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Electrical/Electronics Engineering.

18/ENCO4/1018.

Basic Elect.

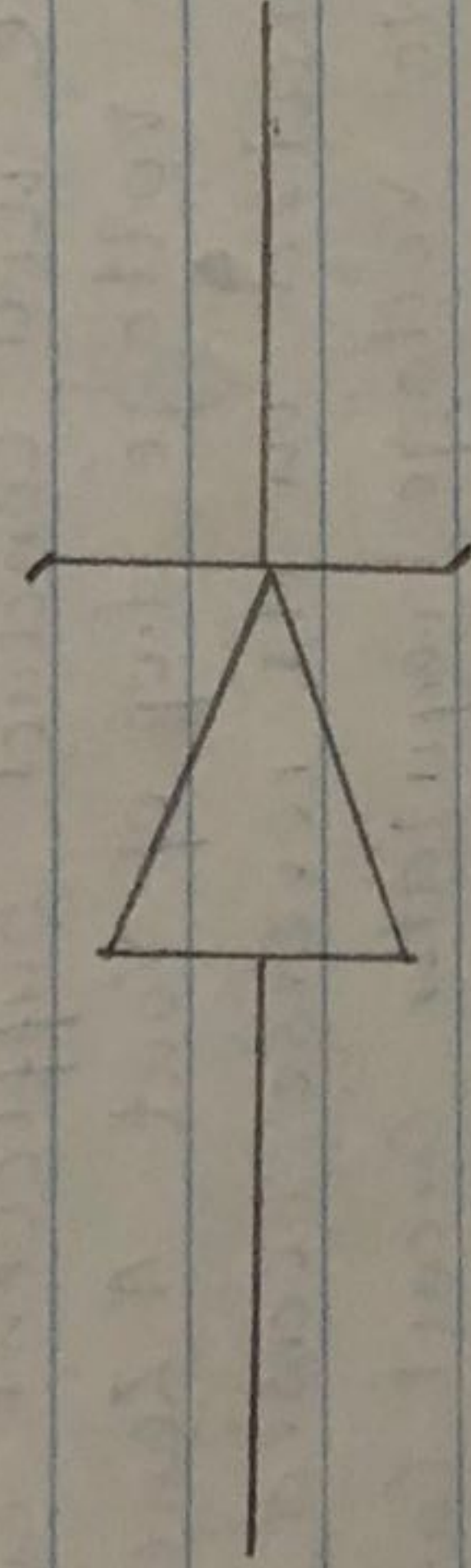
1. Zener Diode Regulator.

Zener Diodes can be used to produce a stabilised voltage output with low ripple under varying load current conditions. By passing a small current through the diode from a voltage source, via, a suitable current limiting resistor (R_S), the Zener diode will conduct sufficient current to maintain a voltage drop of V_{out} . A Zener diode is always operated in its reverse biased condition. As such a simple voltage regulator circuit can be designed using a Zener diode to maintain a constant DC output voltage across the load in spite of variations in the input voltage or changes in the load current. The Zener diode provides a path for the current to flow and hence the load gets protected from excessive currents. ~~The~~ The ability to control itself can be used to great effect to regulate or stabilise a voltage source against supply or load variations. The fact that the voltage across the diode in the breakdown region is almost constant turns out to be an important application of the Zener diode as a voltage regulator. The Zener diode is like a general-purpose signal diode, when biased in the forward direction it behaves just like a normal signal diode, but when reverse voltage is applied to it, the voltage

