1. Experiment name:

I-V Characteristics of diode.

2. Objectives:

The objective of this experiment is to study the I-V characteristic of diode.

3. Apparatus:

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

4. Theory:

A diode is a semiconductor device that allows electrical current to flow in one direction while blocking it in the opposite direction. It is a bi-polar that one end is positive and another is negative. A diode can be in two states depending on the direction of power. If a diode's positive end is connected to a power supply's positive end then it will be in Forward biasing and behave as a short circuit. And if the diode's positive end is connected to a power supply's negative end then it will be in Reverse biasing and behave as an open circuit.

5. Circuit Diagram:

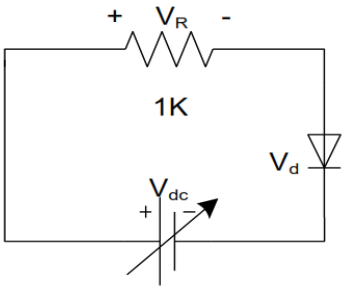


Figure: Circuit Diagram for Obtaining Diode Diode Forward Characteristics.

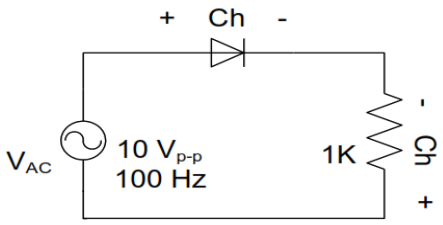


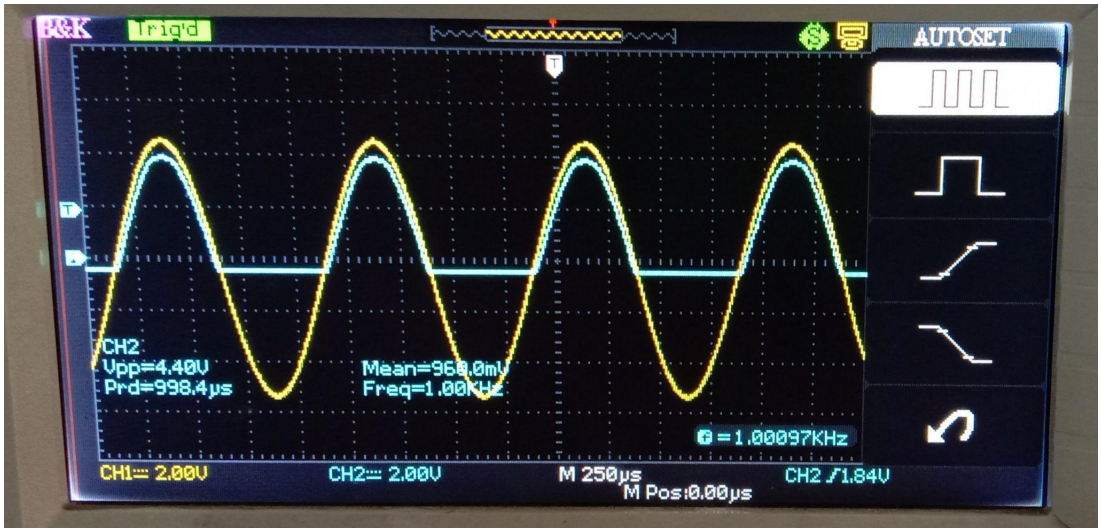
Figure: Circuit Diagram for Obtaining Characteristics From Oscilloscope.

6. Experimental Procedure:

- First we had to measure the resistance of the resistor accurately using a digital multimeter(DMM) and construct the circuit.
- Then we also measured vary input voltage(V_{dc}), diode voltage(V_d) and resistor voltage(V_R) accurately using DMM and recorded the data on the data table.
- We obtained maximum value of V_d without increasing V_{dc} beyond 25 volts and calculated the values of I_d using Ohm's law.
- Again, we had to construct the circuit using a signal generator, make a proper connection and observe the output from the oscilloscope.
- We repeated the process by increasing the input supply frequency 5 KHz.

7. Results:

From the result we can see that when the forward voltage across the diode is 0V, the forward current is 0 mA. As the voltage is being supplied and increased across the diode, the current is also increased. When this voltage becomes large enough to overcome the barrier potential of the P-N junction, a considerable increase in the forward current occurs. Once the voltage being supplied is over 0.7 V, the voltage of the resistor and the current in the circuit suddenly rise rapidly. The voltage of the diode only increases slightly from here. While the other current and voltage readings increase proportionally with the increase of the supply voltage. On the other hand, during the experiment, we also noticed attenuation(1x) in the oscilloscope.

