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REG.NO.: 21BAI1660

BRANCH: BTECH - CSE AND SPEC IN AI/ML – VITCHENNAI

BECE101P_SLOT-L5+L6_EXPERIMENT – 05

FACULTY: PROF. SASITHRADEVI MA'AM

V-I CHARACTERISTICS OF ZENER DIODE

AIM: To study and understand the VI characteristics of the Zener Diode.

SOFTWARE REQUIRED: LT-Spice

Apparatus used in LT-Spice: Zener Diode, Voltage source, Resistor and grounding.

THEORY:

Zener Diode

A Zener Diode, also known as a breakdown diode, is a heavily doped semiconductor device that is designed to operate in the reverse direction. A Zener diode operates just like a normal diode when it is **forward-biased**. However, when connected in reverse biased mode, a small leakage current flows through the diode. As the reverse voltage increases to the predetermined breakdown voltage (Vz), current starts flowing through the diode.

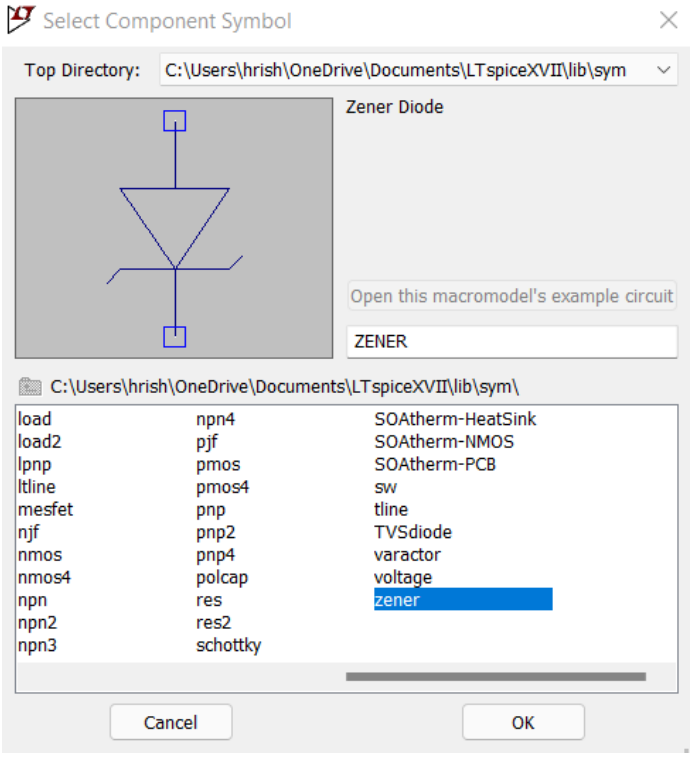
Working

This diode has a thin depletion layer. So, during the reverse bias also, the electrons flow through the depletion layer and hence current flows through the diode. A Zener diode works just like a regular diode in forward bias.When the voltage across the terminals of a Zener diode is reversed and the potential reaches the Zener Voltage (knee voltage), the junction breaks down and the current flows in the reverse direction. This effect is known as the Zener Effect.

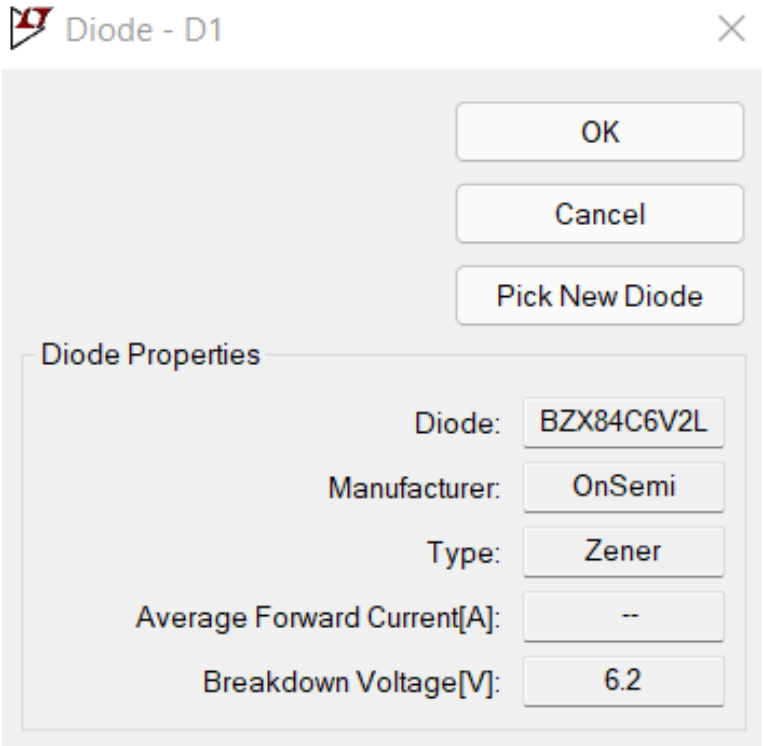
STEPS:

