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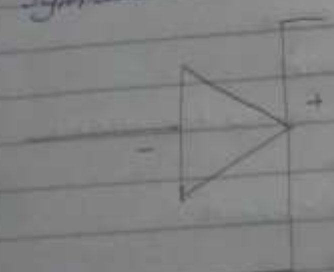
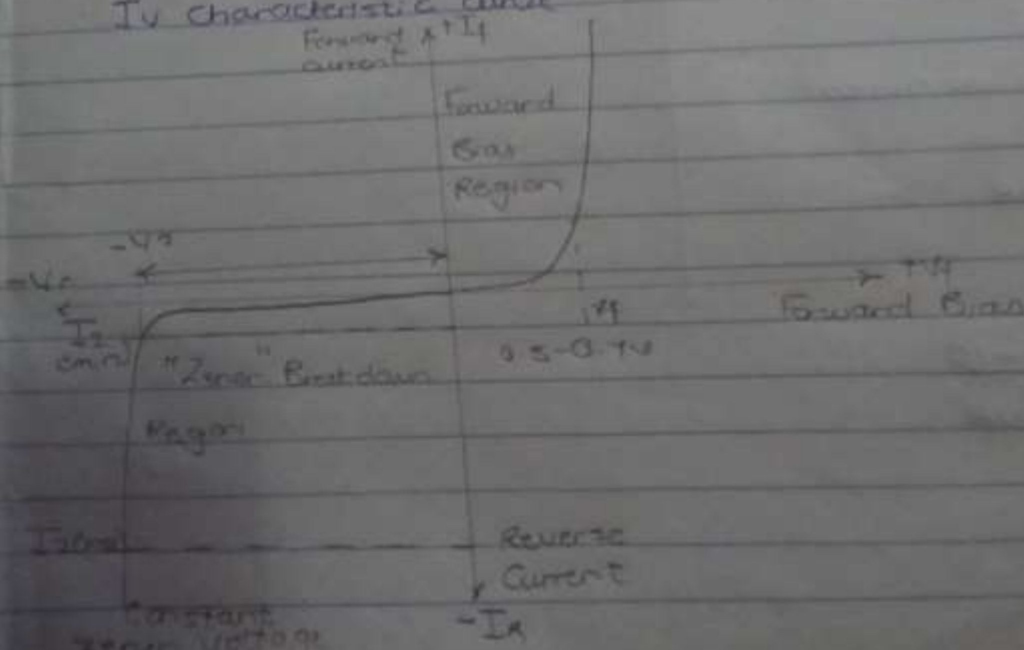
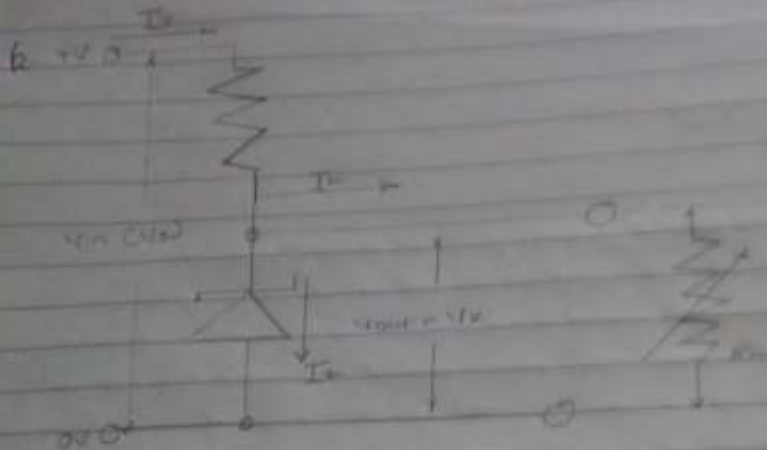
(a) A zener diode is like a general purpose diode, which consists of a silicon PN junction in which it behaves like a normal diode when forward biased, but as soon as a reverse voltage is applied across the zener diode exceeds the normal rated voltage of the device, the diodes break down voltage is reached at which point a process called Avalanche Break down occurs in the semiconductor depletion layer and a current starts to flow throw through the diode to limit this increase in voltage

Symbol



Iv characteristic curve





2 The minimum value of the series resistor

a) $R_S = \frac{V_S - V_Z}{I}$

where $V_S = \frac{2 \times V_{max}}{\pi}$

$= \frac{2 \times 20}{\pi}$

$= 12.73 V_S$

$R_S = 12.73 V_S$

$V_Z = \frac{P}{\text{Maximum current}}$

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

$= 10V$

$R_S = \frac{12.73 - 10}{500mA}$

$= 5.46\Omega$

b) $I_L = \frac{10}{500}$

$= 0.02A$

$= 20mA$

The current across the diode

$I_S = I_S - I_L$

$= 500mA - 20mA$

$= 480mA$