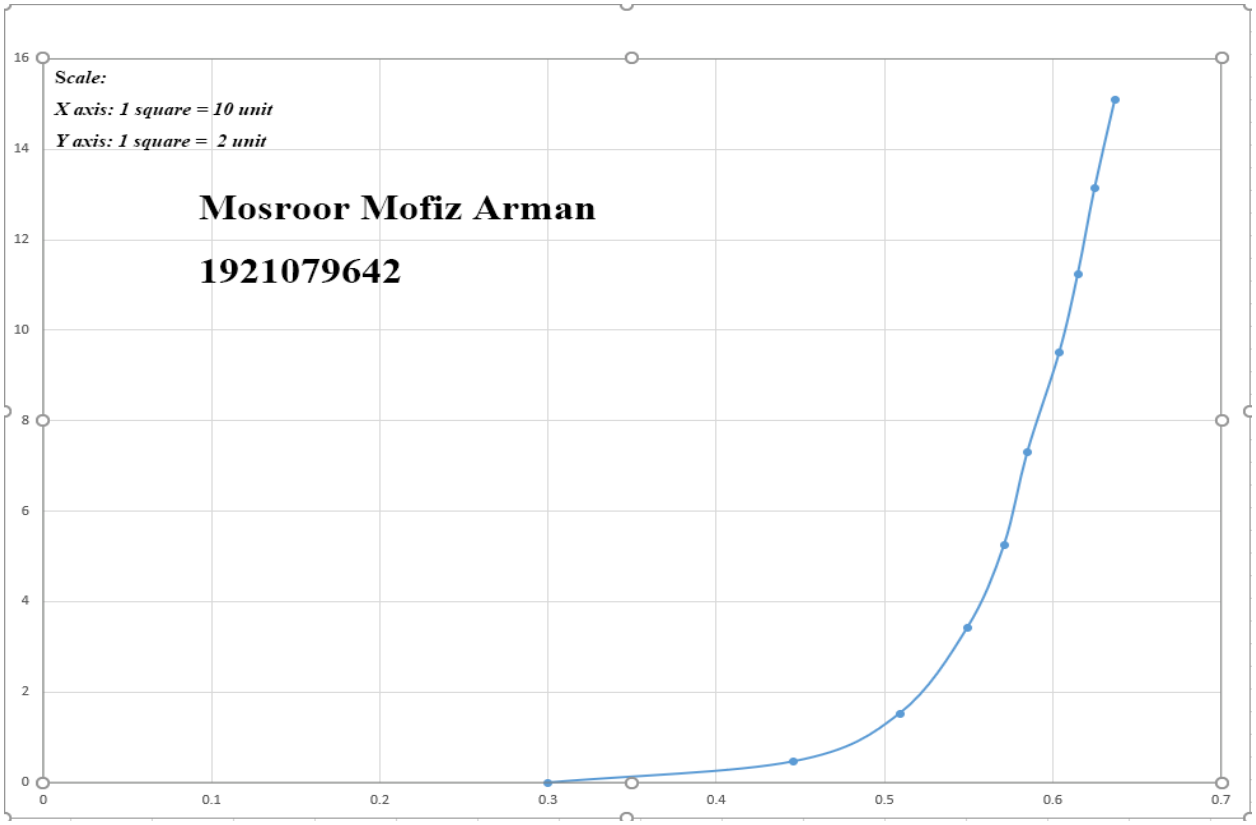


So, we can assume that the diode is a silicon diode because once we are supplying over 0.7 V, current starts flowing through the circuit.

8. Questions and Answers (Q/A):

1. **Draw the I - V characteristics curve of diode from the reading obtain in this experiment.**

Answer: The I - V characteristics curve of diode:



2. Calculate static resistance for I_d = 5 mA and I_d = 10 mA.

Answer: We know, $R_d = \frac{V_d}{I_d}$

For I_d = 5 mA, $V_d\ is$ 0.57 V (From graph)

So, $R_d = \frac{0.57\ V}{5\ mA}$ = 0.114 kΩ

For I_d = 10 mA, $V_d\ is$ 0.61 V (From graph)

So, $R_d = \frac{0.61\ V}{10\ mA}$ = 0.061 kΩ

3. Determine the Q- point for the circuit in figure - 6, when Vdc = 8 volt.

Answer: From the data table, we can see that for 8 volt V_{dc}, V_d is 0.585 volt and I_d is 7.31 mA. So, the Q-point is (0.585, 7.31).

9. Discussion:

The discussion part of the experiment has been attached with the lab report.

10. Experimental Data Table:

The experimental data table of the experiment has been attached with the lab report.

