



Course Name:	Elements of Electrical and Electronics Engineering Laboratory	Semester:	✓ I/II
Date of Performance:	/ /2024	Batch No:	C-5(3)
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Faculty Sign & Date:		Grade/Marks:	/ 20

Experiment No: 6**Title: Zener diode voltage regulator****Aim and Objective of the Experiment:**

- To understand the working of Zener diode as voltage regulator
- To calculate line and load regulation of Zener diode based shunt regulator

COs to be achieved:

CO4: Explain rectifier-filter circuits using PN junction diode and voltage regulator circuits using Zener diode

Requirements:

Zener diode, resistor, potentiometer, voltmeter, ammeter, DC source and bread board.

Theory:

The Zener diode is like a general-purpose signal diode. When biased in the forward direction it behaves just like a normal signal diode, but when a reverse voltage is applied to it, the voltage remains constant for a wide range of currents.

Avalanche Breakdown: There is a limit for the reverse voltage. Reverse voltage can increase until the diode breakdown voltage reaches. This point is called Avalanche Breakdown region. At this stage maximum current will flow through the Zener diode. This breakdown point is referred as "Zener voltage".

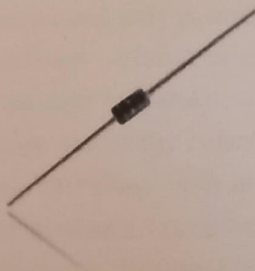


Fig 1: Zener Diode

The Zener Diode is used in its "reverse bias". From the I-V Characteristics curve we can study that

Stepwise-Procedure:

1. Design circuit and connect it as shown in the circuit diagram using Proteus simulator.
2. Keep V_{IN} around 4V and adjust Potentiometer R_L such that $I_L = 5$ mA. Vary V_{IN} and note V_{OUT} for finding line regulation.
3. Keep $V_{IN} = 10$ V and vary Potentiometer R_L such that I_L changed from 3mA to 15 mA and note V_{OUT} for finding load regulation.
4. Plot the graph V_{OUT} Vs V_{IN} for line regulation and V_{OUT} Vs I_L for load regulation.

Observation Table:

Line Regulation: (Keep $I_L = 5$ mA constant)

Unregulated supply voltage (V_{in})	Regulated output voltage (V_o)
4V	3.37
5V	4.21
6V	5.08
7V	5.53
8V	5.58
10V	5.65
12V	5.70
14V	5.75
16V	5.80

Load Regulation: (Keep $V_{in} = 10$ V constant)

Line current I_L (mA)	Regulated output voltage (V_{out})
3mA	5.82
4mA	5.81
5mA	5.8
7mA	5.78
9mA	5.77
10mA	5.76
12mA	5.95
14mA	5.74
No load value V_{NL} (Remove R_L & measure V_{out})	5.82

Post Lab Subjective:

1. What is difference between PN junction diode and Zener diode?

PN Junction diode allow current to pass only forward whereas Zener diode allow current to flow in both direction.

PN Junction diode is used as a full wave rectifier whereas Zener diode is used as a voltage regulator.

Conclusion:

We learnt to use Zener diode as voltage regulator in a circuit. We can conclude that when diode is in reverse breakdown region, voltage across Zener diode remains constant.

Signature of faculty in-charge with Date: