

## Experiment 2

### Aim:

- I-V Characteristics of diode and zener diode.
- Transient analysis of diode for AC source.

### Tools and Apparatus:

- LTSpice
- Diode
- Zener Diode
- Resistor
- AC/DC Source

### Theory and Design:

\* PN Junction Theory :

- Ability to conduct in one direction.
- Very high resistance in opposite direction.

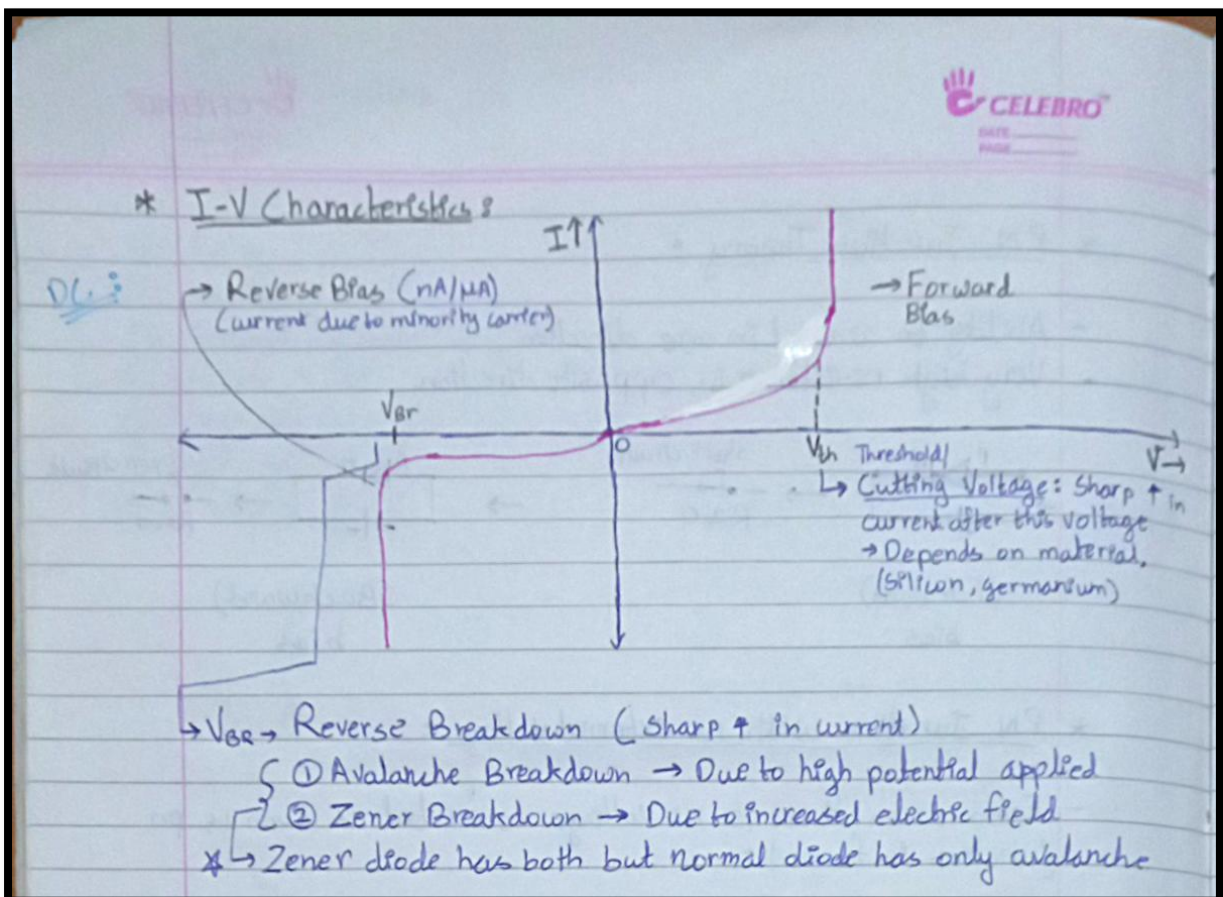
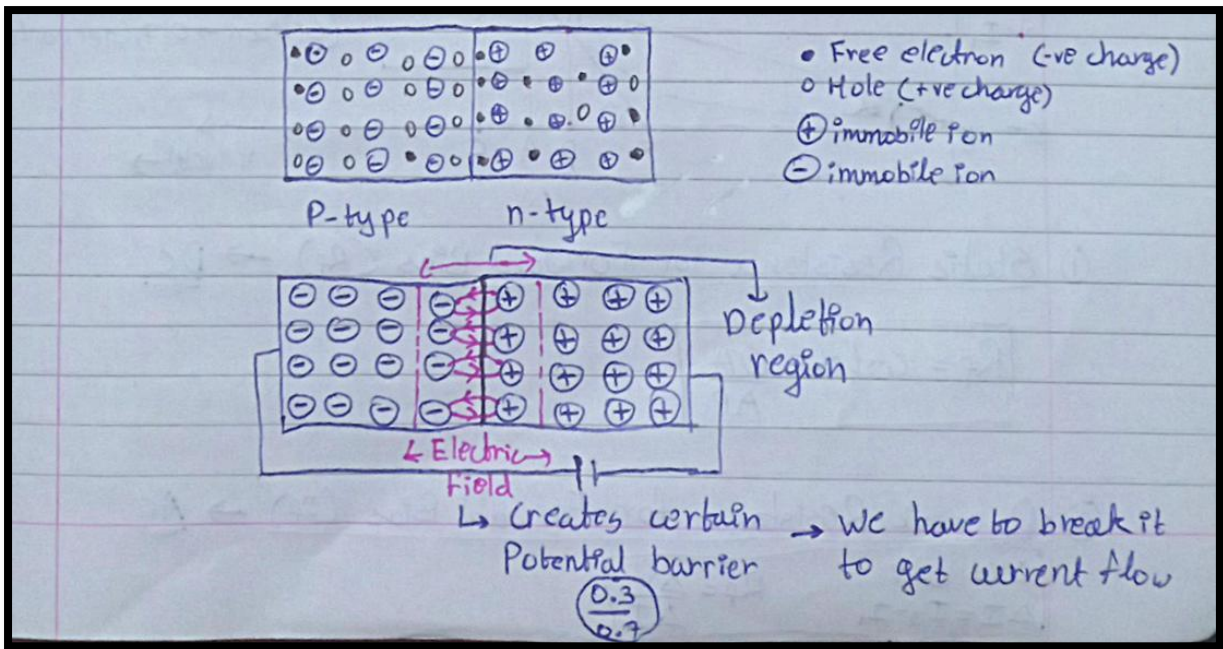
(Forward) bias → short circuit  $R \approx 0$

