

B. L. D. E. A's
S. B. Arts and K. C. P. Science College, Vijayapur
(Affiliated to Rani Channamma University, Belagavi)



Department of PG Studies in PHYSICS

20²² - 20²³

SEMINAR

M. Sc^{IV}.....Semester

Name of the Student:	Aruna. Hadimani
Roll No. :	University Registration No. : P15Km2150022
Subject:	Cmp <u>III</u> Seminar On Tunnel diode
Date of submission:	30/09/2023

Assignment Number	Date	Marks Assigned	Marks Obtained	Name and Signature of Faculty	Remarks
			05/05	Dr. S. S. S. S.	

⇒ Tunnel Diode :-

⇒ Tunnel diode basics

* It is invented by "Leo Esaki" in 1957 & based on that he received Nobel in 1973

* Sony have manufactured tunnel diode 1st in 1957 and from 1960 onwards other compore like used.

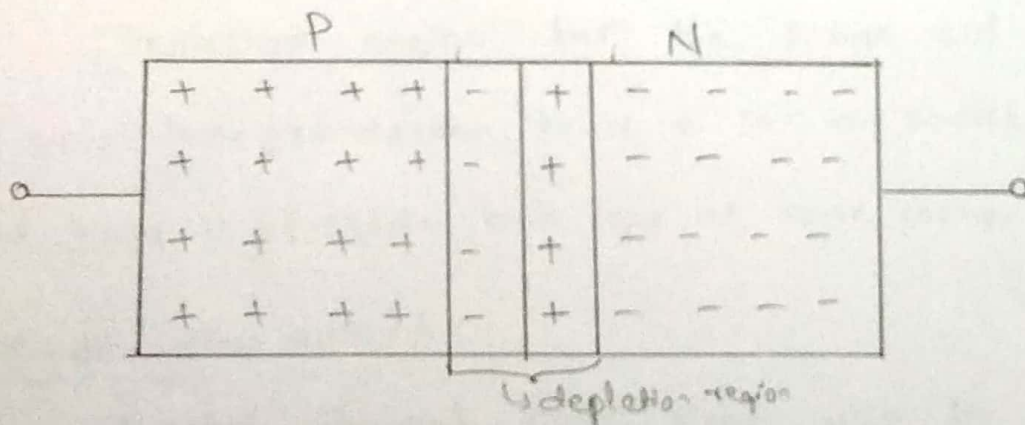
⇒ Defⁿ :- A tunnel diode is a heavily doped P-N junction diode.

It has a negative resistance characteristics due to tunneling effect.

⇒ Symbol :-



⇒ Tunneling Effect :-

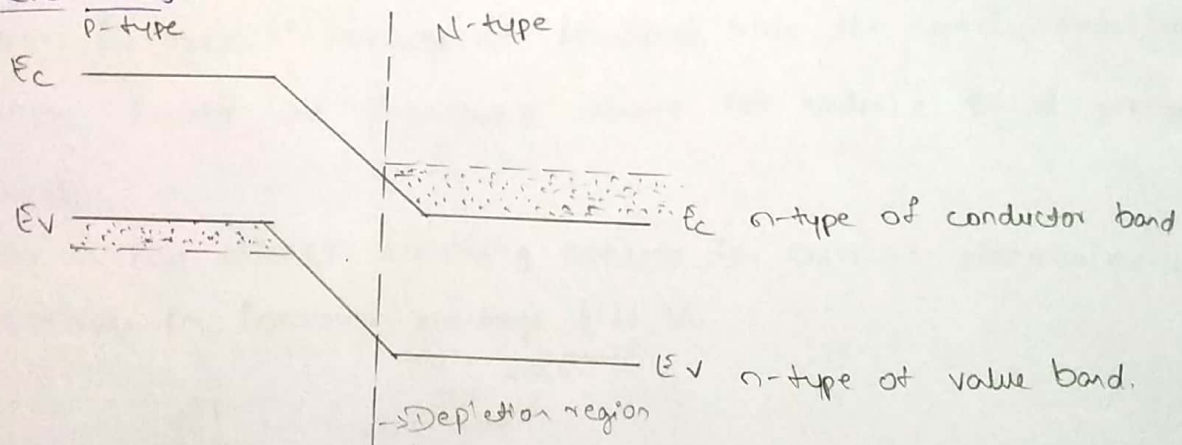


In general due to heavily doping the width of the depletion region is very small where some times they may be overlapping betⁿ the conduction band on the n-side and the valence band on the p-side so it's called Tunnel betⁿ p-type to n-type.

