18/ENG04/1023

Bello Haneef Elect/Elect

1) Zener Diode Regulator

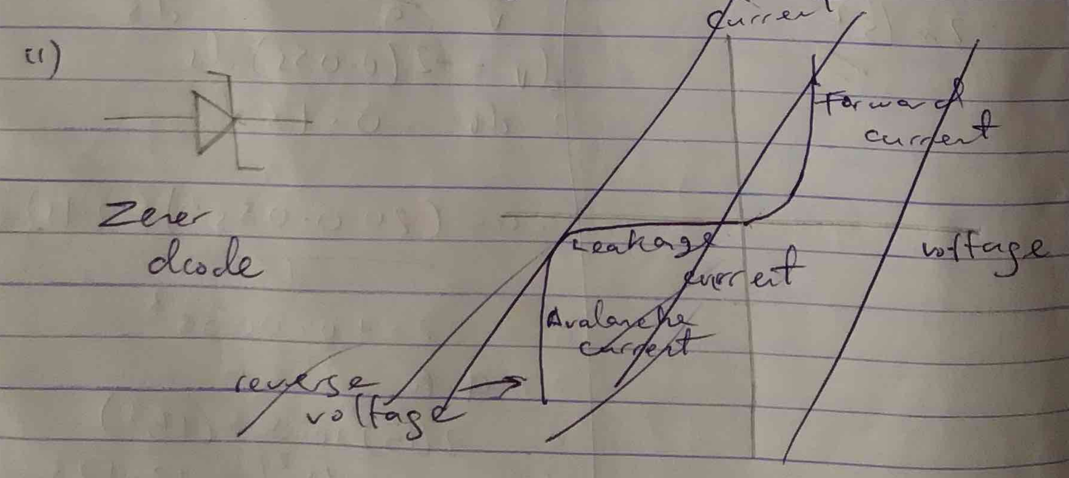
The I-V characteristics of zener diode make it suitable to be used as a voltage regulator. Excess voltage protection is done by using zener diodes because there will be reverse bias current.

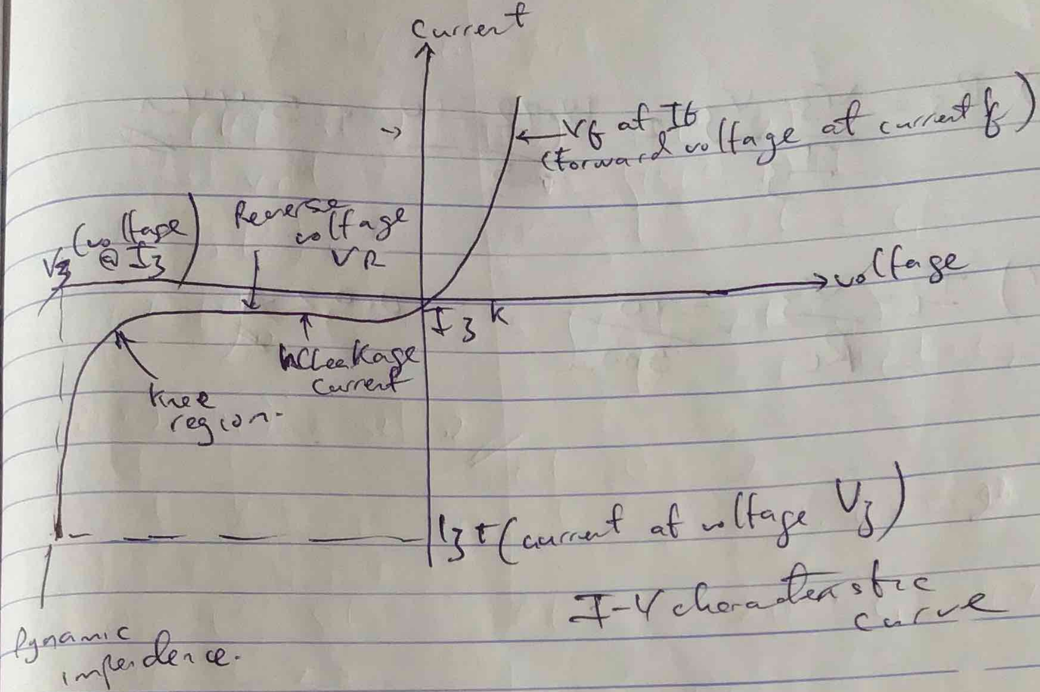
In a zener diode regulator, the zener diode is kept in parallel with the variable load resistance (R_L), in order to ensure a constant output voltage when the load current and supply voltage are unregulated. The zener diode must always be reverse biased and the input voltage should be higher than the zener voltage.

As the input voltage increases, the current flowing through the zener diode increases also, but voltage drop remains constant.

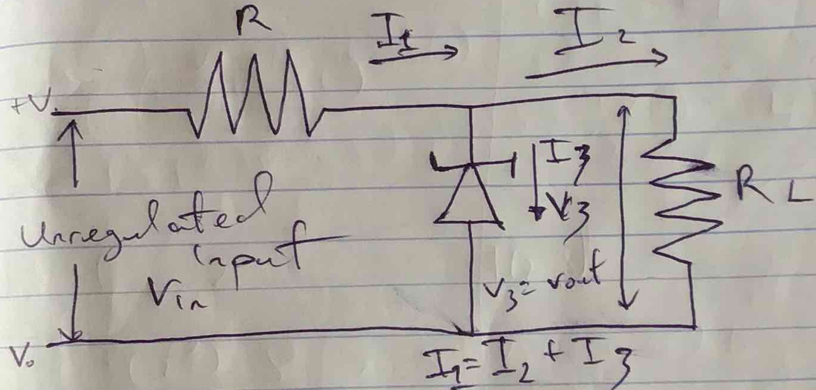
The zener diode will continue to function as long as the zener diode current doesn't fall below I_{Zmin}.

ii)





I-V characteristic curve



Circuit diagram

2) $500\,mA = 0.5\,A = I_z$ $P = 5\,W$

Recalling $I_{z\,max} = \frac{Power}{voltage}$ $\therefore voltage = \frac{Power}{I_{z\,max}}$

$\therefore voltage = \frac{5}{0.5} = 10\,V = V_z$

~~Vmax = V~~ $Vdc = \frac{2V_{max}}{\pi} = \frac{2(20)}{\pi}$ = ~~6.36 Vdc = Vs~~

$= 12.72\,Vdc = V_s$

i) $R_s = \frac{V_s - V_z}{I_z} = \frac{12.72 - 10}{0.5} = 5.44\Omega$

ii) $I_L = \frac{V_z}{R_L} = \frac{10}{500\Omega} = 0.02A$