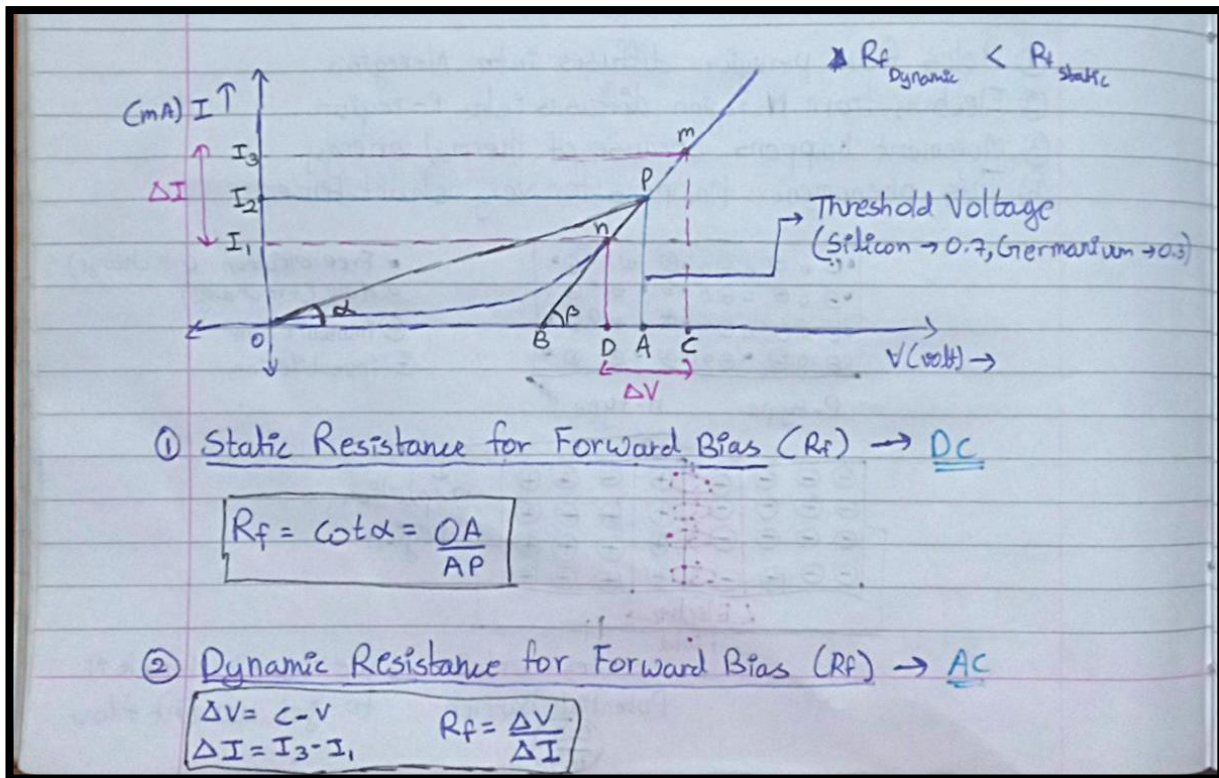
(Backward) bias → open circuit  $R = \infty$

