

# Named Nominally Dynamic feature

Mst No: 18/ENL/08/01

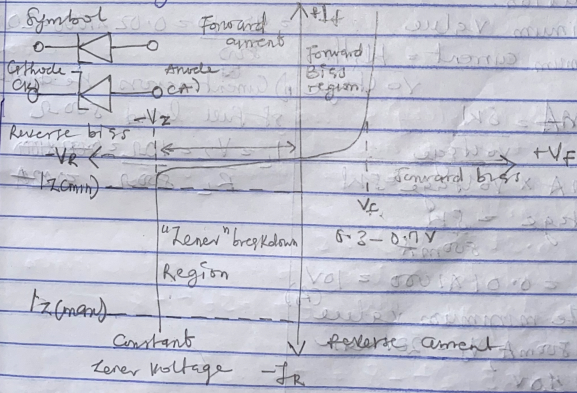
Dept: Biomedical Engineering

1) Describe a Zener diode regulator

The Zener diode can be used to produce a stabilized voltage output with low ripple under varying load conditions. By passing a small current through the diode from voltage source, via a suitable limiting resistor ( $R_L$ ) the Zener diode will conduct sufficient current to maintain a voltage drop of  $V_{out}$ .

The DC output voltage from the half or full wave rectifiers contains ripple superimposed onto the DC voltage and this is the load value changes so does the average output voltage. By connecting a simple Zener stabilizer circuit across the rectifier, a more stable output voltage can be produced.

2) Sketch the symbol and I-V characteristics curve



"Zener" breakdown Region

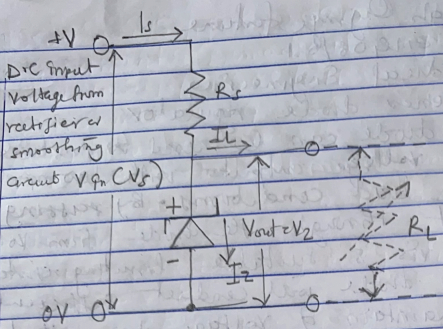
0.2 - 0.1 V

$V_{OL} = 500 \times 10^{-3} = 0.5$

Constant Zener voltage

Reverse current

$-I_R$



2. A 5W maximum rated Zener diode has 500mA maximum current flowing through it. If 20V max bridge rectifier circuit is connected as input to the regulator circuit calculate

- i) the minimum value of the series resistor to the Zener diode
- ii) the current across the diodes at full load 500Ω

Solution:

Minimum value  
 Maximum current =  $\frac{5W}{\text{Voltage}}$

$= \frac{20-10}{500} = 0.02 \times 1000 = 20\mu A$

$500mA = \frac{5W}{\text{Voltage}}$   
 $500mA \times \text{Voltage} = 5W$   
 $\text{Voltage} = \frac{5W}{500mA}$

ii) Current across the diodes at full load 500Ω

$I_L = \frac{V_Z}{R_L} = \frac{10V}{500\Omega} = 0.02A$

$= 0.01 \times 1000 = 10V$

∴ The minimum value

$I_Z = 500mA, V_Z = 20V \text{ max}$

$V_Z = 10V$   
 $R_{S} = \frac{V_S - V_Z}{I_Z}$