2. A 5W Maximum rated zener diode has 500mA maximum current flowing through it. If a 20V max bridge rectifier is connected as input to the regulator circuit - Calculate:

i) The minimum value of the series resistor to the zener diode

ii) The current across the diode at full load of 500Ω

Solution

Maximum current = Power / Voltage , 500mA = 0.5A = I_Z

$V_S = 20V$

$P = 5W$

$R_L = 500\Omega$

$$I_Z = \frac{P}{V_Z}$$

$$V_Z = \frac{P}{I_Z} = \frac{5}{0.5} = 10V$$

i) minimum value of the series resistor, R_S

$$R_S = \frac{V_S - V_Z}{I_Z} = \frac{20 - 10}{0.5} = 20\Omega$$

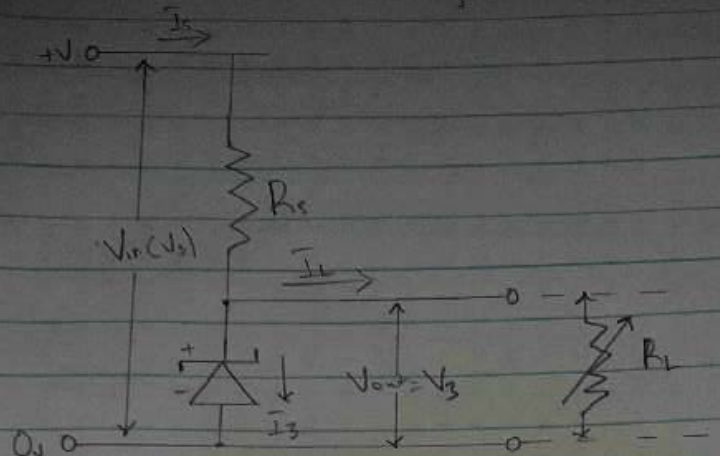
ii) The current across the diode at full load of 500Ω

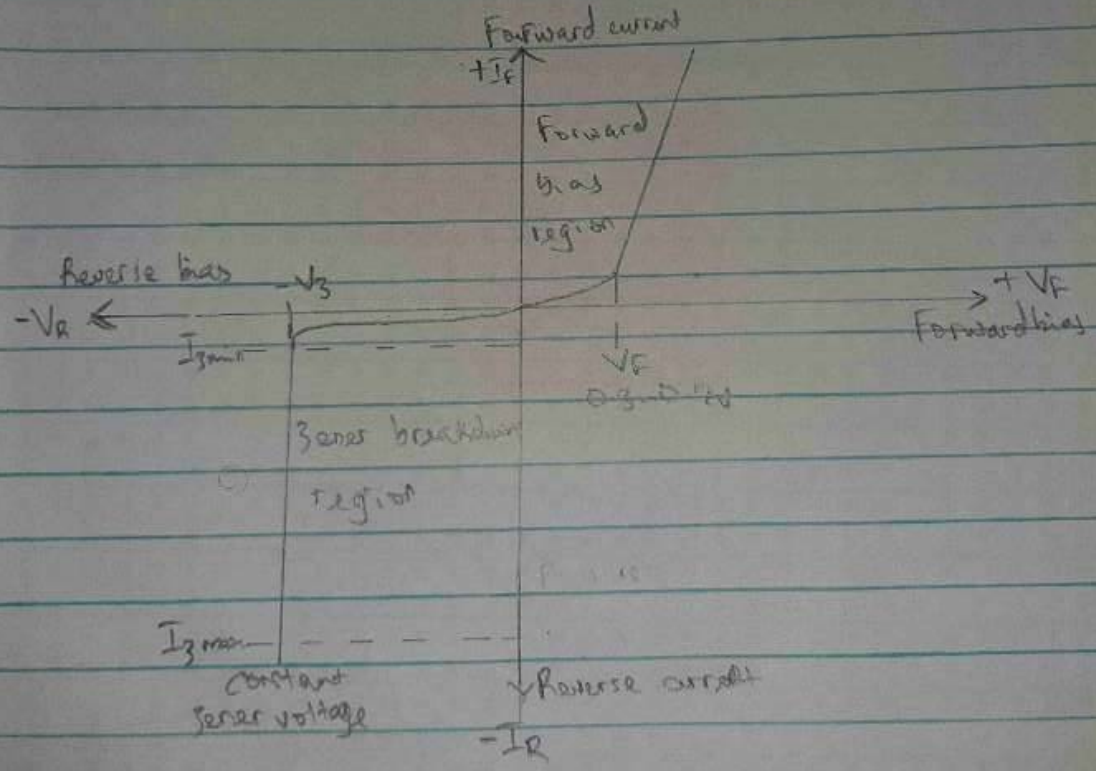
$$I_L = \frac{V_Z}{R_L} = \frac{10}{500} = 0.02A \text{ or } 200mA$$

$$I_Z = I_{diode} - I_L = 500 - 200 = 300mA$$

Zener current at full load = 300mA

Zener diode circuit diagram





Zener diode I-V characteristics curve

Assignment

1) A particle moves along a straight line with a velocity of $v = (4t - 3t^2)$ m/s where t is in seconds. Determine the position of the particle when $t = 4$s. $s = 0$ when $t = 0$

Solution

$$v = (4t - 3t^2)$$

$$v = \frac{ds}{dt}$$

$$\int ds = \int v\,dt$$

$$s = \int v\,dt$$

$$s = \int_0^t (4t - 3t^2)\,dt = \int_0^4 (4t - 3t^2)\,dt$$

$$s = \left(\frac{4t^2}{2} - \frac{3t^3}{3} \right)_0^4 = 2(4)^2 - 4^3 - 0 - 0 = -32 = 32$$

Position of particle = 32.

2. A particle moves along a straight line with a speed $v = (0.5t^3 - 8t)$ m/s where t is in seconds. Determine the acceleration of the particle when $t = 2$s

Solution

$$v = (0.5t^3 - 8t)$$

$$a = \frac{dv}{dt}$$