


Figure 2

Figure 3

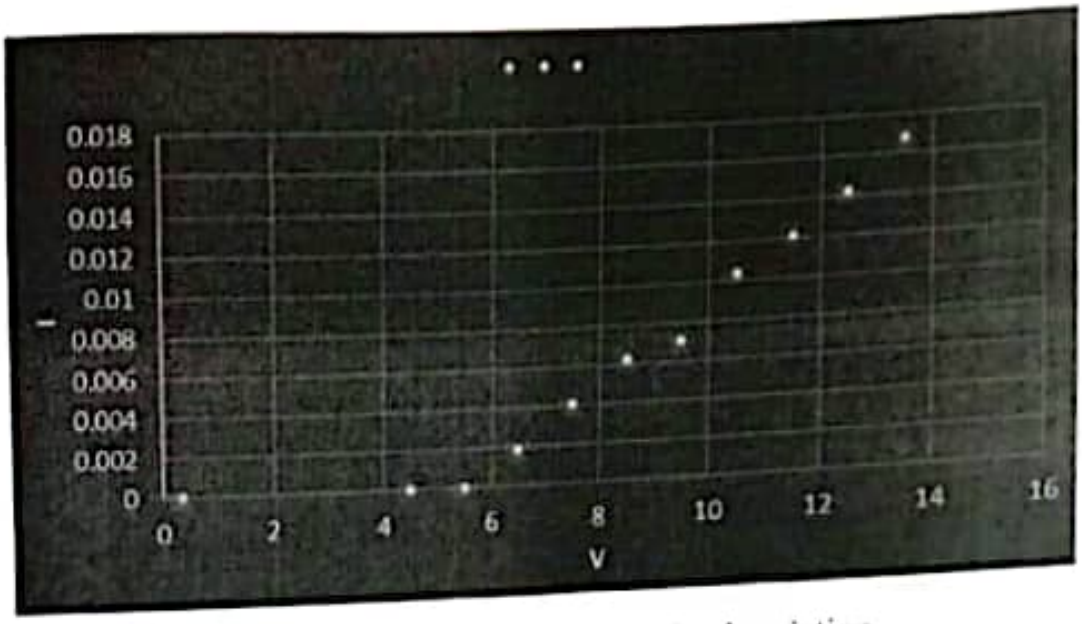


Figure: Data for Regulation due to load variation.