And under little forward bias condition, the conduction band electrons tunnel through in the depletion layer $\rightarrow$ The current reaches maximum value with minimum forward bias condition.

$\Rightarrow$ Working principle:-

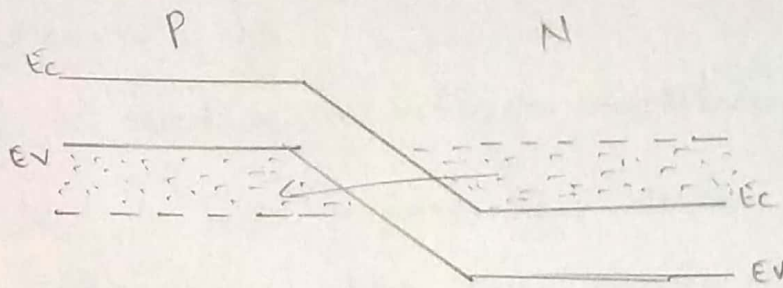
$\hookrightarrow$ Zero bias:-



Depletion region betⁿ the p-type and n-type it is very thin conduction band e⁻ in n-side & valence band holes in p-side both are at same energy level.

$\hookrightarrow$ Small voltage applied:-

Applied forward bias starts with the small forward bias voltage.



Under the small forward bias condition, the conduction-band electrons tunnel through the depletion region to fill the holes in the valence band. This movement of electrons towards the holes in the valence band is called tunneling.

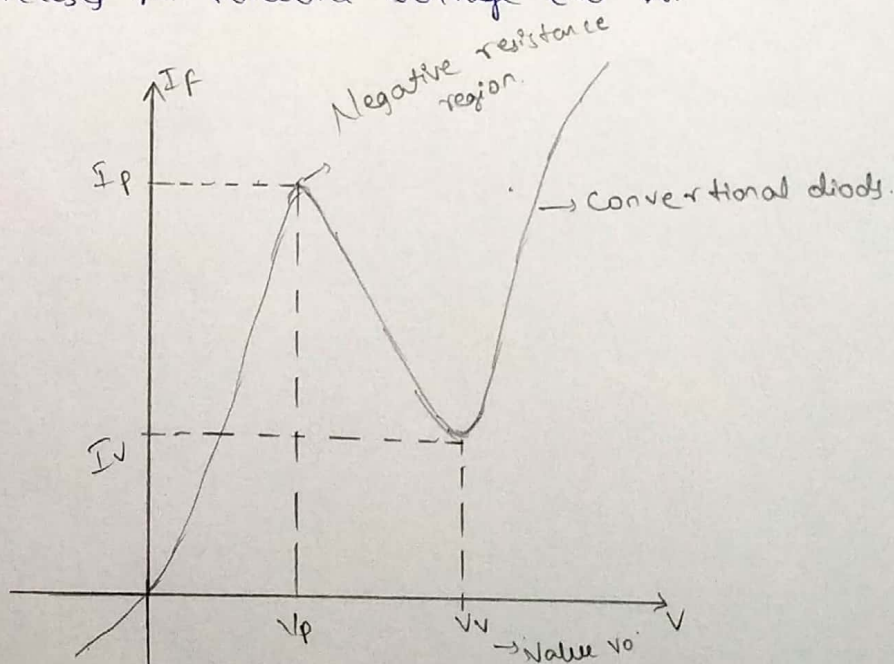
* Because of tunneling effect there is high current.

⇒ High forward voltage

The current reaches maximum of I_p at voltage V_p .

* For further increases of forward bias the conduction band energy levels are increased above the valence band energy levels.

* There is no direct tunneling occurs as current decreases with increase in forward voltage till V_v .



Applications:-

- * It can be used as a reflection amplifier (RDPA)
- * It is used as logic memory storage device.
- * It is used as ultra high-speed switches.
- * It is used in FM receivers.

Advantages :-

- * High - Speed operation
- * Low noise, wide bandwidth
- * Low power consumption

Disadvantages

- * High cost
- * The input & output are not isolated from each other.

Q. 1