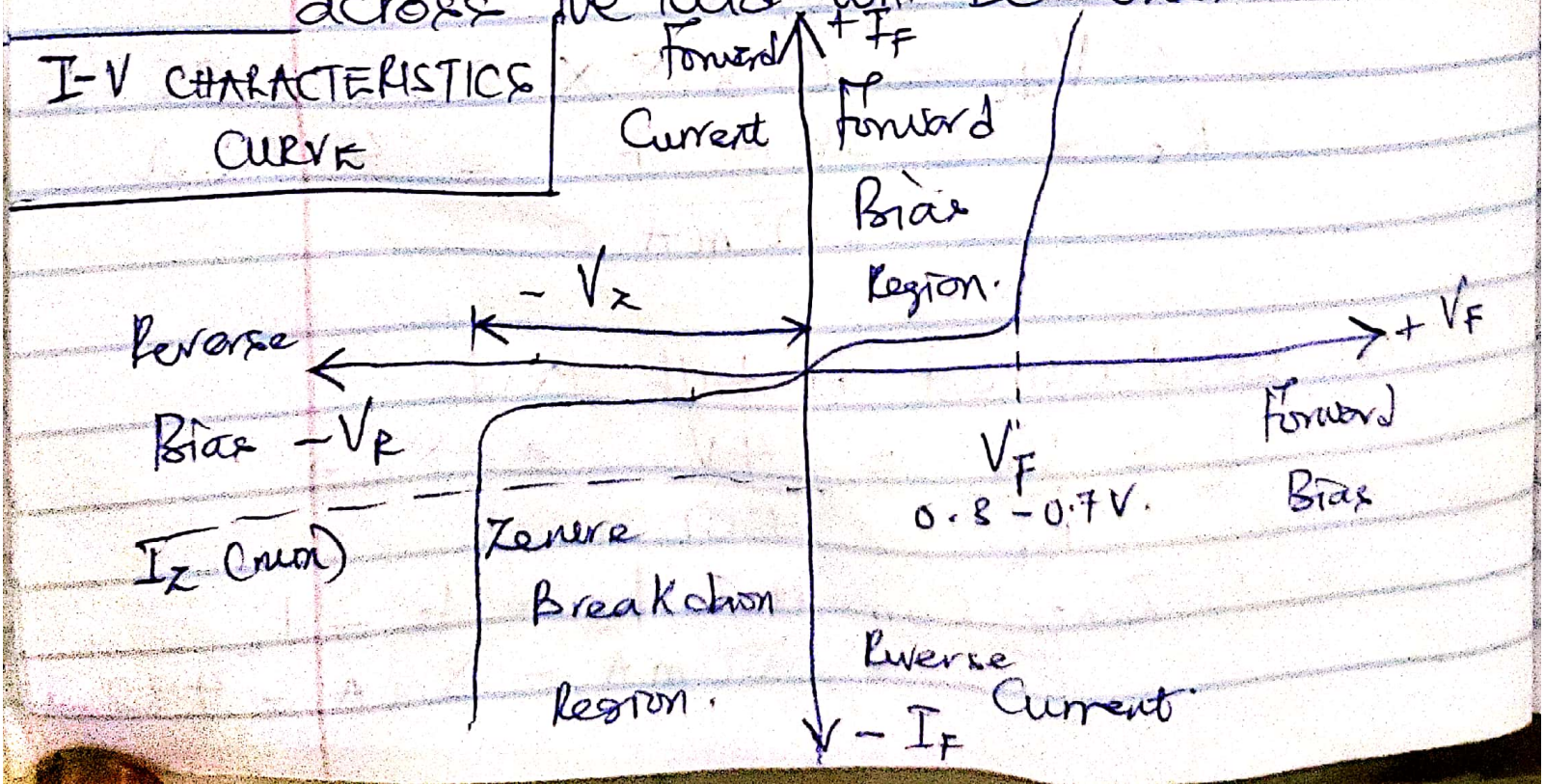
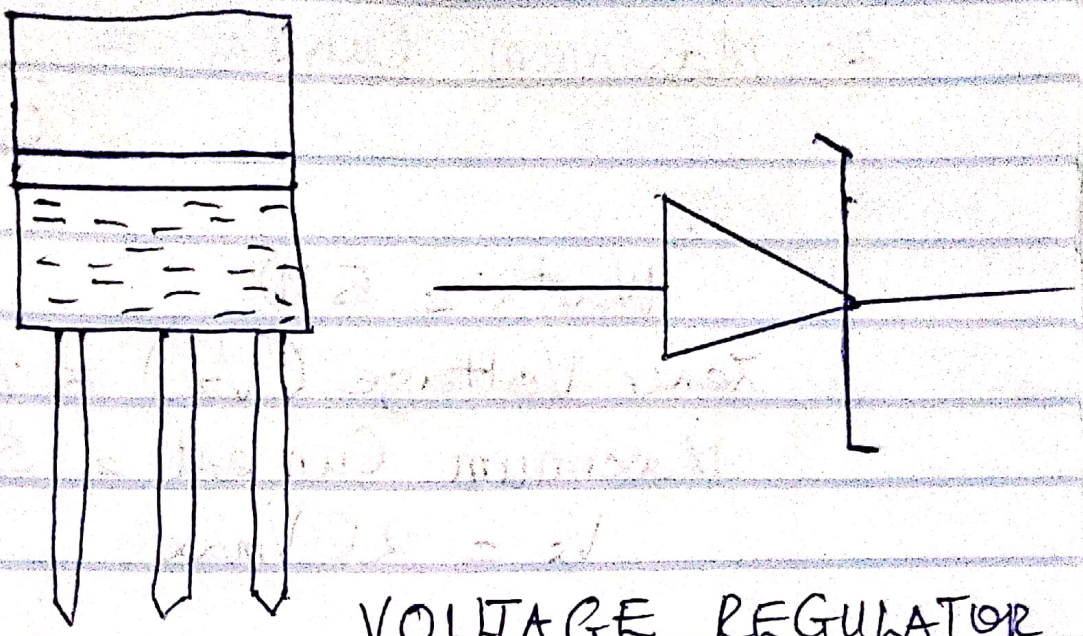
18/ENG05/064
Mechatronics Engineering.
Unah, Benjamin Sunday.