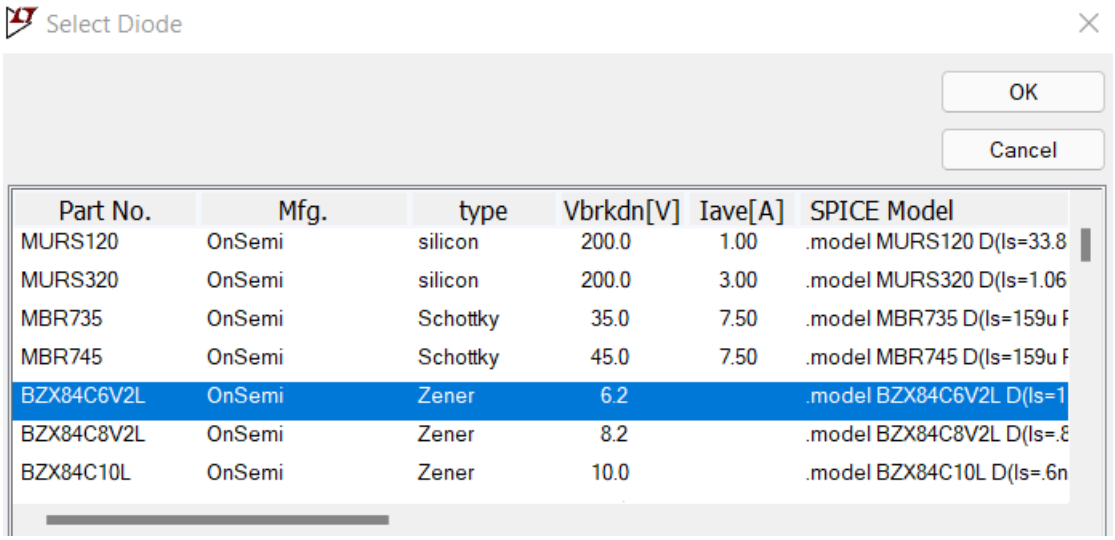
- Go to LT-spice and open new schematic.
- Write name and reg.no. in the text button on the toolbar.
- Using Voltage source, resistor, Zener diode and grounding draw the circuit as shown in the circuit diagram using tool bar and component library.

- For Zener diode click on component button on the toolbar and search Zener.

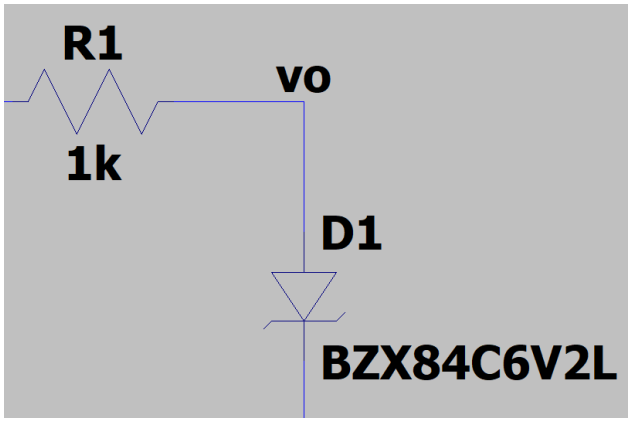


- Give value of Voltage source as 5V, give resistor a value of 1k ohms.
- Right click on the Zener diode, and click on pick new diode and choose the one with Zener and breakdown voltage 6.2V with model number - BZX84C6V2L.

