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Basic Elect Assignment

Answers

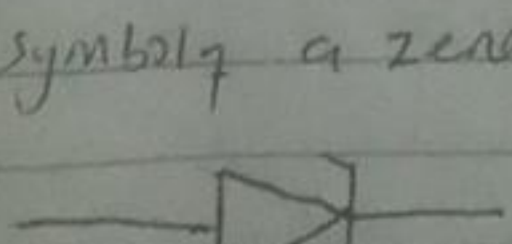
1) Describe a Zener diode regulator.

The zener diode is like a general-purposed signal diode consisting of a silicon PN junction. The Zener diode is like a general-purpose signal diode. When biased in the forward direction, it behaves just like a normal signal diode but when a reverse voltage is applied to it, the voltage remains constant for a wide range of currents.

The zener diode is used in its "reverse bias". From the I-V characteristics curve, we can study that the Zener diode has a region in its reverse biase charateristics of almost a constant negative voltage regardless of the value of the current flowing through the diode and remains nearly constant even with large changes in current as long as the Zener diodes current remains between the breakdown current I_z (min) and the maximum current rating I_z (max).

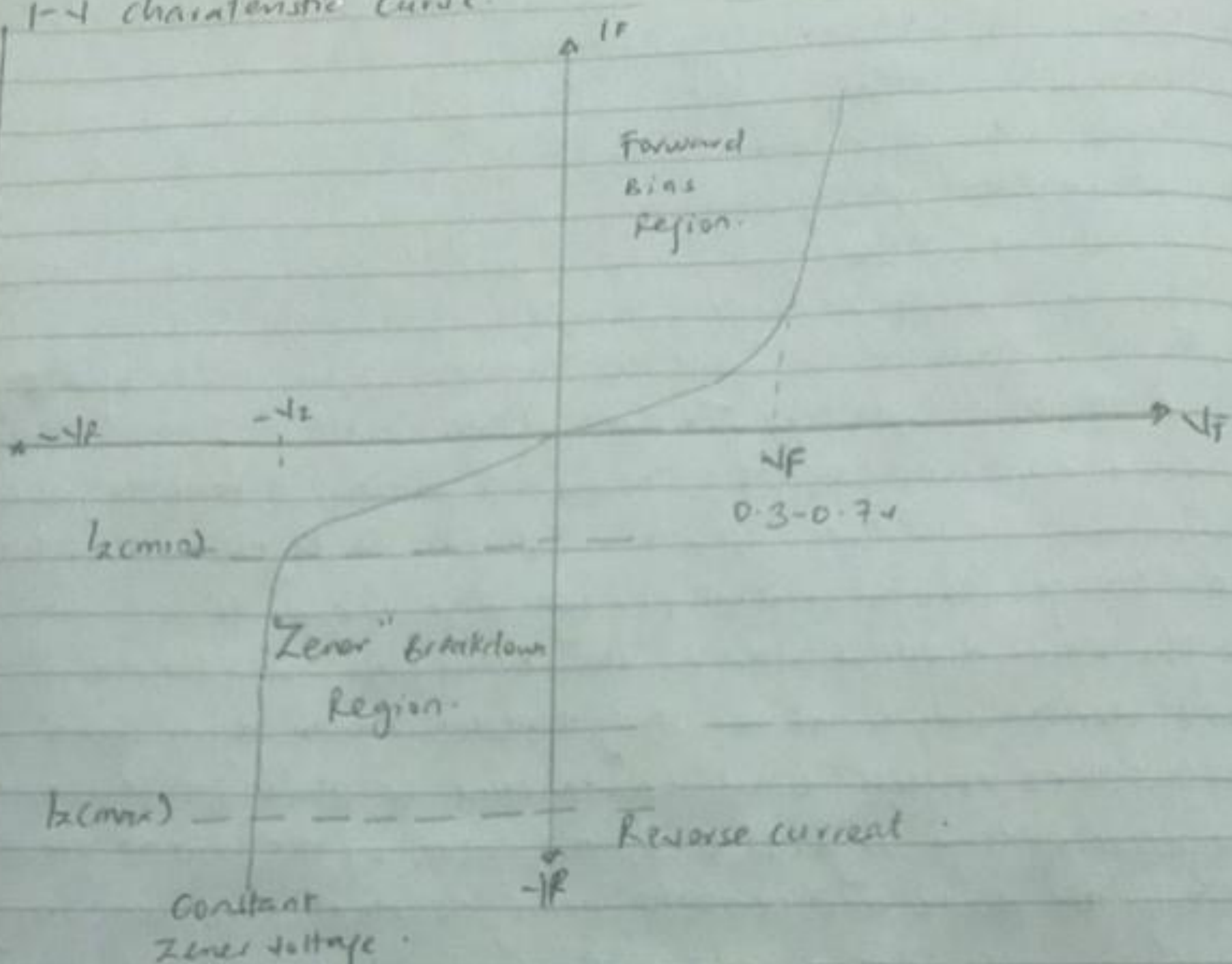
~~Avalanche Breakdown~~ The ability to control itself can be used to great effect to regulate or stabilize a voltage source. The function of a regulator is to provide a constant output voltage to a load connected in parallel with it in spite of the ripples in the supply voltage or the variation in the load current and the Zener diode will continue to regulate the voltage until the diodes current falls below the minimum I_Z (min) value in the reverse breakdown region.