11. Simulation:

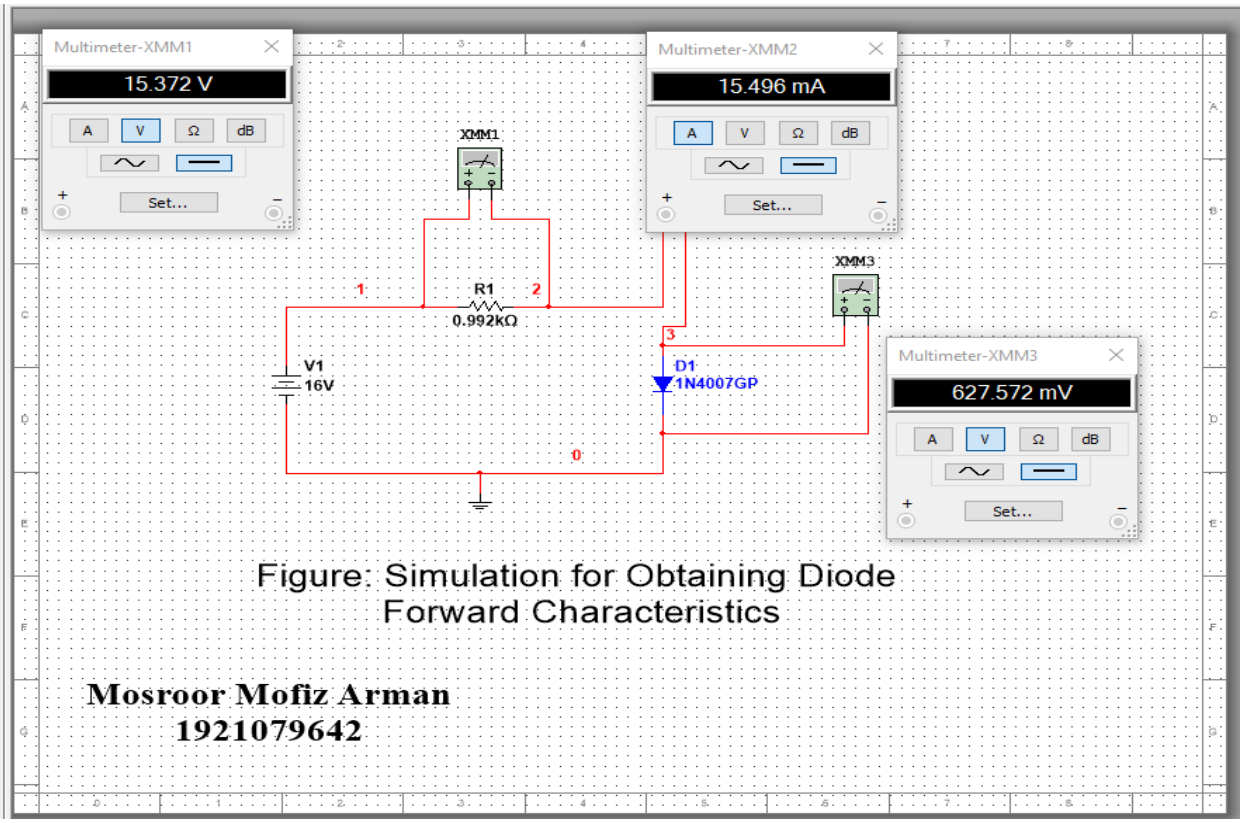


Figure: Simulation for Obtaining Diode Forward Characteristics

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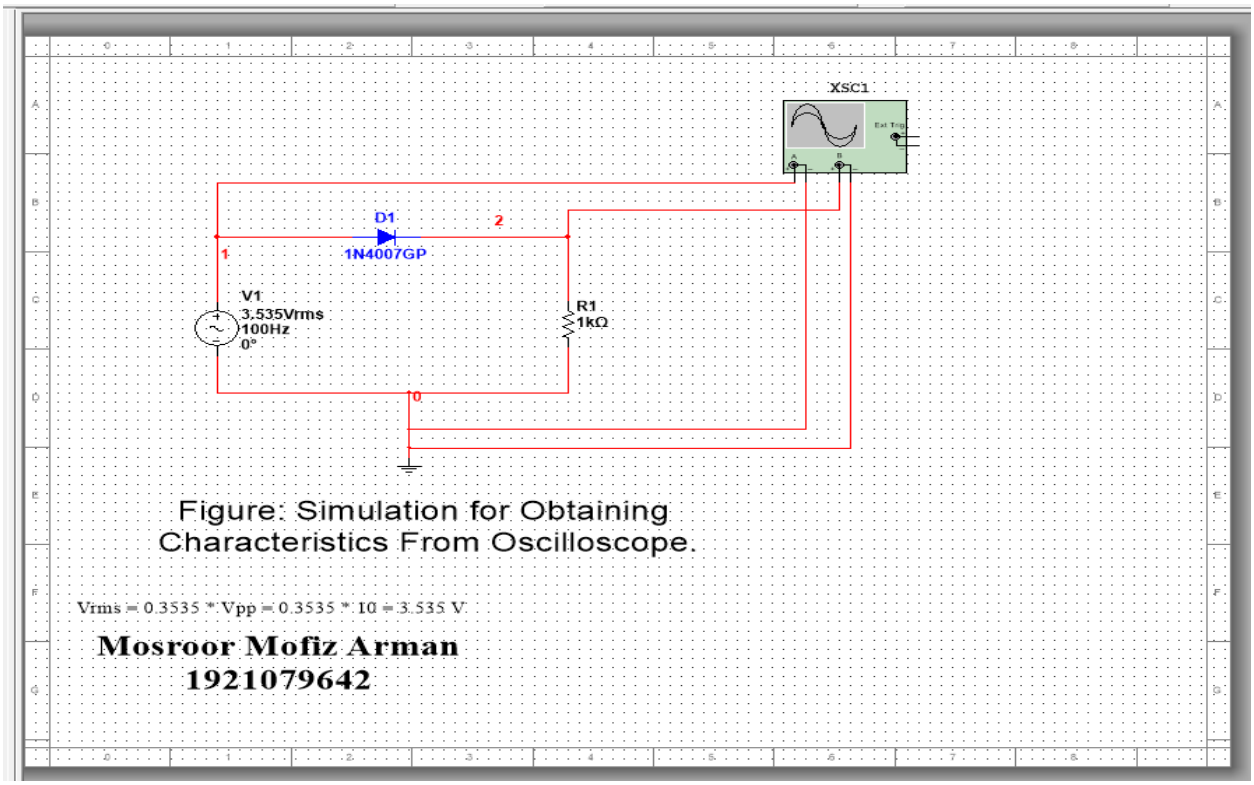