\* PN Junction with no external voltage :

- Even when there is no voltage connected as soon as pn junction is formed :

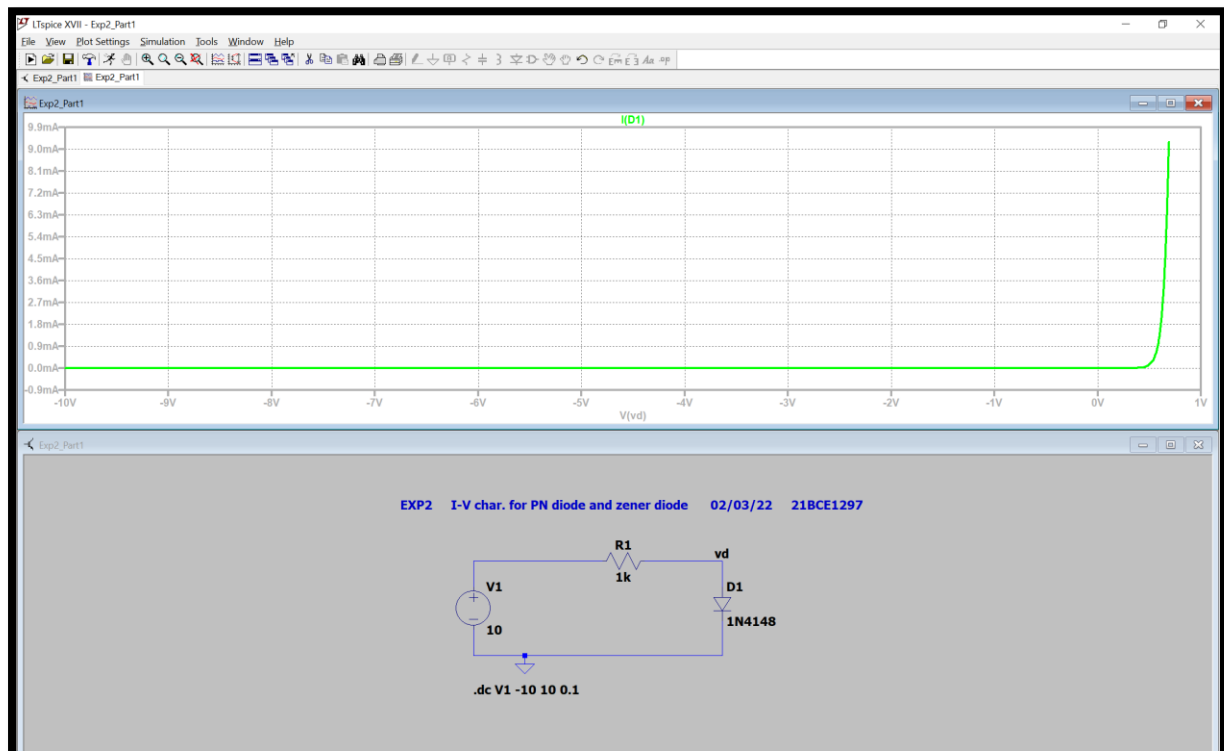
- ① Holes from p-region diffuses into N-region
- ② Electron from N-region diffuses into P-region
- ③ Movement happens because of thermal energy
- ④ This phenomenon happens for very short time.