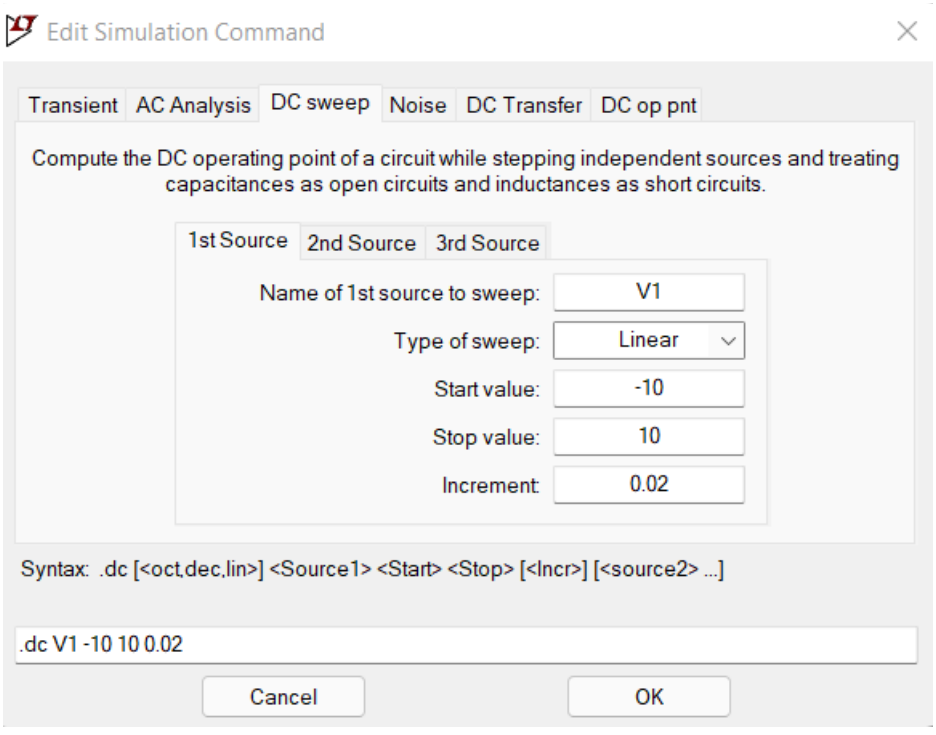




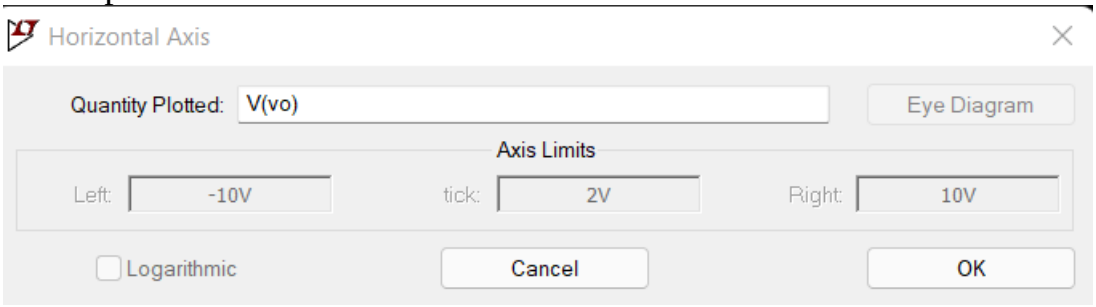
- Now click on the label button on the toolbar and type vo and then place it on the point connecting the resistor and the Zener diode.



