



भारतीय सूचना प्रौद्योगिकी संस्थान, पुणे
Indian Institute of Information Technology, Pune
(An Autonomous Institute of National Importance under act of Parliament)

CERTIFICATE
Academic Year 2024 - 25
Basic Electronics Lab

Department : **ECE**

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Section : **C** **Group :** **7**

Year : **1st** **Semester :** **1st**

Professor Signature

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Semester : I

Subject : BEE Lab File

Session : 24-25

MIS No. : 112416037

Year: First

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| S. No. | Experiment Name | Experiment Date | Submission Date | Remarks |
|--------|---------------------------------------------------------------------------------------------------------|-----------------|-----------------|---------|
| 1. | Introduction to the Components of Electronic device. | 29-08-24 | | |
| 2. | To plot V-I char. of pn junction diode and calculate cut in voltage, forward & Reverse diode Resistance | 5-9-24 | | |

Experiment - 2

Date: 11
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Aim: To plot the V-I characteristics of p-n junction diode and calculate

- (i) Forward Resistance
- (ii) Reverse Resistance
- (iii) Cutt in voltage

Equipments used:

| S.N.O. | Name of Equipment | Range | Quantity |
|--------|------------------------|---------------|----------|
| 1. | Bread Board | | 1 |
| 2. | Resistor | 1 K Ω | 1 |
| 3. | Regulated power supply | (0-30)V DC | 1 |
| 4. | Digital Ammeter | 200uA - 200mA | 1 |
| 5. | Digital voltmeter | (0-20)V DC | 1 |
| 6. | Wires | | 3 |

Theory:

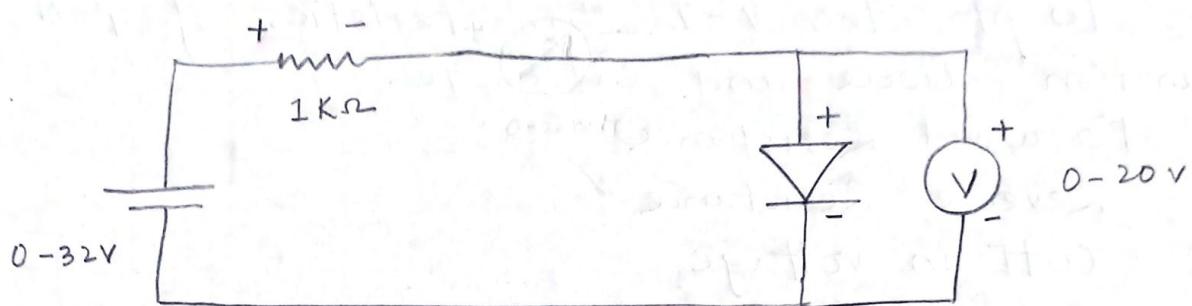
(i) PN Junction diode : A p-n junction diode is a semiconductor device that control the flow of electric current in a circuit. It has a positive side (P) and a negative side (N), created by adding impurities to each side of a silicon Semiconductor.

(ii) Forward Biasing : Forward Biasing occurs when the voltage across a diode permits the natural flow of current.

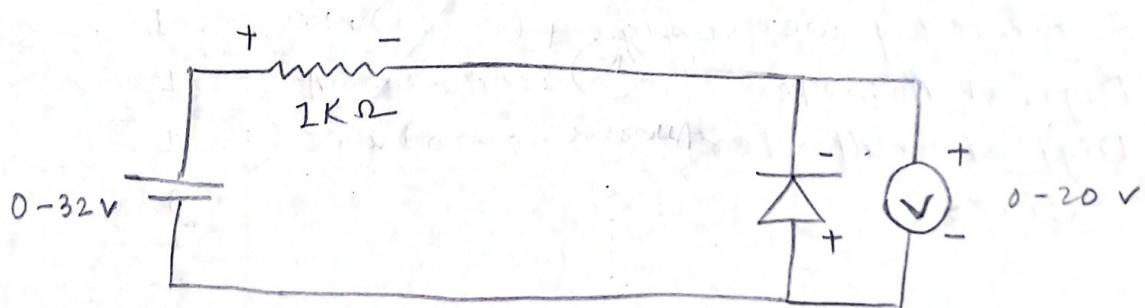
(iii) Reverse Biasing : Reverse Biasing denotes the voltage across the diode in the opposite direction.

