Experiment No: 1

Name of the Experiment: I-V Characteristics of diode.

Objective:

Study the I-V characteristic of diode.

Theory:

A diode is a bi-polar device that behaves as the short circuit when it is in forward bias and as an open circuit when it is in reverse bias condition.

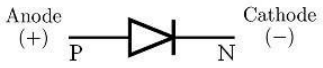

Figure 1.1: Schematic Diagram of Diode.

Figure 1.2: P - N Junction

Diode. There are two types of biasing condition for a diode:

1. When the diode is connected across a voltage source with positive polarity of source connected to P side of diode and negative polarity to N side, then the diode is in forward bias condition.

2. When the diode is connected across a voltage source with positive polarity of source connected to N side of diode and negative polarity to P side, then the diode is in reverse bias condition.

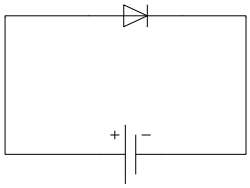

Figure 1.3: Forward Bias connection.

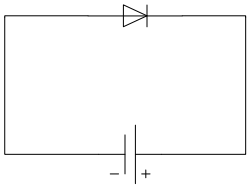

Figure 1.4: Reverse Bias connection.

If the input voltage is varied and the current through the diode corresponding to each voltage are taken, the plot of diode current (Id) VS diode voltage (VD) will be follows:

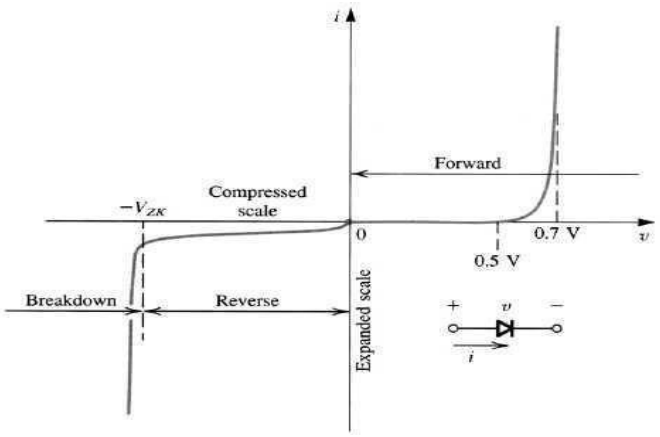

Figure 1.5: I - V Characteristics of Diode.

At the reverse bias condition the amount of current flows through the diode is very small (at microampere range). But if the voltage continuously increases in reverse direction, at a certain value the diode will break down and huge amount of current will flow in reverse direction. This is called breakdown of diode. In laboratory the breakdown will not tested because it will damages the diode permanently.

From the characteristics curve it can be seen that, a particular forward bias voltage (V_T) is required to reach the region of upward swing. This voltage, V_T is called the cut-in voltage or threshold voltage of diode. For Si diode the typical value of threshold voltage is 0.7 volt and for Ge diode is 0.3volt.

Equipment and Components:

Serial no.	Component Details	Specification	Quantity
1.	p-n junction diode	1N4007	1 piece
2.	Resistor	1KΩ	1 piece
3.	DC power supply		1 unit
4.	Digital Multimeter		1 unit
5.	Chords and wire		as required

Experimental Setup:

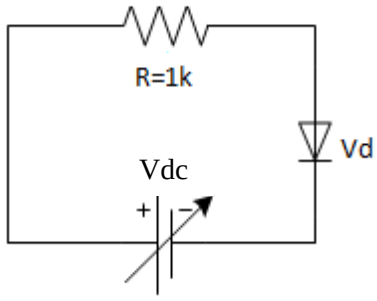

Figure 1.6: Diode forward biased configuration

Procedure:

1. Measure the resistance accurately using DMM.
2. Construct the circuit as shown in Figure 1.6.
3. Vary input voltage with values given in table.
4. Measure Vd and V_R for each increment of and record data on data table.
5. Obtain maximum value of without exceeding 25V for
6. Calculate the values of using the formula, $I_d = V_R / R$.

Data Collection:

Experiment: 1

Theoretical value: R = ___

Measured value: R = ___

V_{dc} (volt)	V_d (volt)	V_R (volt)	$I_d = V_R / R$ (mA)
0.1			
0.3			
0.5			
0.7			
0.9			
1			
2			
3			
4			
6			
8			
10			
12			
14			
16			
18			
20			

Report:

1. Taking readings from the data table, draw curve of diode in a graph paper with proper scale [x-axis: 0.2 V per unit, y-axis: any suitable range].
2. What is dynamic and static resistance of a diode?
3. From the graph, find Vd for corresponding values of I_d = 5 mA and I_d = 10 mA and calculate the static resistance.
4. Considering V_{dc} = 2 volt, find the load line (Showing all calculations)
5. Draw the load line in the curve of diode and find Q-point.