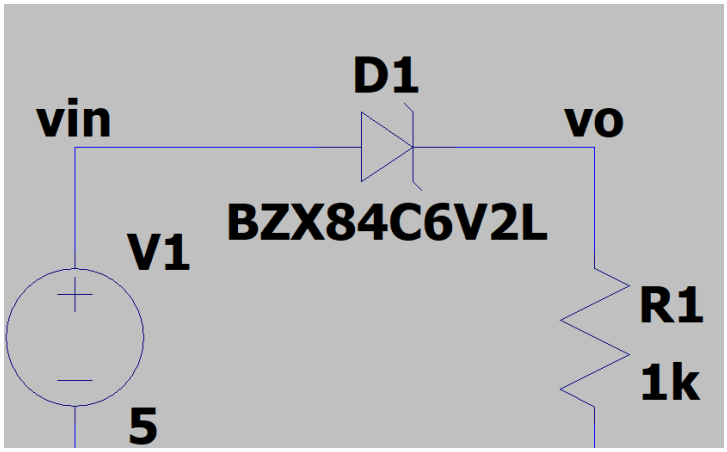
- Now go to the section, under edit simulation command, go under DC sweep and give the values as shown below.



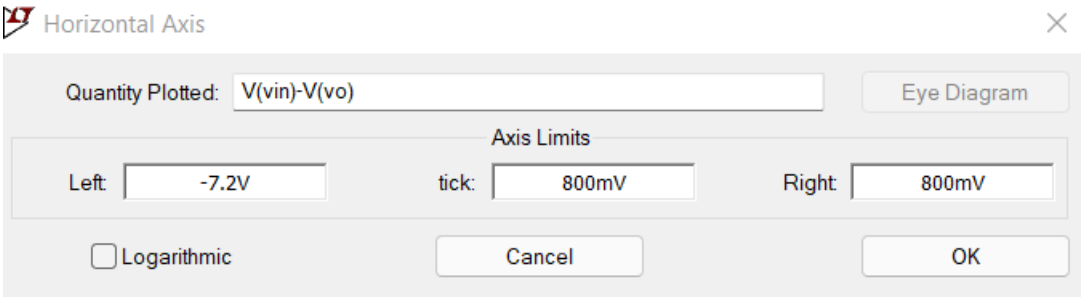
- Click on the run button, a graph opens up.
- Now go on to the X-axis right click, under quantity plotted type in V(vo) which takes voltage of vo point in the x-axis.



- And now, left click on the Zener diode to plot the VI characteristics.
- Now, we have to repeat a similar process but by switching the places of Zener Diode and the resistor.
- All the simulation settings, Zener diode settings and all component values are the same as previous.
- But, in this we have to also label the point in between voltage source and Zener diode vin and the point between Zener diode and resistor as vo.