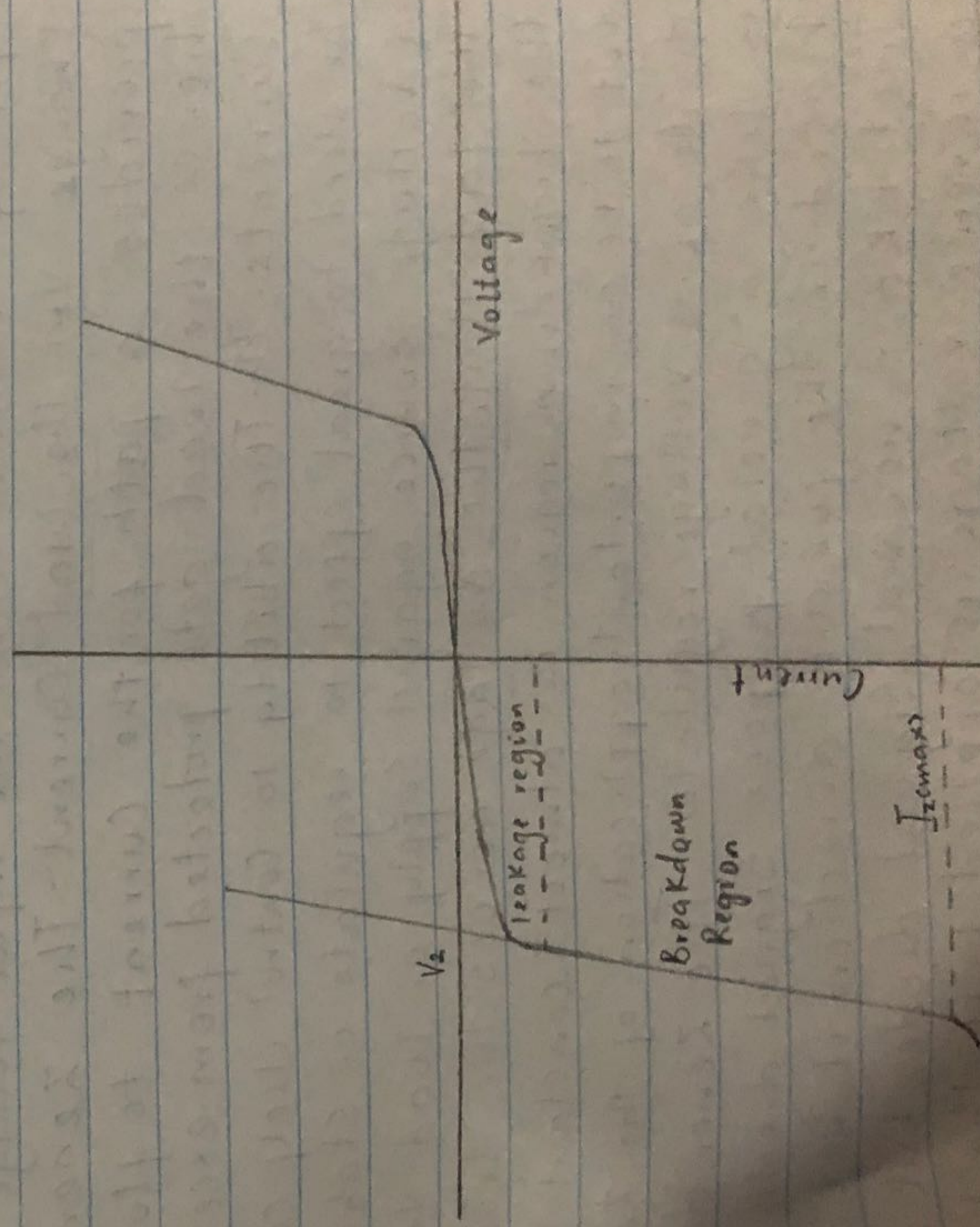
remains constant for a wide range of currents.

The forward bias region of a Zener diode is identical to that of a regular diode. The typical forward voltage at room temperature with a current of around 1mA is around 0.6 volts. In the reverse bias condition the Zener diode is an open circuit and only a small leakage current is flowing as shown on the exaggerated plot.