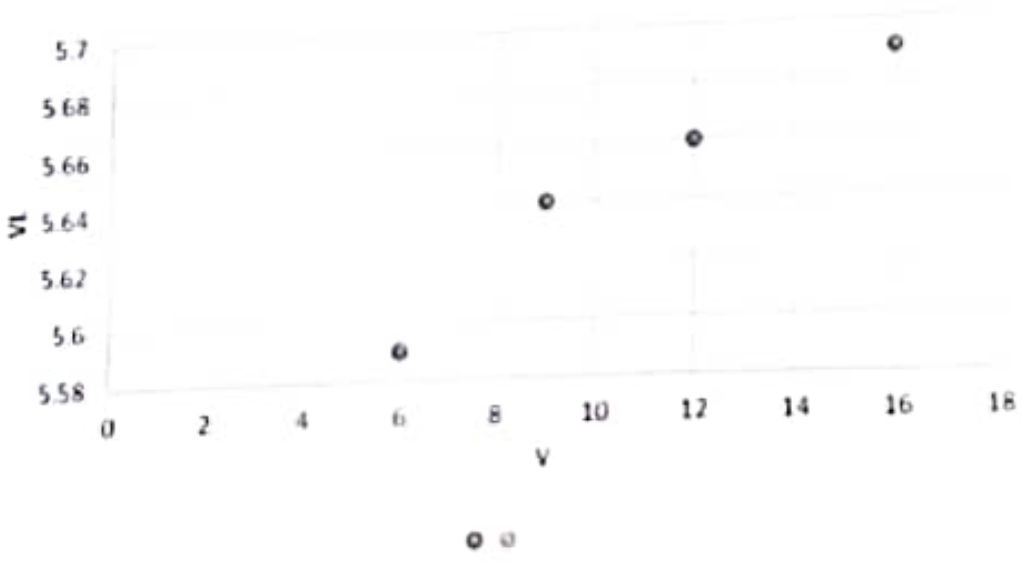
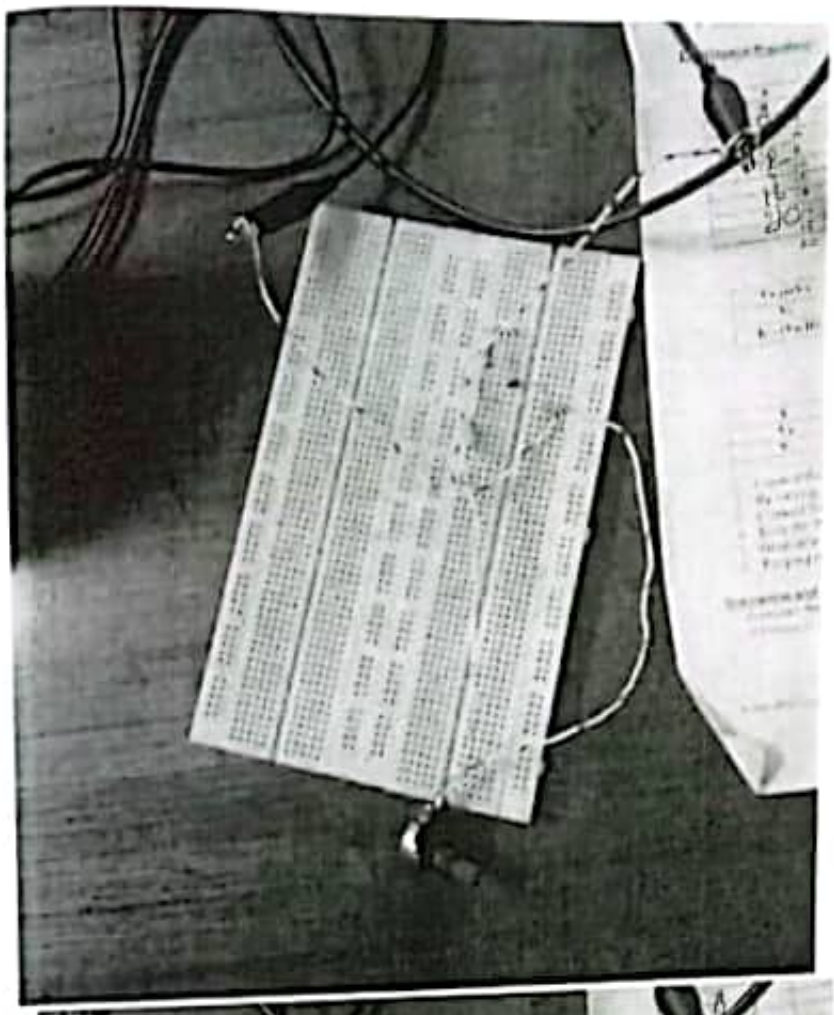
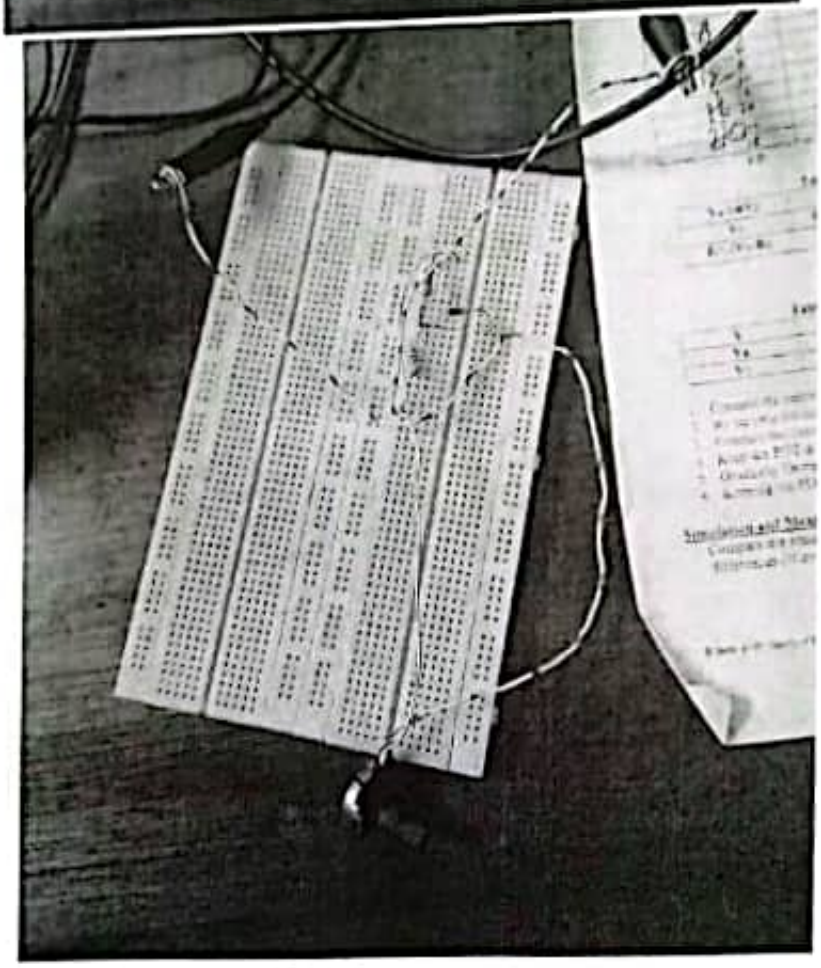


Figure: Data for regulation due to supply voltage variation.





Discussion and Conclusion: Interpret the data finding and determine the extent to which the experiment was successful in complying with the goal that was initially set. Discuss any mistake that might have been made while conducting the lab investigation and describe ways the study could have been improved.

References:

1. Adel S. Sedra, Kenneth C. Smith, "Microelectronic Circuit", Saunders College Publishing, 3rd ed., ISBN:0-03-051698-X, 1991

2. David J. Comer, Donald T. Comer, Fundamentals of Electronic Circuit Design John Wiley and Sons Canada, Ltd; ISBN:0471410160, 2002

3. American International University-Bangladesh (AIUB) Electronics LAB Manual.