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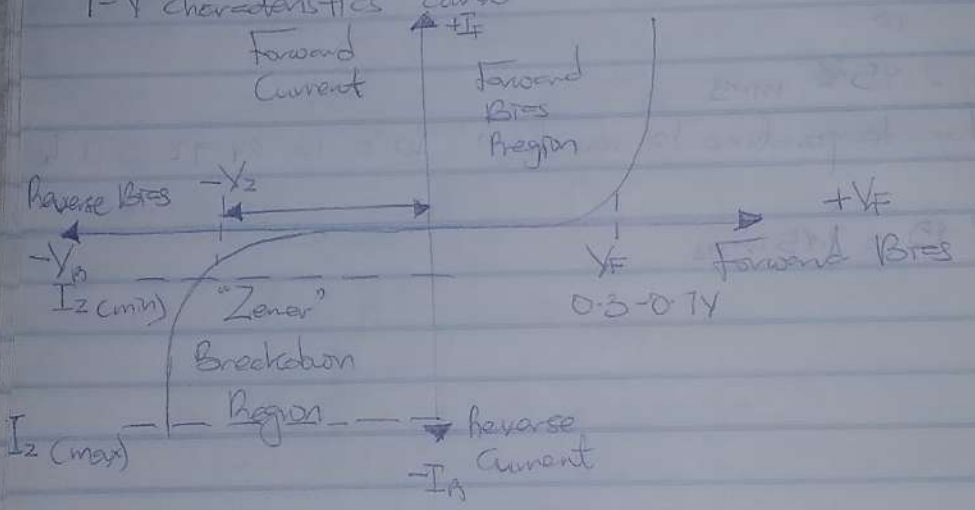
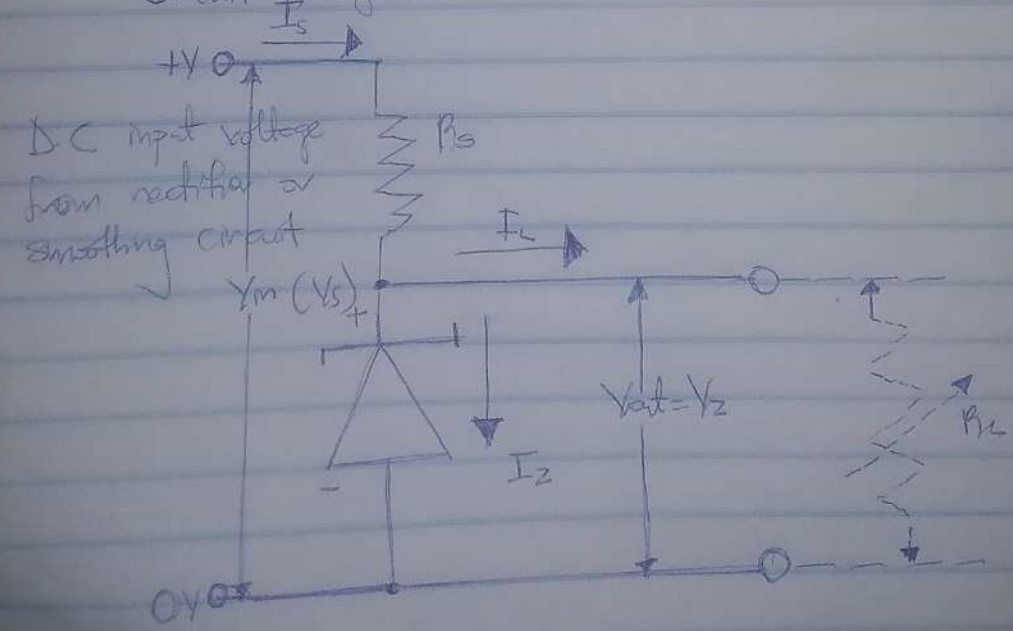
① The zener diode is the simplest type of voltage regulator and the point at which a zener diode breaks down or conducts is called the "Zener voltage" (V_Z). The zener diode is like a general-purpose signal diode consisting of a silicon PN junction. When biased in the forward direction it behaves just like a normal signal diode passing the rated current, but as soon as a reverse voltage applied across the zener diode exceeds the rated voltage of the device, 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 this increase in voltage.

I-V characteristics curve



Circuit Diagram



②

① Minimum V

$R_S = \frac{V_S - V}{I_Z}$

I_Z = Maximum

$V = IR$

V_{in} R

ⓘ The current

②

(i) Minimum Value of the series resistor

$$R_S = \frac{V_S - V_Z}{I_Z} =$$

I_Z = Maximum Current = 500mA

$$R = \frac{20}{500} = 0.04\Omega$$

(ii) The current across the diode at full load of 500 Ω.

$$I_L = \frac{V_Z}{R_L} = \frac{20}{500} = 0.04\,mA$$