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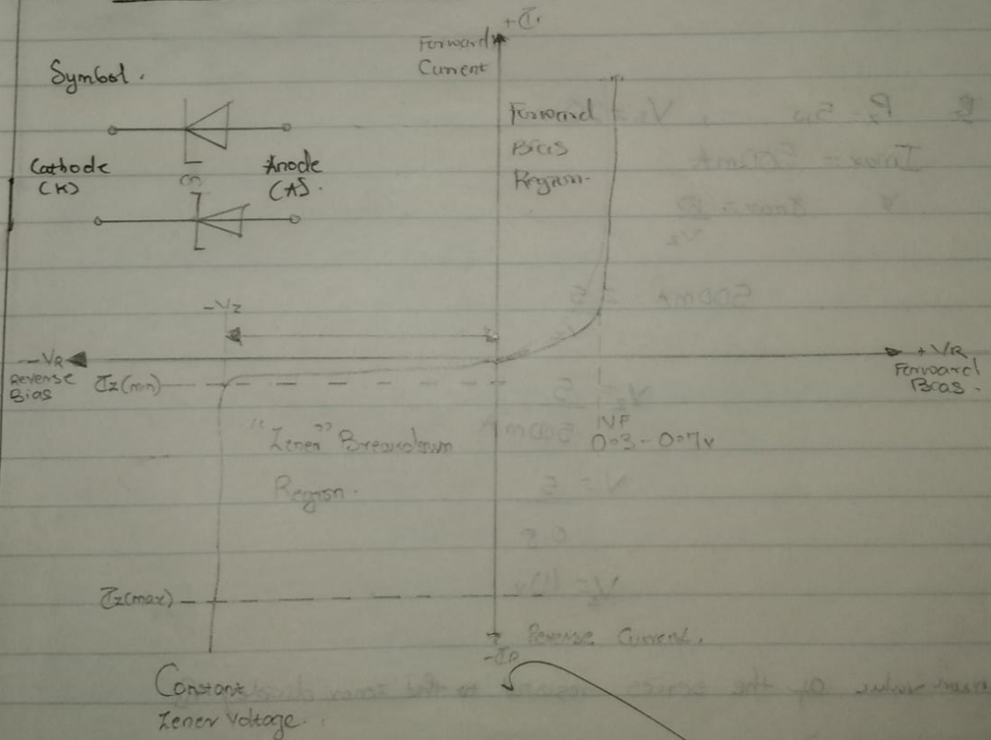
1). Zener Diode Regulator.

Zener diodes can be used to produce a stabilised voltage output with low ripple under a 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}.

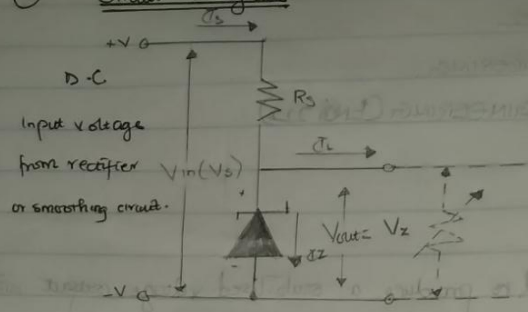
~~I-V curve~~

(i) I-V Characteristics Curve.



From the I-V characteristics curve above, we can see that the zener diode has a region in its reverse bias characteristics of almost a constant negative voltage regardless of the value of the current flowing through the diode.

(11) <u>Circuit Diagram.</u>



The resistor R_s, is connected in series with the zener diode ~~with the~~ limit the current flow through the diode with the voltage source, V_s being connected across the combination. The stabilised output voltage V_{out} is taken from across the zener diode.

2). ~~E~~ $P_z = 5W$, $V_s = 20V$

$I_{max} = 500mA$

∀ $I_{max} = \frac{W}{V_z}$

$500mA = \frac{5}{V_z}$

$V_z = \frac{5}{500mA}$

$V = \frac{5}{0.5}$

$V_z = 10V$

(i) Minimum value of the series resistor to the zener diode, R_s

$R_s = \frac{V_s - V_z}{I_z} = \frac{20 - 10}{500mA} = \frac{10}{0.5}$

$= 20\Omega$

(12) Current acro

$I_L = V$

(iv) Current across the diode at full load of 500Ω, I_L

$$I_L = \frac{V_Z}{R_L}$$ ~~$I_L = 20$~~

$$I_L = \frac{10}{500} \quad \frac{10}{500}$$

$$= 2mA$$