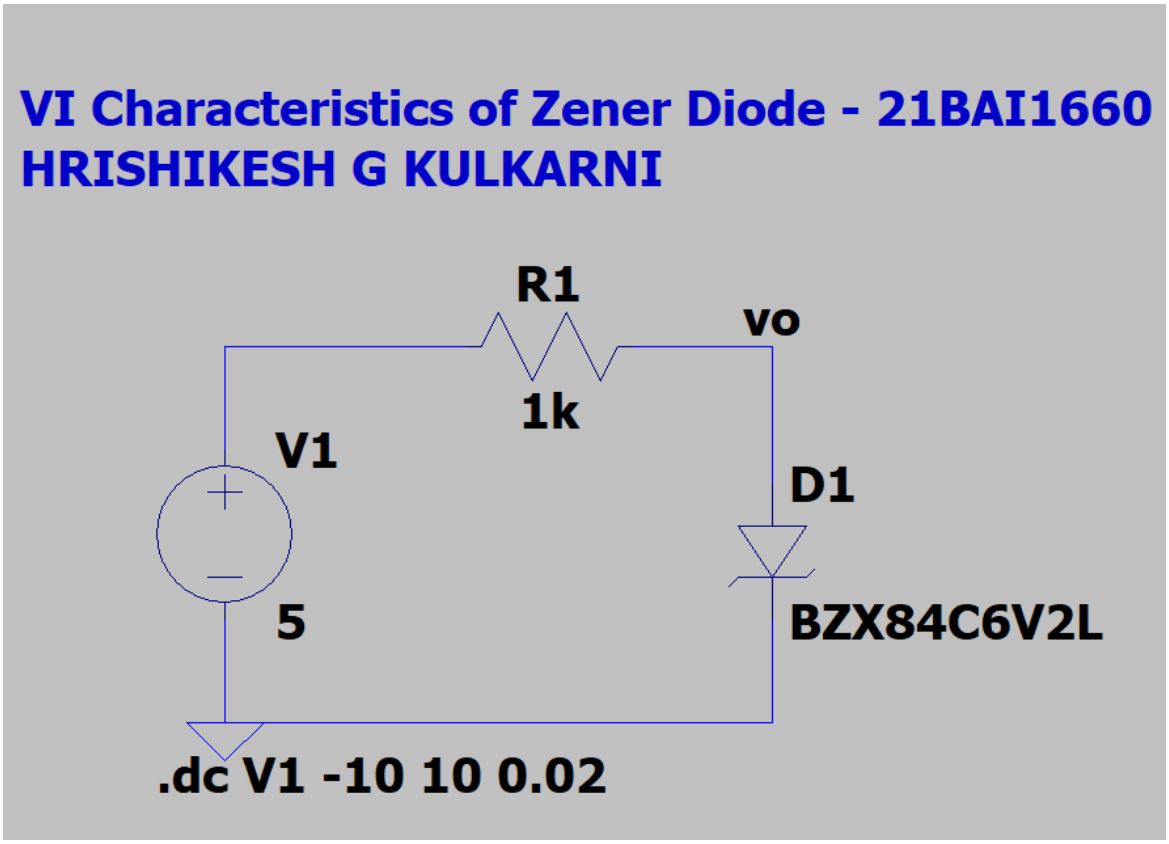


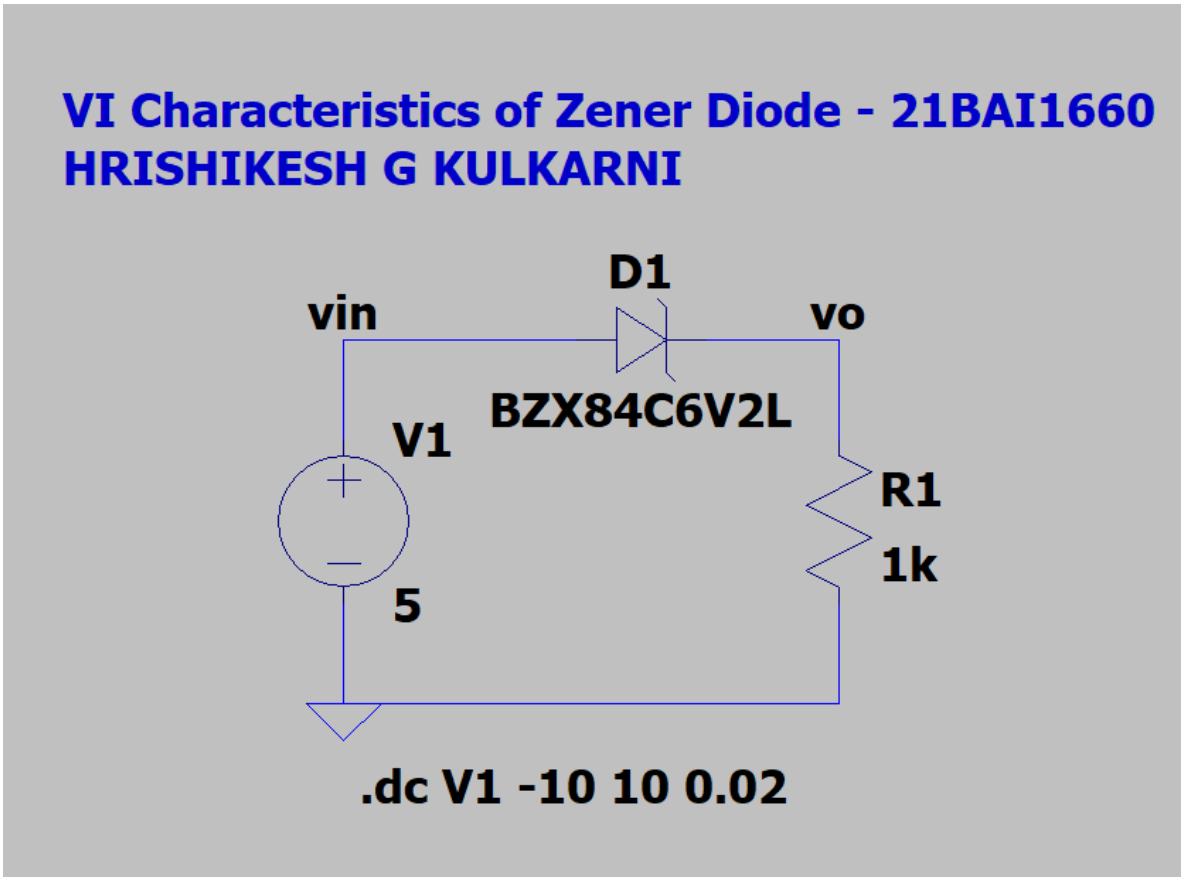
- Now we click on run, a graph opens.
- Now take the cursor on X-axis and we right click, under quantity plotted we type in V(vin) – V(vo).



