

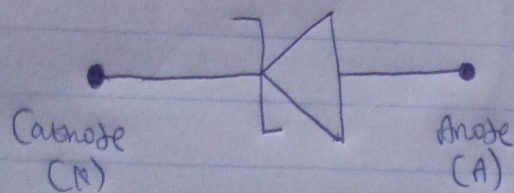
NAME: ONILEOWO JEREMIAH OLUWOLE
MAT NO:18/ENG04/066
DEPT:ELECT/ELECT

Solution to Assignment

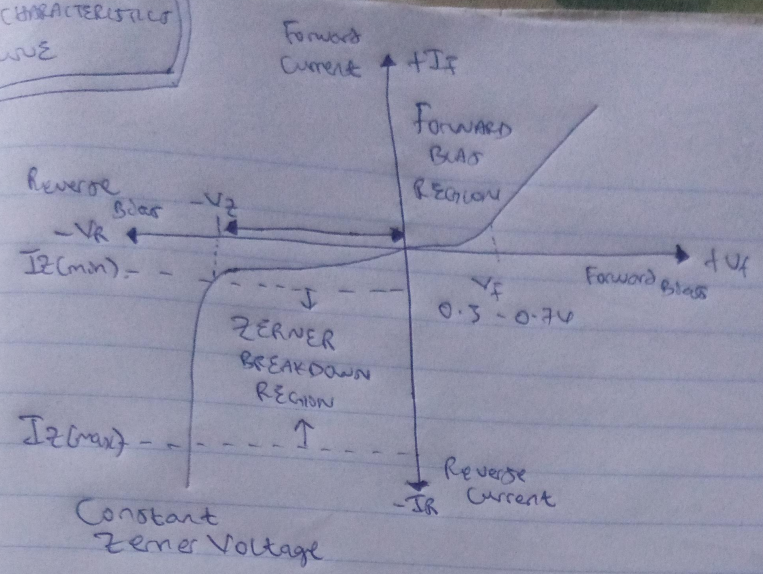
(1)

Zener Diode Voltage Regulator are used to regulate voltage across small loads. Zener Diodes have a sharp reverse breakdown voltage, and breakdown voltage will be constant for a wide range of currents. When the Zener diode is 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.

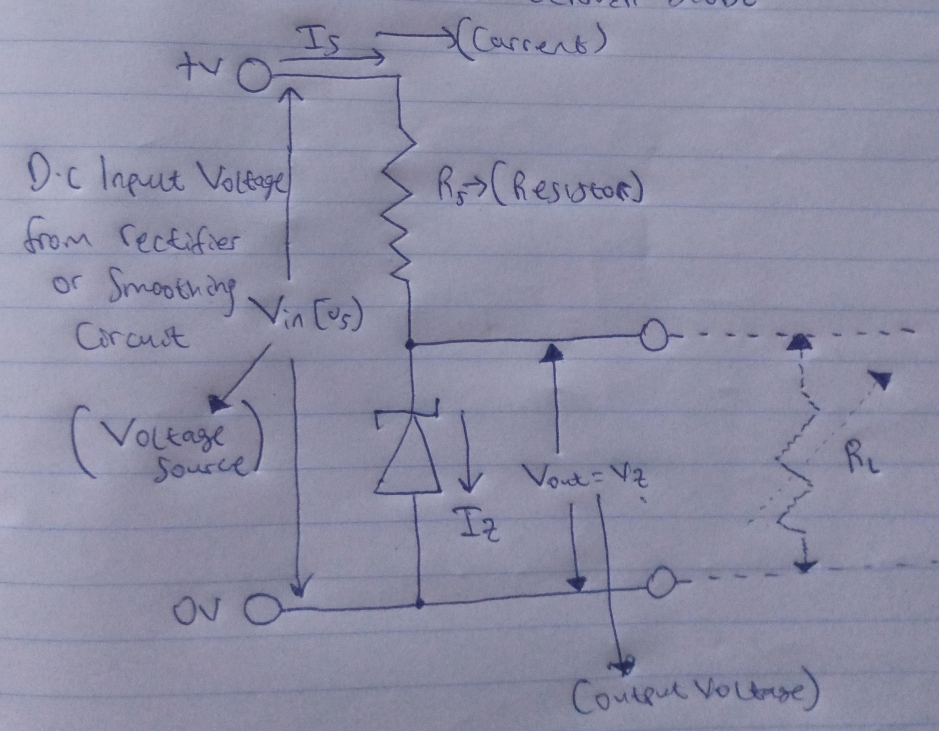
→ (i) ZENER SYMBOL



V CHARACTERISTICS CURVE



II CIRCUIT DIAGRAM FOR ZENER DIODE



(2)

$$P = 5W$$

$$I_Z = 500mA \\ = 500 \times 10^{-3} \\ = 0.5A$$

$$V_{max} = 20V_{max}$$

$$V_{DC} = \frac{2 \times V_{max}}{\pi} \\ = \frac{2 \times 20}{\pi} \Rightarrow \frac{40}{\pi} \Rightarrow 12.73V_{DC}$$

The minimum value of the series resistor to the Zener diode

$$R_S = \frac{V_S - V_Z}{I_Z}, \quad V_Z = 7$$

$$P_Z = I_Z V_Z$$

$$V_Z = \frac{P_Z}{I_Z} = \frac{5}{0.5}$$

$$= 10V$$

$$R_S = \frac{12.73 - 10}{0.5} = \frac{2.73}{0.5} = 5.46 \Omega$$

(1) The current across the load at full load of 500mA

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

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

$$= 0.02A$$

$$I = 20mA$$