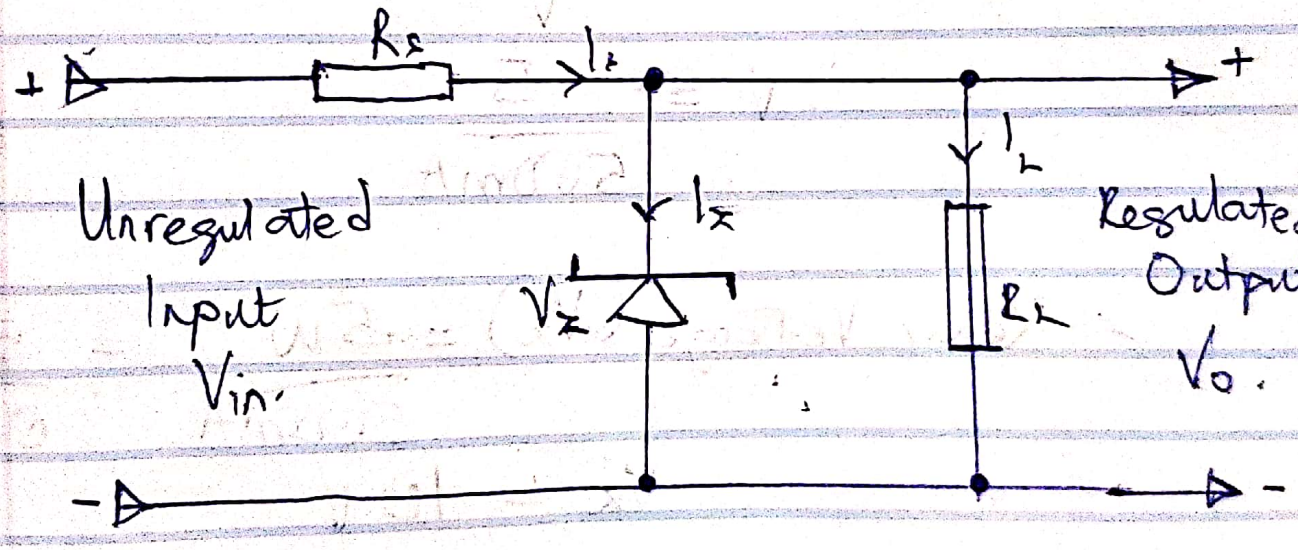
1. Zener Diodes are widely used as Shunt Voltage Regulators to regulate voltage across small loads. Zener Diodes have a sharp reverse breakdown voltage and breakdown voltage will be constant for a wide range of currents. Thus we will connect the zener diode parallel to the load such that the applied voltage will reverse biase it. Thus if the reverse bias voltage across the zener diode exceeds the knee voltage, the voltage across the load will be constant.

I-V CHARACTERISTICS CURVE





# VOLTAGE REGULATOR




Zener Diode Voltage Regulator Circuit Diagra

2. Maximum Current = $\frac{\text{Watts}}{\text{Output Voltage } (V_z)}$

Watts = 5W

Zener Voltage ($V_z$) = ?

Maximum Current = 500mA

$V_s$ = 20V max

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

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

$$\text{Zener Voltage } (V_z) = \frac{5W}{500mA} = \frac{5}{0.5A}$$

$$\therefore V_z = 10V$$

③ Minimum Value of Series Resistor,

$$R_s = \frac{V_s - V_z}{I_z}$$

$V_s = 0.637 \times 20 V_{max} = 12.74 V_{dc}$.

$\therefore R_s = \frac{V_s - V_z}{I_z}$

$= \frac{12.74 - 10}{500mA} = \frac{2.74}{0.5}$

$= 5.48 \Omega$

(ii) Load Current at full load of 500 Ω

$I_L = \frac{V_z}{R_L} = \frac{10}{500mA} = 20mA$

$\therefore$ Current across the diode; $I_z$

$I_z = I_s - I_L$

$= 500mA - 20mA$

$= 480mA$