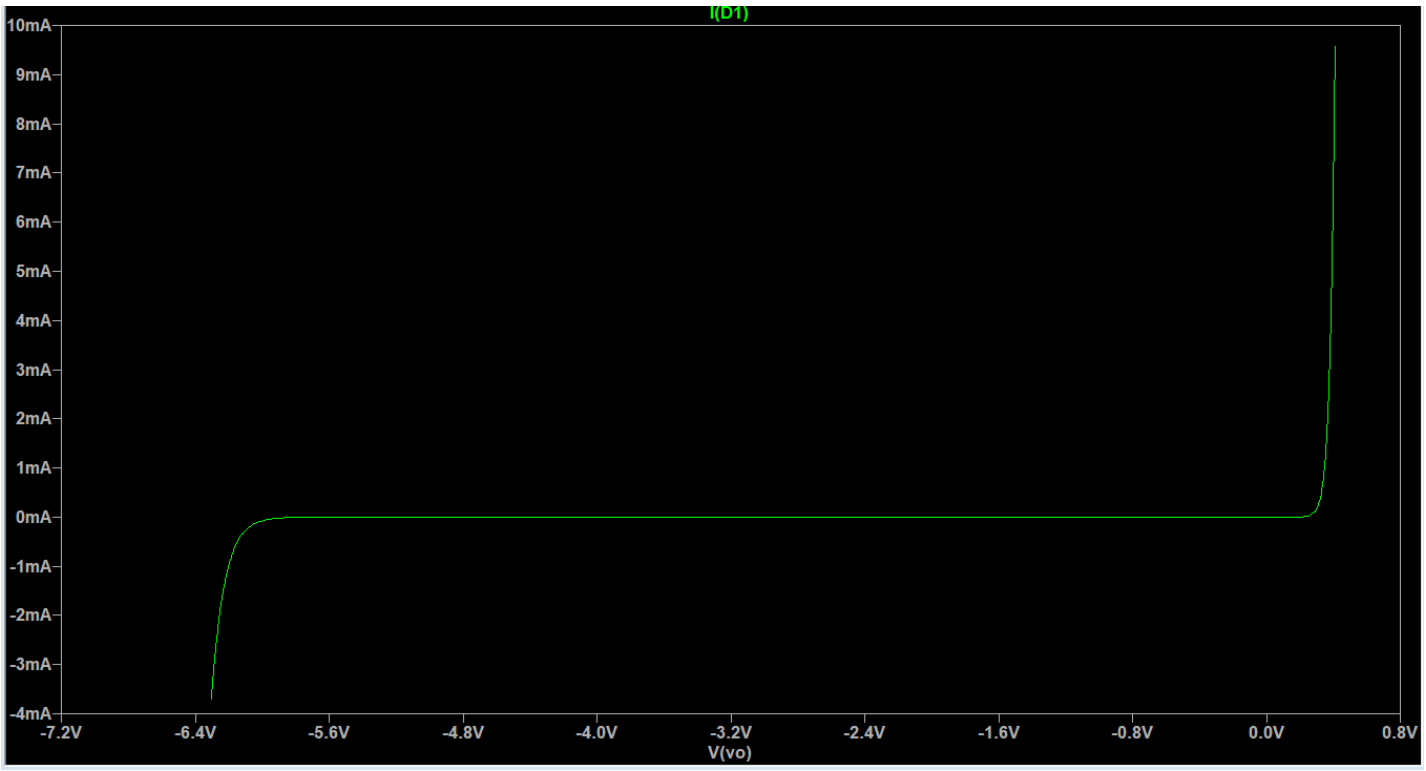
- This gives the VI characteristic plots of the Zener diode.