* circuit Diagram

① Forward Biased p-n junction diode



② Reverse Biased p-n junction diode



procedure:for forward Biasing :

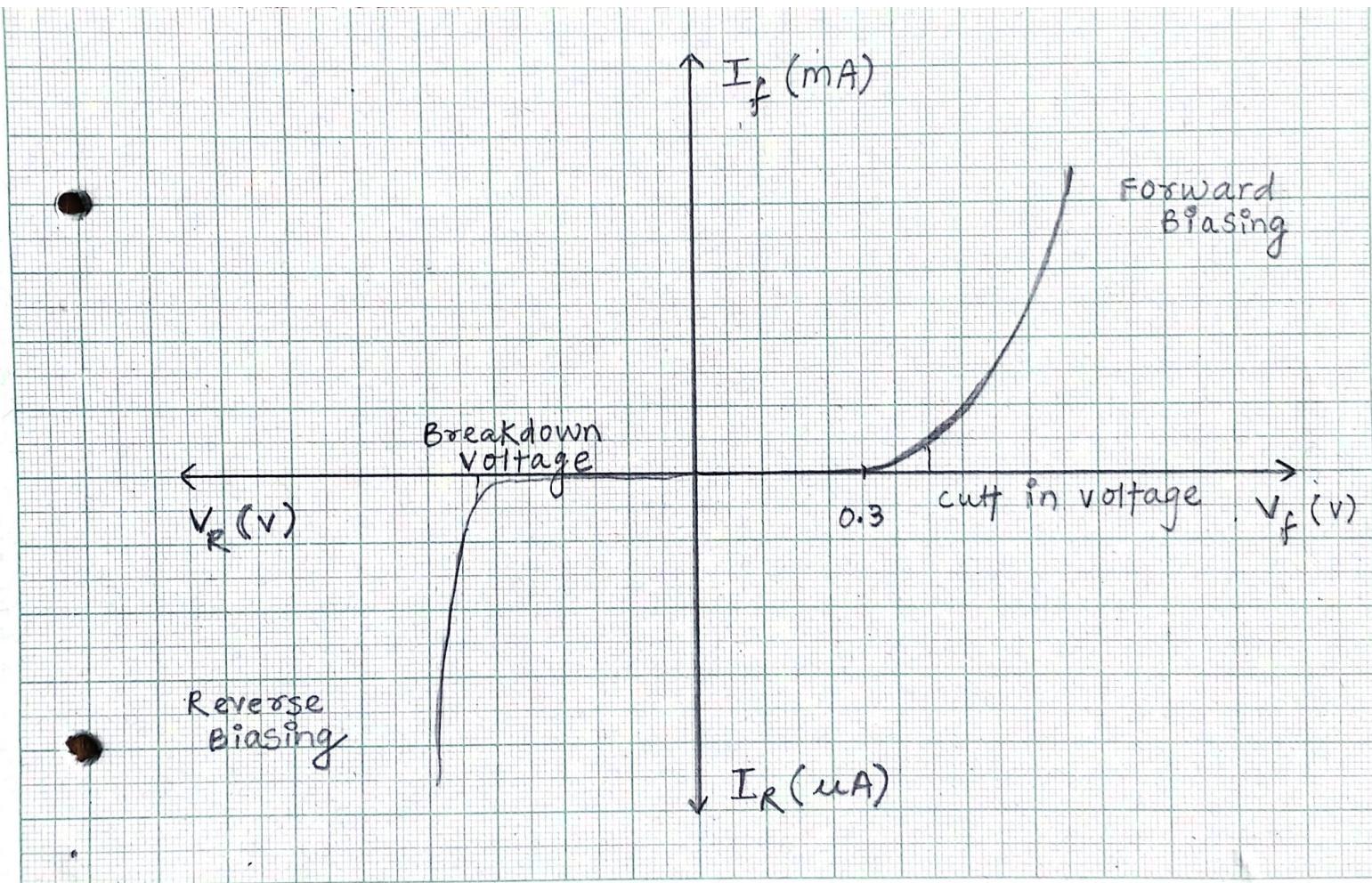
1. The positive terminal of the power supply is connected to resistance.
2. The other end of the resistance is connected to positive terminal of ammeter.
3. Negative terminal of ammeter is connected to PN junction diode at Anode (positive terminal of diode).
4. Other terminal (cathode) of p-N junction diode is connected with negative terminal of power supply.
5. The positive & negative terminal of voltmeter is connected with P-N junction at positive and Negative respectively.

