Experiment No: 2

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.

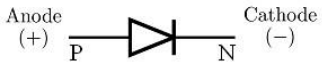

Figure 2.1 : Schematic Diagram of Diode.

Figure 2.2 : 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.

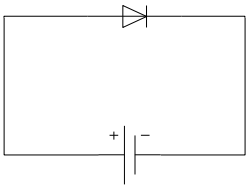

Figure 2.3: Forward Bias connection.

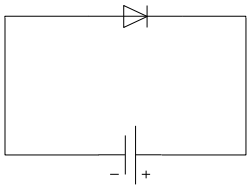

Figure 2.4: Reverse Bias connection.

If the input voltage is varied and the current through the diode corresponds to each voltage are taken then the plot of diode current (I_d) vs diode voltage (V_D) will be follows:

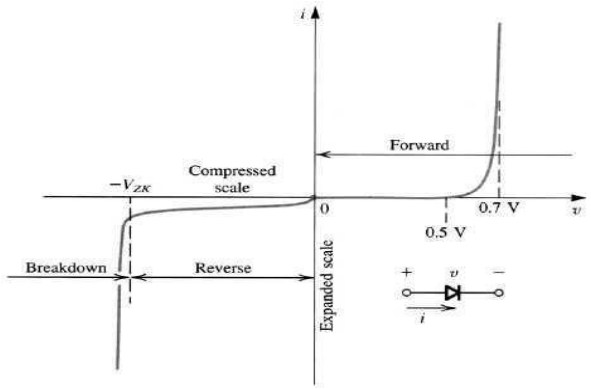

Figure 2.5 : I - V Characteristics of Diode.

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 0.3 volt.

Equipments 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.	Signal generator		1 unit
5.	Trainer Board		1 unit
6.	Oscilloscope		1 unit
7.	Digital Multimeter		1 unit
8.	Chords and wire		as required

Experimental Setup :

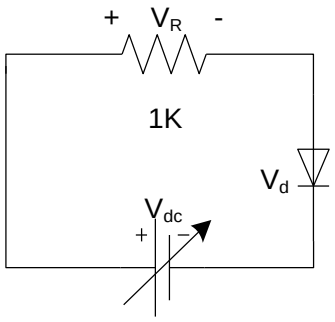

Figure 2.6 : Circuit Diagram for Obtaining Diode Diode Forward Characteristics.

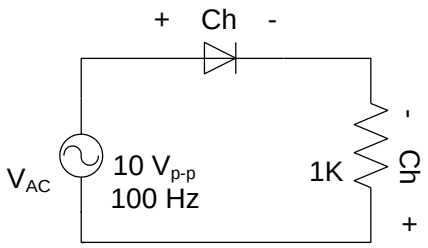

Figure 2.7 : Circuit Diagram for Obtaining Characteristics From Oscilloscope.

Procedure :

1. Measure the resistance accurately using multimeter.
2. Construct the circuit as shown in figure - 1.6.
3. Vary input voltage V_{dc}. Measure V_{dc}, V_d, V_R for the given values of V_d and record data on data table. Obtain maximum value of V_d without increasing V_{dc} beyond 25 volt.
4. Calculate the values of I_d using the formula, $I_d = V_R / R$.
5. Construct the circuit as shown in figure - 1.7.
6. Make proper connection and observe the output from the oscilloscope.
7. Repeat the step 5 and 6 by increasing the input supply frequency 5 KHz.

Data Table :

V_{dc} (volt)	Measured V_{dc} (volt)	V_d (volt)	V_R (volt)	$I_d = V_R / R$ (mA)
0				
1				
2				
4				
6				
8				
10				
12				
14				
16				

Report :

1. Draw the I - V characteristics curve of diode from the reading obtain in this experiment.
2. Calculate static resistance for I_d = 5 mA and I_d = 10 mA.
3. Determine the Q- point for the circuit in figure - 6, when V_{dc} = 8 volt.
4. Add the PSPICE simulation waveforms of all the experimental circuits.