(i) Symbol of a zener diode

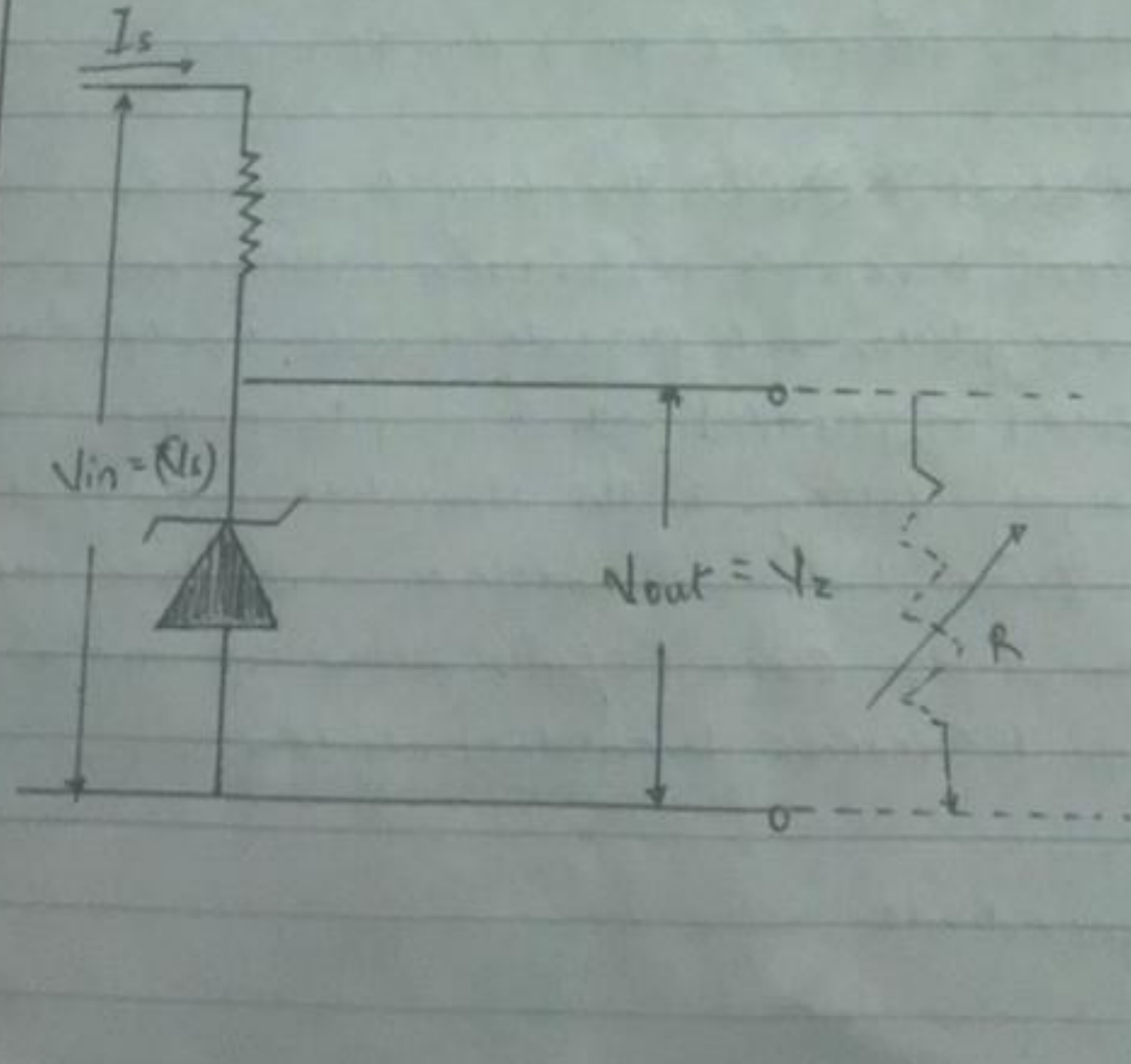


Symbol of a Zener diode.

I-V characteristic curve.



(ii)



2) Current = 500mA

Watts = 5W → Power

20Vmax

$V_{dc} = \frac{2V_{max}}{\pi}$

$V_s = \frac{2 \times 20}{\pi} = 12.74 V_{dc}$

→ V_T

$P = IV$

$V_z = \frac{P_z}{I_z} = \frac{5}{500 \times 10^{-3}}$

$V_z = 10V$

Recall that $V_z + V_R = V_s$

$V_R = V_s - V_z$

$\left(\frac{2 \times 20}{\pi}\right) - 10$

$= 12.74 - 10 = 2.74V.$

$\therefore V = IR$

$R = V/I = \frac{2.74}{500 \times 10^{-3}}$

$R = 5.48$

(ii) Since in Series ∴ Same current

$I_s = I_z + I_L$

$I_z = I_s - I_L$

$I_L = \frac{V_z}{R} = \frac{10V}{500\Omega} = 0.02A$

$I_z = 500mA - 20mA$

$= 480mA = 0.48A$