Figure: Simulation for Obtaining Characteristics From Oscilloscope.

Vrms = 0.3535 * Vpp = 0.3535 * 10 = 3.535 V

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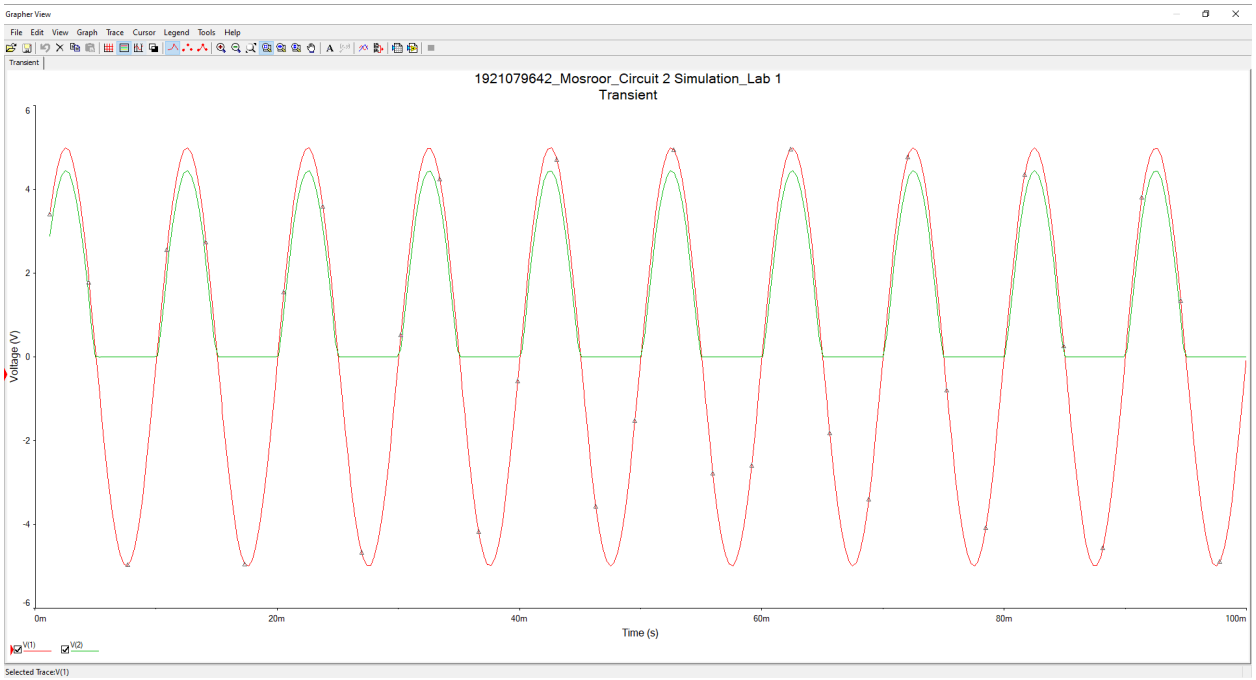
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Transient
1921079642_Mosroor_Circuit 2 Simulation_Lab 1
Transient
Voltage (V)
6
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2
0
-2
-4
-6
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60m
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100m
Time (s)
V(1)
V(2)
Selected Trace:V(1)