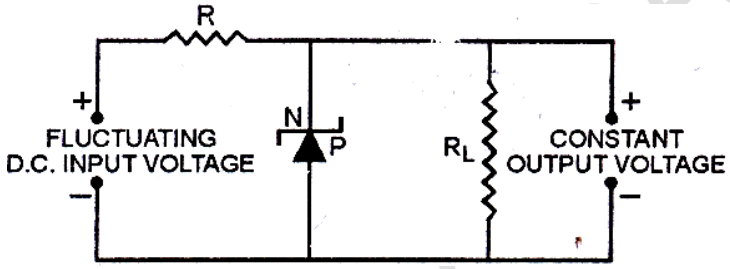
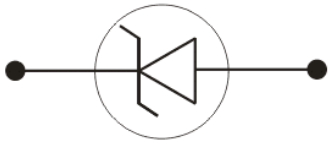
Project Report

Project Name: Zener Diode





Submitted To:

Submitted By:

Aim: To Design and simulate Zener Diode.

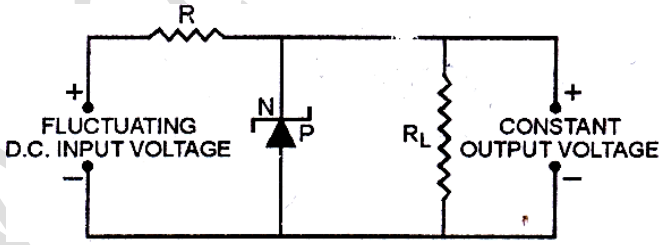
Components: p-n diode, Transformer, Resistance and LED.

Theory and Construction:

In the usual junction diodes, when the applied reverse bias increases a particular large value, the reverse current increases suddenly on increasing the reverse bias even slightly. This particular large value of reverse bias is called breakdown voltage. An ordinary junction diode of low power rating will get destroyed on applying reverse bias above its breakdown voltage.

The specially designed junction diodes, which can operate in the reverse breakdown voltage region continuously without being damaged, are called zener diodes.

A zener diode is represented by the symbol as shown in the figure.

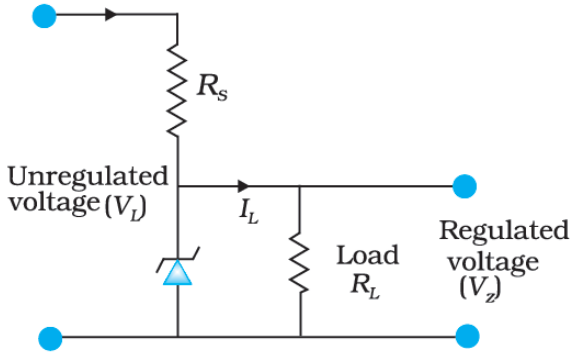


The next figure shows the use of zener diode in providing a constant voltage supply. This use of zener diode is based on the fact that in reverse break down (or zener) region, a very small change in voltage across the zener diode produces a very large change in the current through the circuit. If voltage is increased beyond zener voltage; the resistance of the zener diode drops considerably. Consider that the zener diode and the resistor R, called dropping resistor are connected to a fluctuating d.c. supply (say of a rectifier), such that the zener diode is reverse

biased. Whenever voltage across the diode tends to increase, the current through the diode rises out of proportion and causes a sufficient increase in voltage drop across the dropping resistor. As a result, the output voltage lowers back to the normal value.

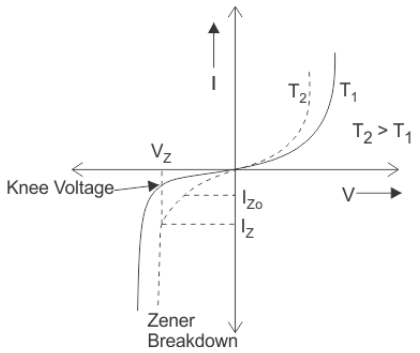
Working and Application :

(Zener Diode as Voltage Regulator)



The unregulated dc voltage (filtered output of a rectifier) is connected to the Zener diode through a series resistance R_s such that the Zener diode is reverse biased. If the input voltage increases, the current through R_s and Zener diode also increases. This increases the voltage drop across R_s without any change in the voltage across the Zener diode. This is because in the breakdown region, Zener voltage remains constant even though the current through the Zener diode changes. Similarly, if the input voltage decreases, the current through R_s and Zener diode also decreases. The voltage drop across R_s decreases without any change in the voltage across the Zener diode. Thus any increase/ decrease in the input voltage results in, increase/ decrease of the voltage drop across R_s without any change in voltage across the Zener diode. Thus the Zener diode acts as a voltage regulator. We have to select the Zener diode according to the required output voltage and accordingly the series resistance R_s.

Characteristics of Zener Diode



The above diagram shows the V-I characteristics of the zener diode. When the diode is connected in forward bias, this diode acts as a normal diode but when the reverse bias voltage is greater than a predetermined voltage zener breakdown voltage takes place. To make the breakdown voltage sharp and distinct, the doping is controlled and the surface imperfections are avoided. In the V-I characteristics above Vz is the zener voltage, we can say. It is also the knee voltage because at this point the current is the current is very rapid.