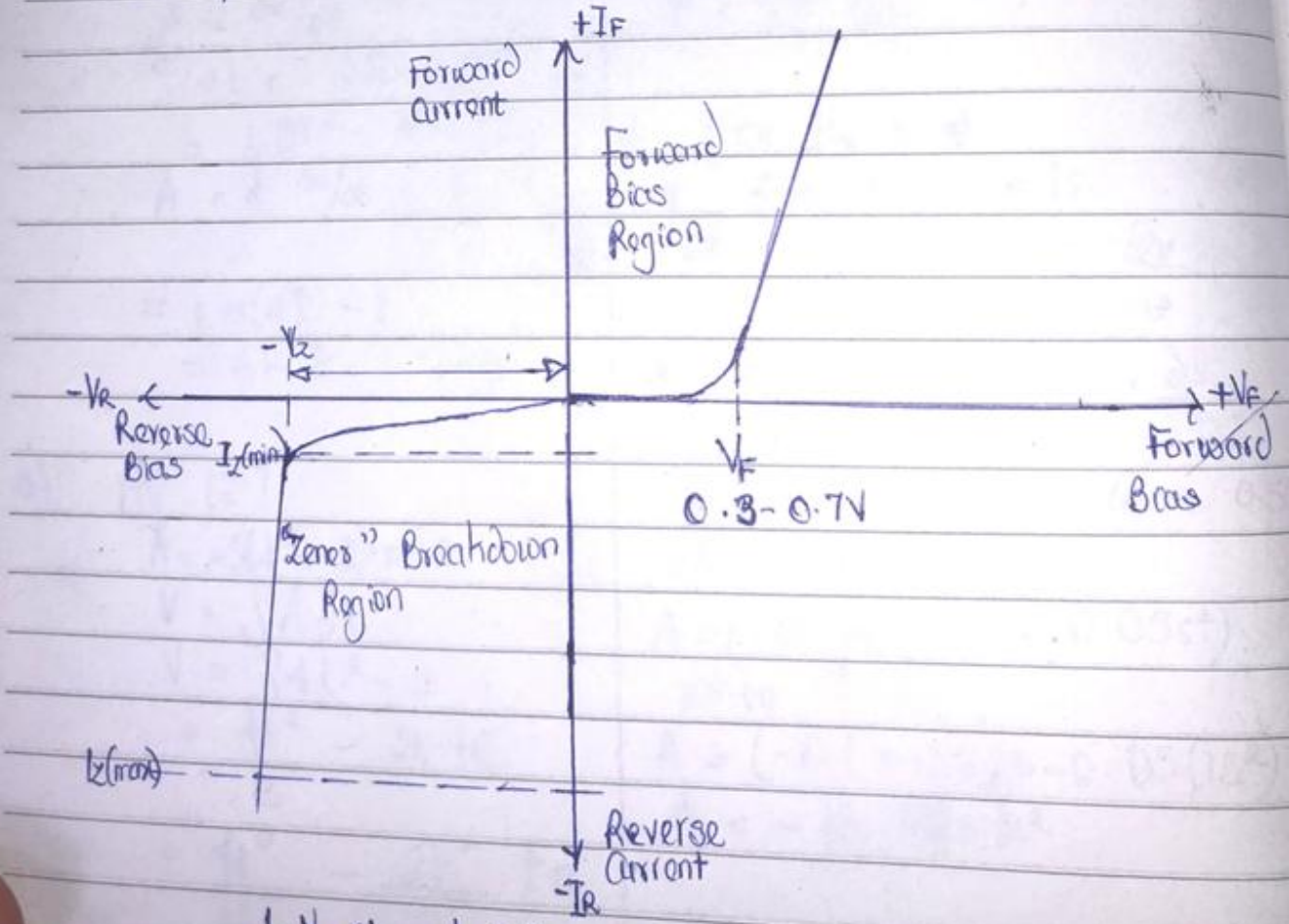
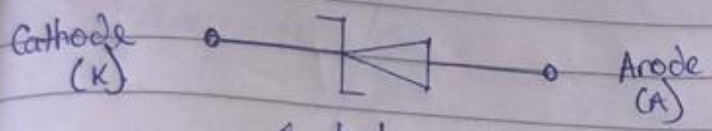
KIAKAMA FESTA NENGI
18/SCI14/025
CIVIL ENGINEERING

i) 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 a reverse voltage is applied to it, the voltage remains constant for a wide range of currents. It consists of a silicon PN junction. The diodes breakdown voltage of the devices, the diodes breakdown voltage is reached at which point a process called Avalanche Breakdown occurs in the semiconductor depletion layer and a current starts to flow through the diode to limit the increase in voltage.