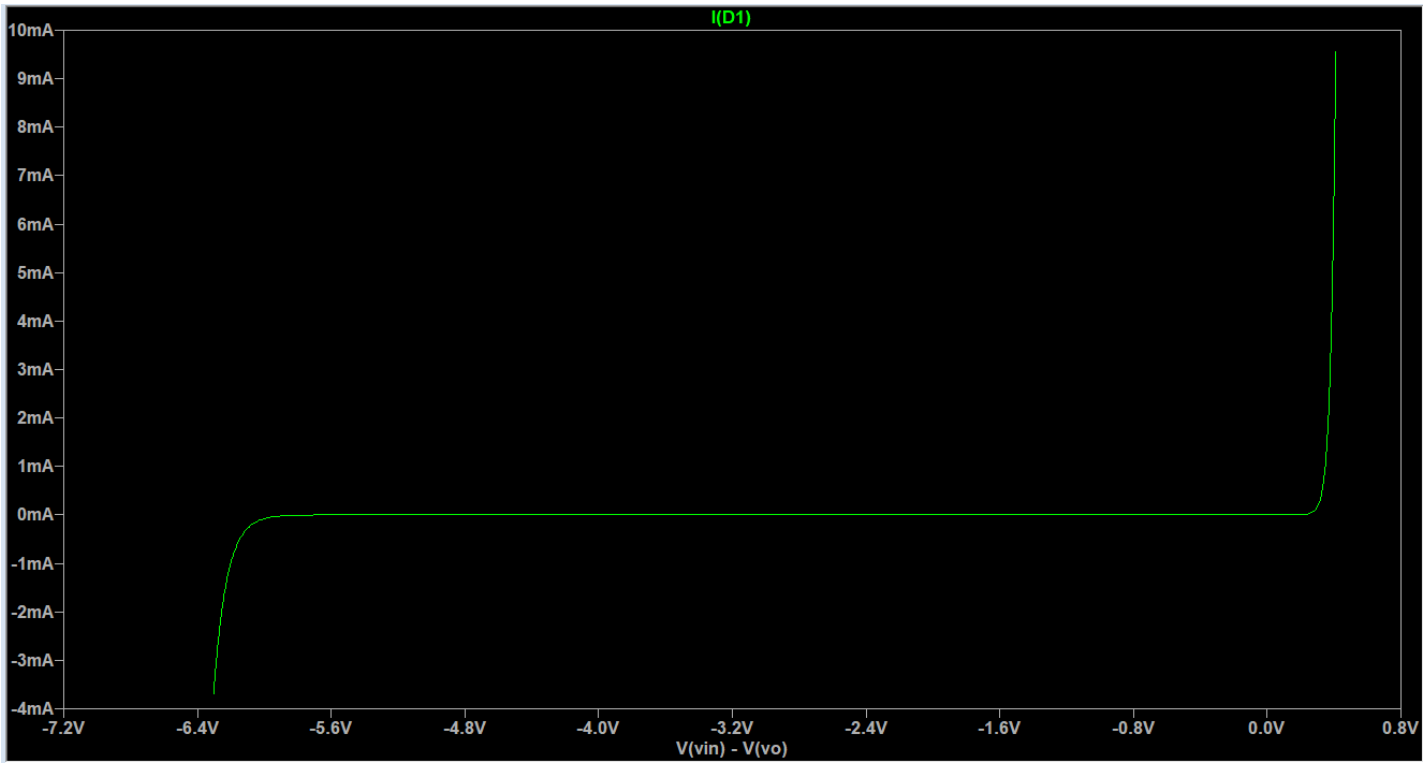
CIRCUIT DIAGRAMS:





OUTPUT:





INFERENCE

From the above LT-Spice simulation, we can say that a Zener diode allows current to flow through it even in reverse bias and we have understood the the working of Zener diode and observed its V-I characteristics.

-----THE END-----