

OLOGBOSERE ANTHONIA EFE

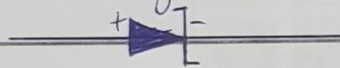
MECHATRONICS

18/ENG05/049

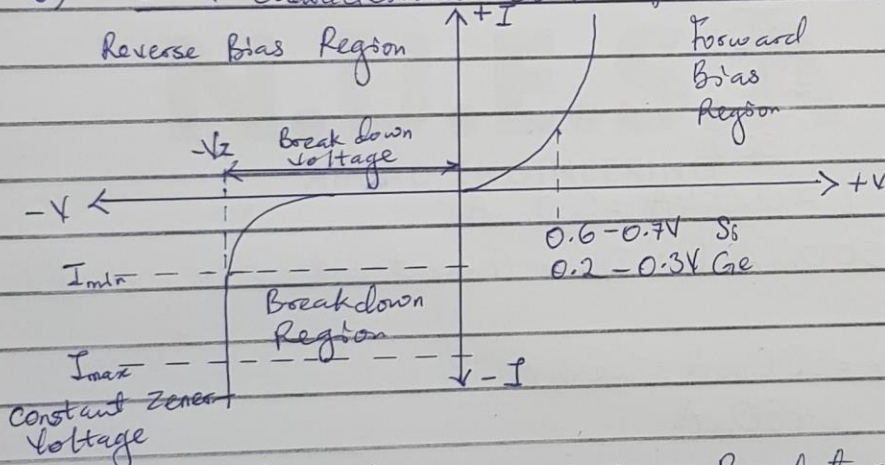
ENG 222

1. A zener diode regulator is the simplest form of voltage regulator formed by connecting a zener diode in the reverse bias position to the applied voltage. This diode takes advantage of its fixed breakdown voltage to produce an almost constant voltage output from an unsteady voltage input source

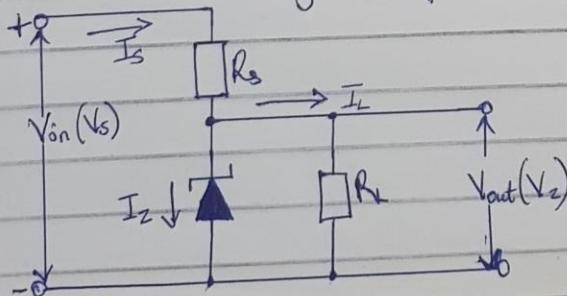
a) Zener Diode Symbol



b) I-V Characteristics Curve of Zener Diode



b) Circuit Diagram of Zener Regulator



$$2. P_z = 5W, I_z = 500mA \quad V_s = 20V_{max} = \frac{2 \times 20}{\pi} = 12.73V$$

But  $V_z = ?$

$$\begin{aligned} \text{a) Recall, } P_z &= I_z V_z \\ 5 &= 500 \times 10^{-3} \times V_z \\ V_z &= 10V \end{aligned}$$

$$\begin{aligned} \text{Also, } R_s &= \frac{V_s - V_z}{I_z} \\ &= \frac{12.73 - 10}{500 \times 10^{-3}} \\ R_s &= 5.46 \Omega \end{aligned}$$

$$\begin{aligned} \text{b) Recall, } I_s &= I_z + I_L \\ I_z &= I_s - I_L \end{aligned}$$

$$\begin{aligned} \text{But } I_L &= \frac{V_z}{R_L} \\ &= \frac{10}{500} \\ &= 0.02A \end{aligned}$$

$$I_L = 0.02A = 20mA$$

$$I_s = 500mA \text{ (ie Zener current without any load)}$$

$\therefore$

$$\begin{aligned} I_z &= 500mA - 20mA \\ &= 480mA \end{aligned}$$