i. The symbol and I-V characteristics curve,



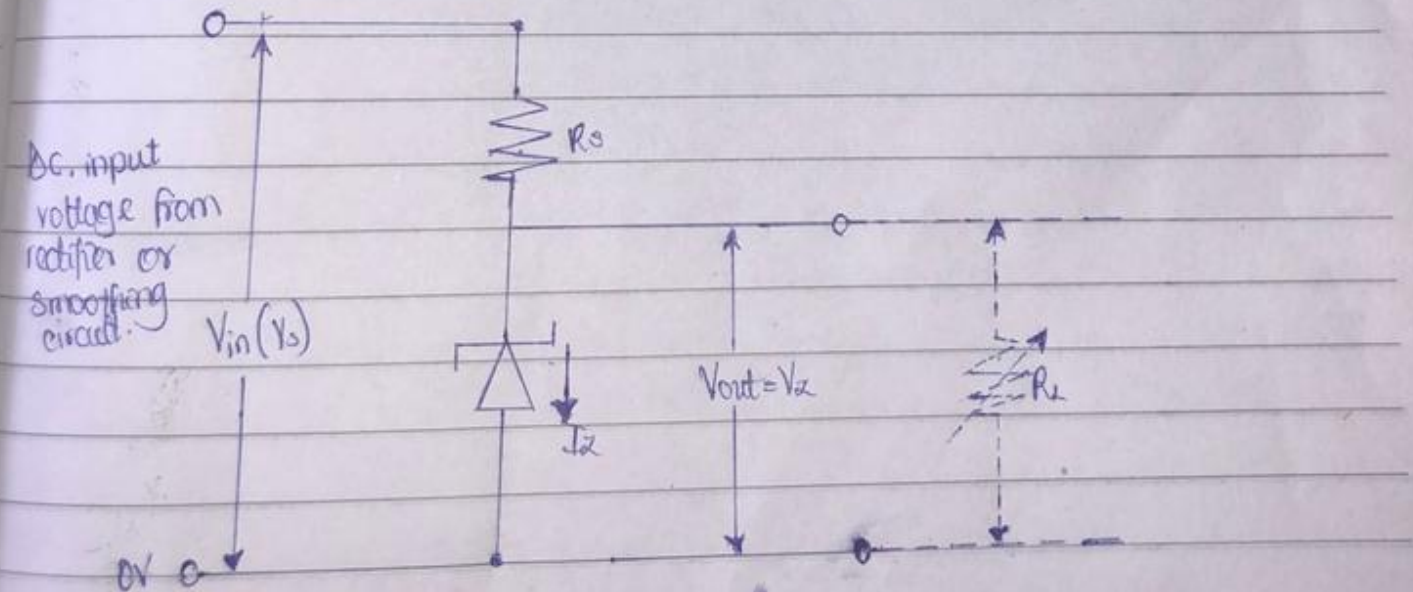
I-V Characteristics Curve.



Symbol

ii) Circuit Diagram

The function of a regulator is to provide a constant output voltage to a load connected in parallel with it inspite of the ripples in the supply voltage or the variation in the load current and the zener diode will continue to regulate the voltage until the diodes current falls below the minimum I_Z (min) value in the reverse breakdown region.



2) Maximum power = 5W

I_z = 500mA = 0.5A

20 V_{max} = V

∴ The max current = $\frac{\text{max Power}}{\text{voltage}} = \frac{5W}{V}$

= 0.5A

V_z = 10volts

Series

$V_R + V_z = V_{dc}$

$V_c = \frac{2V_{max}}{\pi}$

= 0.637 V_{max}

V_{dc} = 0.637 x 20

= 12.74 V_{dc}

$V_R + V_z$ = 12.74V

V_R + 10 = 12.74V

V_R = 12.74 - 10V

V_R = 2.74V

$R_{max} = \frac{V_s - V_z}{I_z}$

$= \frac{12.74 - 10}{0.5} = 5.48\Omega$

(ii) Load Current $I = \frac{V_z}{R} = \frac{10}{500} = 0.02A$

≈ 0.02A = 20mA

$I_z = I_s - I_l$

500 - 20 = 480mA