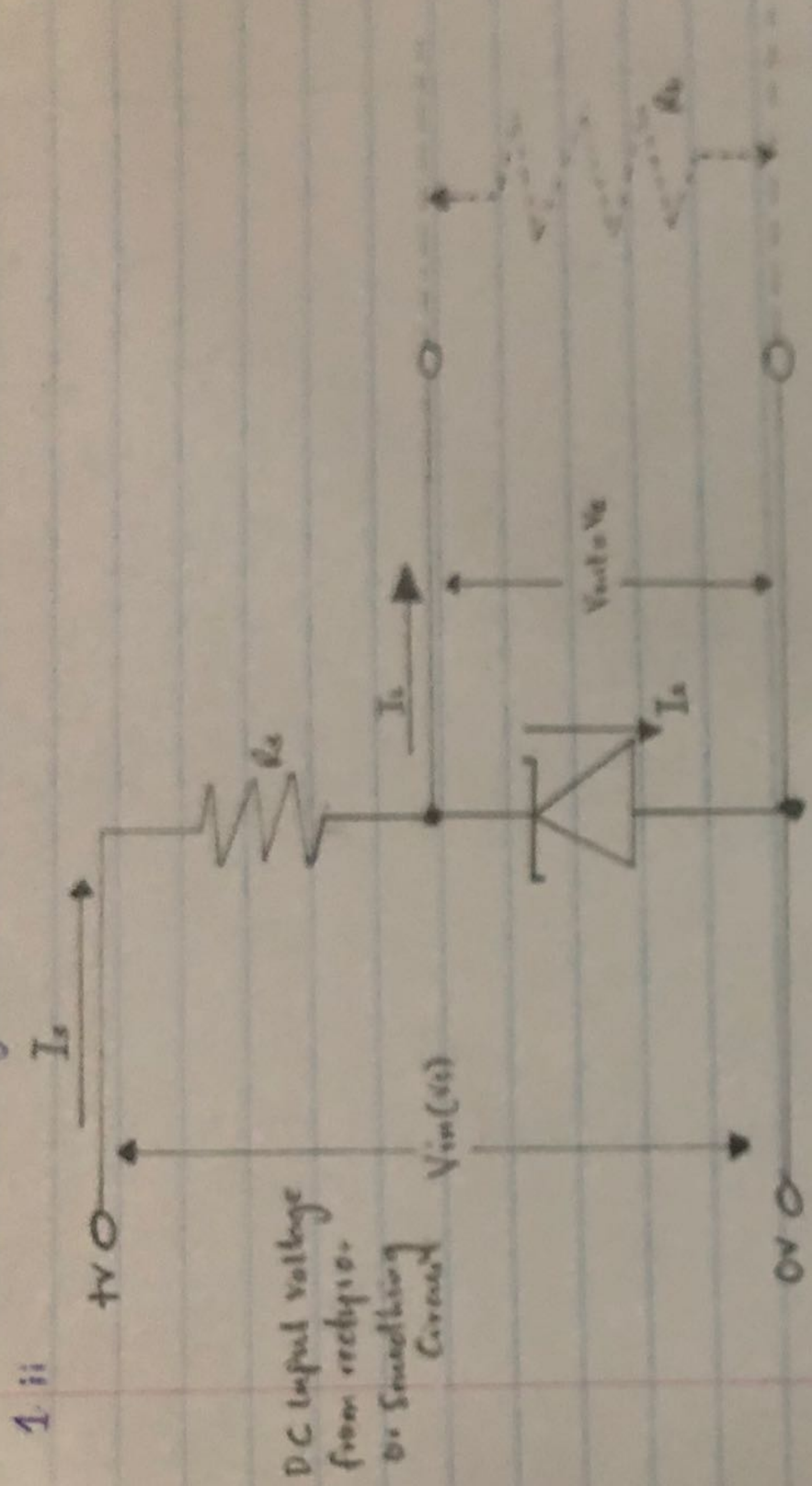
1:



Symbol of Zener Diode.



Circuit Diagram:



2a. First Voltage of Zener diode

$$V_{Z, \text{ Watt}} = \frac{5}{500 \text{ mA}} = 10 \text{ V}$$

This Minimum Value

$$R_s = \frac{V_s - V_z}{I_z} = \frac{20 - 10}{500 \text{ mA}}$$

$$R_s = 20 \Omega$$

2b Current at 500Ω

$$I_L = \frac{V_z}{R_L} = \frac{10}{500 \Omega} = 0.02 \text{ A}$$

$$I_L = 0.02 \text{ A}$$