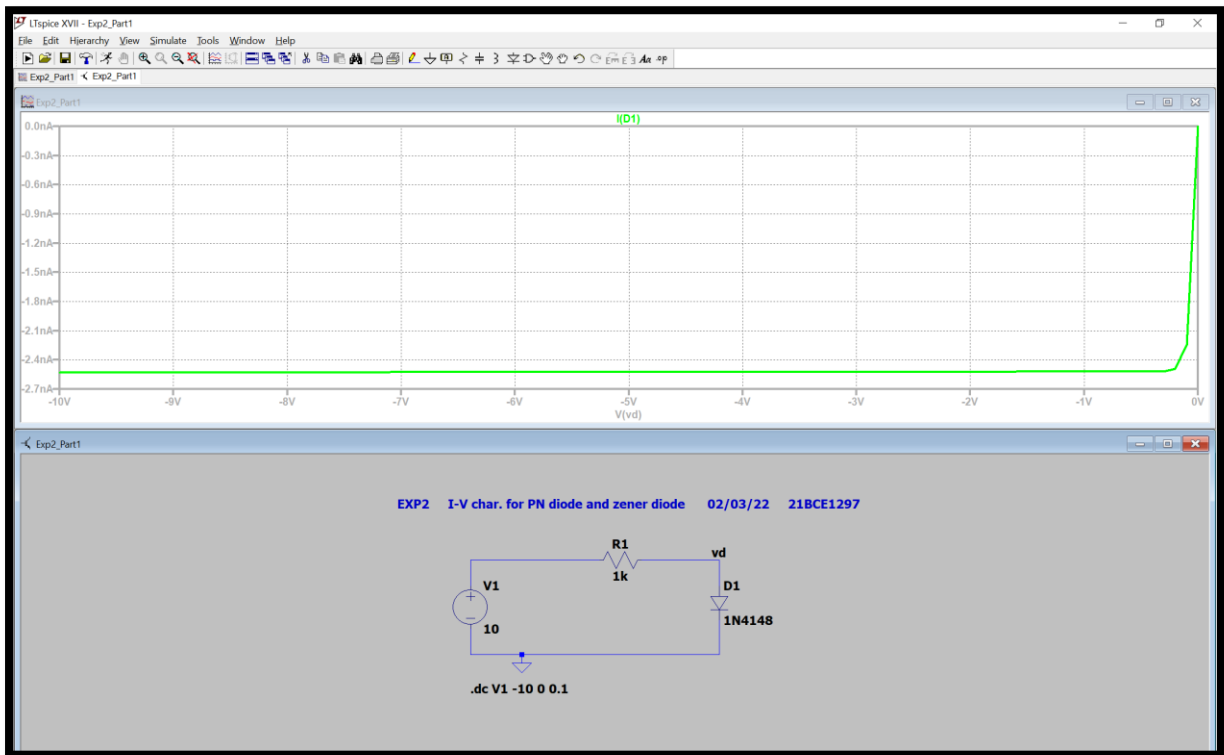
## Simulation Results:

