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CHEMICAL ENGINEERING

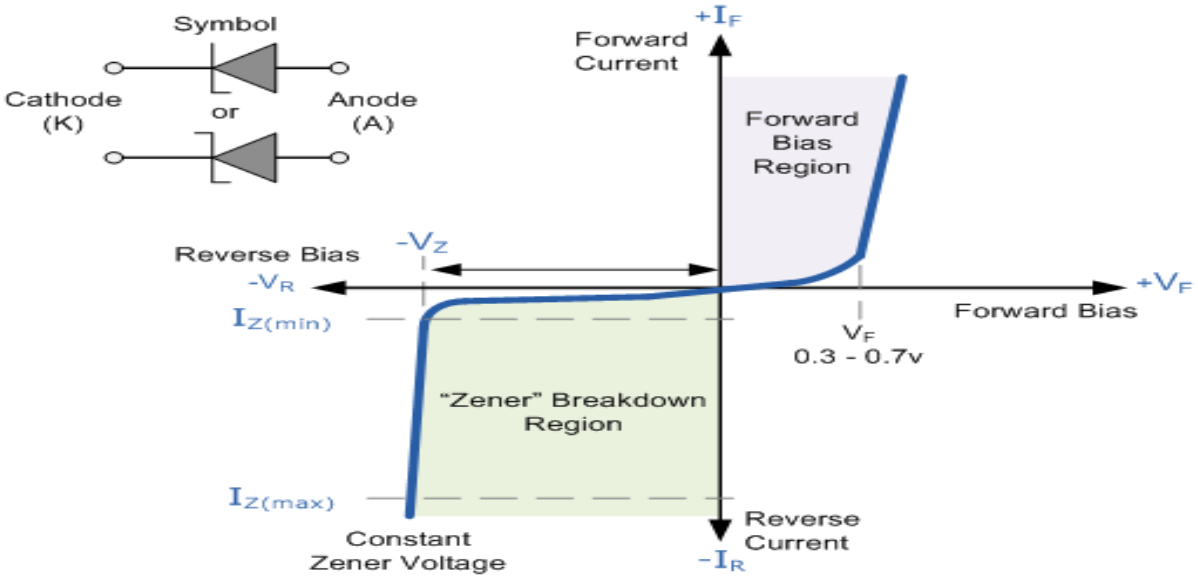
18/ENG01/016

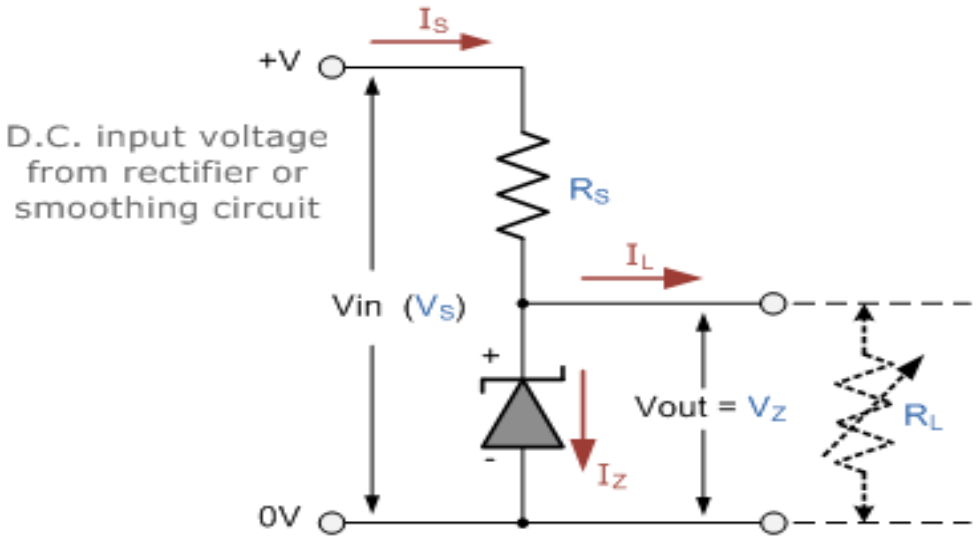
BASIC ELECTRICITY

ENG 222

1.) ZENER DIODE

Zener diode is a type of diode that allows current to flow in the conventional manner from its anode to its cathode i.e. when the anode is positive with respect to the cathode. When the voltage across the terminals is reversed and the potential reaches the Zener voltage (or "knee"), the junction will break down and current will flow in the reverse direction a desired characteristic. However, the Zener Diode or “Breakdown Diode” as they are sometimes called, are basically the same as the standard PN junction diode but are specially designed to have a low pre-determined Reverse Breakdown Voltage that takes advantage of this high reverse voltage.





2.) A 5W maximum rated zener diode has 500mA maximum current flowing through it. If a 20Vmax bridge rectifier circuit is connected as input to the regulator circuit. Calculate:

The minimum value of the series resistor to the zener diode

The current across the diode at full load of 500Ω

Solution

i.) Pz= 5Watt

Iz= 500 m A

20Vmax

To convert Vmax to VDc ,

Vs=VDC=$\frac{2Vmax}{\pi}$

Vs=$\frac{2\times20}{\pi}$ = 12.73VDc

Recall that P=IV

Vz= $\frac{Pz}{Iz} = \frac{5}{500 \times 10^{-3}}$

Vz= 10v

Recall that Vz + Vr = Vs

Vr = Vs – Vz

= 12.73 – 10

=2.73

Since V = IR

R=$\frac{V}{I}$

=$\frac{2.73}{500 \times 10^{-3}}$ = 5.46 Ω

ii.) Then remember that the zener diode is in series with the resistor therefore the same current flows through them

Is = Iz + IL

Iz = Is – IL

IL= $\frac{Vz}{R}$

= $\frac{10v}{500\Omega}$ = 0.02A = 20m A

Iz= 500m A – 20m A

=480m A = 0.48A.