For Reverse Biasing :

1. Only the direction of diode is changed means the connected wires of diode are interchanged for reverse biasing.
2. power supply is switched on & supply voltage is increased.

Observation Table : (forward Biasing)

| SNO. | $V_{source}(V)$ | $V_{across\ Resistance}(V)$ | $V_{diode} = V_{forward}(V)$ | $I_F = I_{forward}(mA)$ |
|------|-----------------|-----------------------------|------------------------------|-------------------------|
| 1. | 0.1 | 0.0 | 0.001 | 0.0 |
| 2. | 0.2 | 0.0 | 0.120 | 0.0 |
| 3. | 0.4 | 0.008 | 0.373 | 0.008 |
| 4. | 0.6 | 0.069 | 0.455 | 0.069 |
| 5. | 0.9 | 0.334 | 0.527 | 0.334 |
| 6. | 1.1 | 0.536 | 0.550 | 0.536 |



| | | | | |
|-----|-----|-------|-------|-------|
| 7. | 1.2 | 0.616 | 0.557 | 0.616 |
| 8. | 1.4 | 0.792 | 0.570 | 0.792 |
| 9. | 1.9 | 1.227 | 0.591 | 1.227 |
| 10. | 2.0 | 1.327 | 0.598 | 1.327 |
| 11. | 3.1 | 2.420 | 0.626 | 2.420 |
| 12. | 4 | 3.385 | 0.641 | 3.385 |
| 13. | 6.9 | 6.210 | 0.671 | 6.210 |
| 14. | 7 | 6.280 | 0.672 | 6.280 |
| 15. | 7.7 | 7.040 | 0.676 | 7.040 |

(Reverse Biasing.)

| S.NO. | V_{source} (V) | $V_{reverse}$ (V) | $I_{reverse}$ (mA) |
|-------|------------------|-------------------|--------------------|
| 1. | 0.1 | 0.05 | 0 |
| 2. | 0.2 | 0.22 | 0 |
| 3. | 0.3 | 0.25 | 0 |
| 4. | 0.4 | 0.4 | 0 |
| 5. | 0.5 | 0.45 | 0 |
| 6. | 0.7 | 0.68 | 0 |
| 7. | 0.8 | 0.8 | 0 |
| 8. | 0.9 | 0.92 | 0 |
| 9. | 1.0 | 1.02 | 0 |
| 10. | 1.2 | 1.17 | 0 |
| 11. | 1.4 | 1.36 | 0 |
| 12. | 1.8 | 1.75 | 0 |
| 13. | 2.1 | 2.05 | 0 |
| 14. | 2.4 | 2.36 | 0 |
| 15. | 3.0 | 2.98 | 0 |

Result and Calculation:

1. Static forward Resistance (R_{dc})

$$R_{dc} = \frac{V_f}{I_f} = \frac{0.616}{1.2} \approx 0.513$$

2. Static Reverse Resistance (R_{dc})

$$R_{dc} = \frac{V_R}{I_R} = \frac{1}{\sim 0} \approx \infty$$

3. Cut in voltage is approximately 0.3.

4. Dynamic Reverse Resistance

$$= \frac{\Delta V_R}{\Delta I_R} = \frac{0.373}{0.4 - 0} = \frac{0.4 - 0}{0 - 0} \approx \infty$$

5. Dynamic forward Resistance

$$= \frac{\Delta V_f}{\Delta I_f} = \frac{|0.373 - 0.676|}{|7.040 - 0.008|} = 0.043 \text{ k}\Omega = 43 \Omega$$

Precautions:

1. All connections should be checked and connected if required.
2. Value should be noted carefully.
3. Make sure to turn off the switch after use.
4. Increase the supply voltage gradually.

Conclusions:

Through this experiment we learned about VI characteristics (voltage and current) of a p-n junction diode in case of forward and reverse biasing. In case of Reverse Biasing, it shows infinite resistance i.e. no flow of current.