### 1) Forward Bias

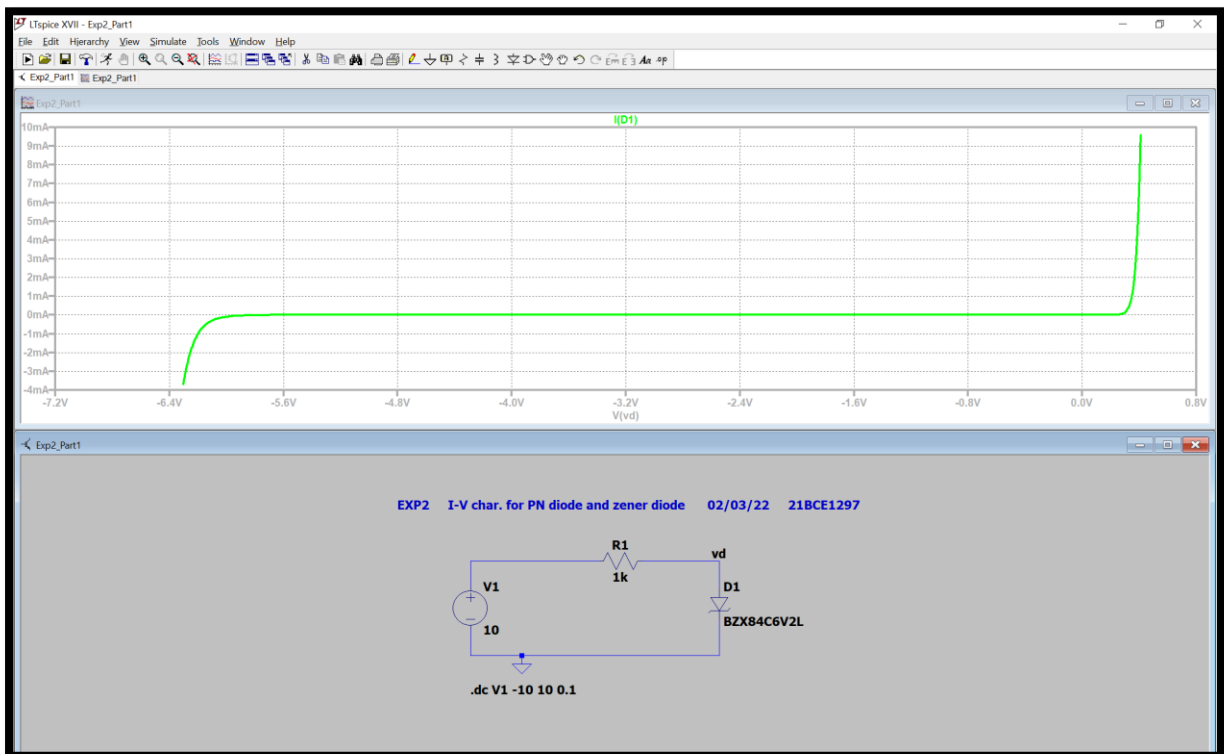




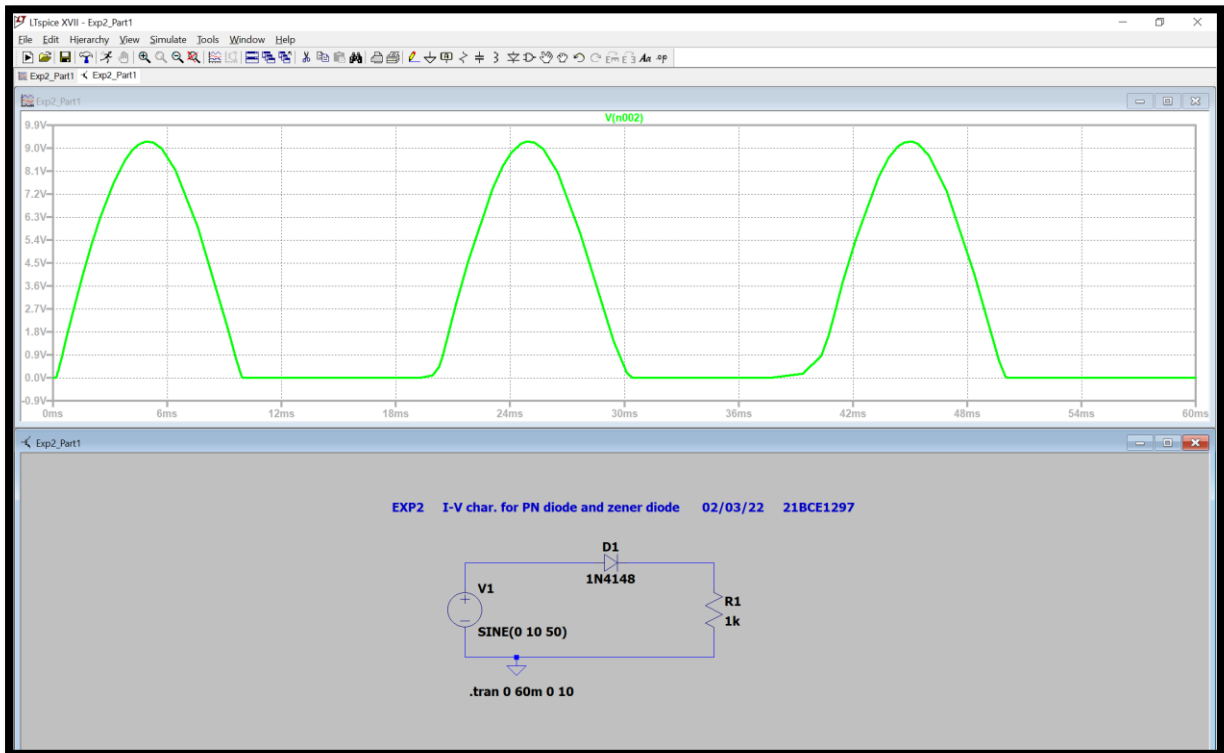
## 2) Reverse Bias



## 3) Zener Diode



#### 4) Transient Analysis



#### Conclusion:

$$V = 560 \text{ mV}$$

$$I = 600 \mu\text{A}$$

$$\text{Static Resistance} = \frac{560 \times 10^{-3}}{600 \times 10^{-6}} = 933.33 \Omega$$

#### Inferences:

- Threshold voltage and breakdown voltage for zener diode is clearly visible.
- In transient analysis output is (10V - Threshold Voltage). So it is around 9.3V as threshold voltage is around 0.7 V.
- For static resistance calculate ratio by taking values from linear region and NOT exponential region.
- Label vd properly.