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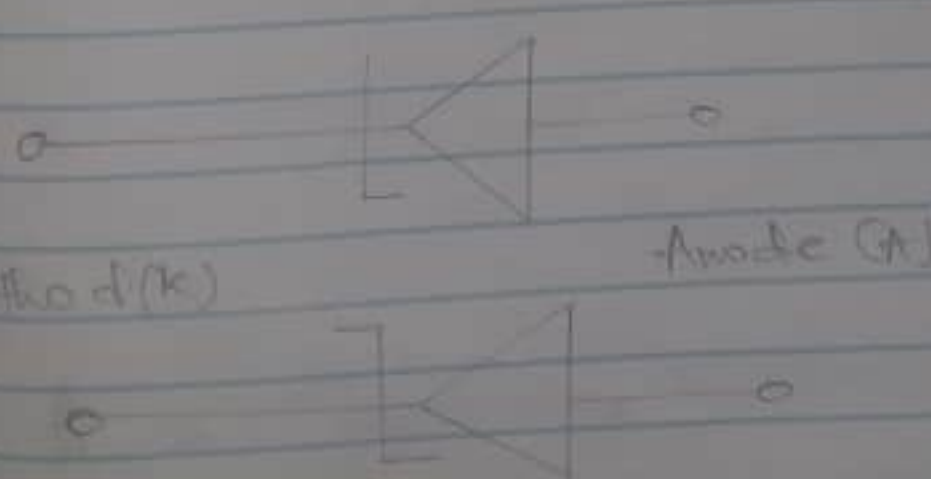
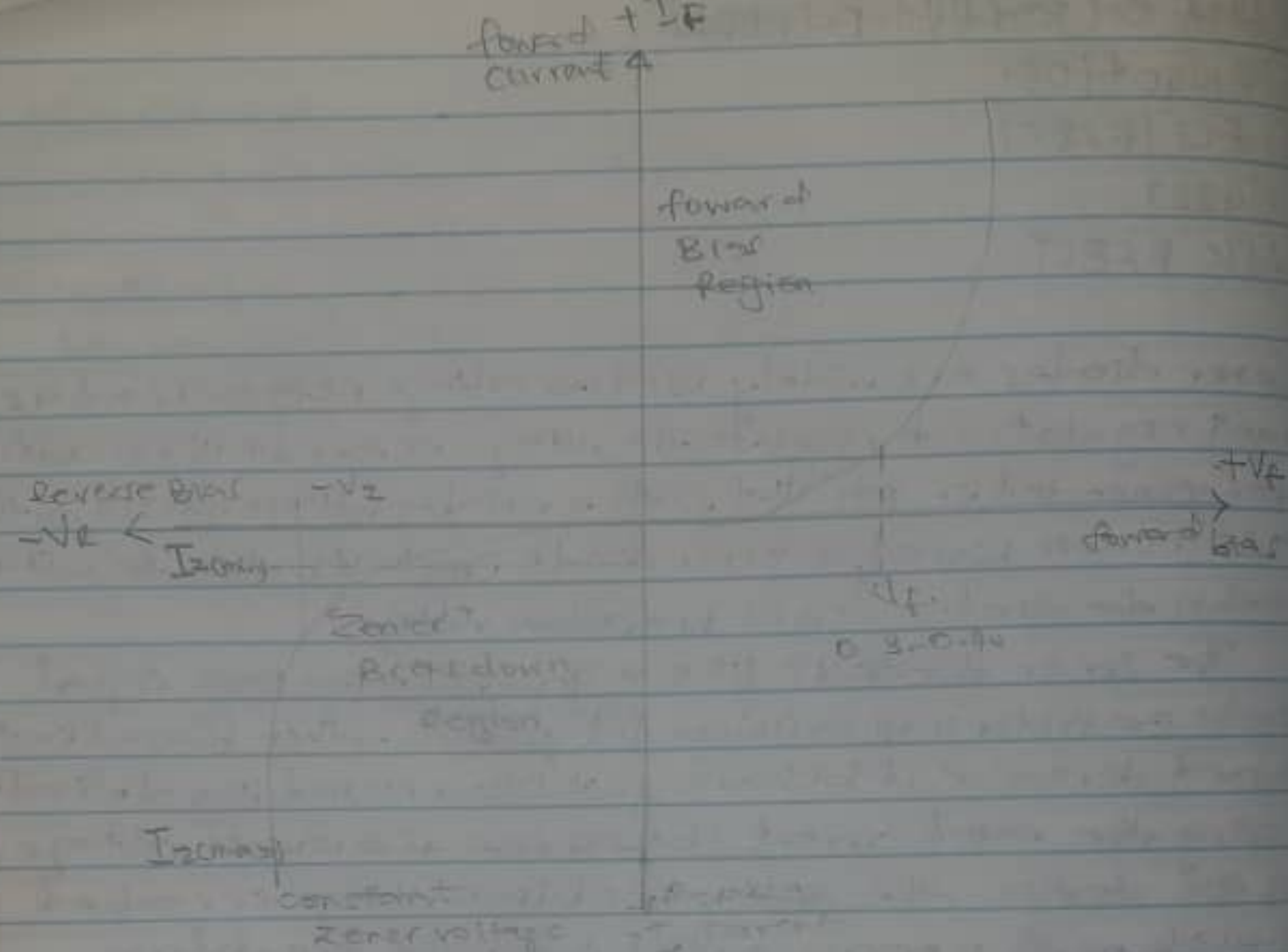
18/ENG04/051
ELECT/ELECT
ENG222
BASIC ELECT.

1. Zener diodes are widely used as voltage references and as shunt regulators to regulate the voltage across small circuits. When connected in parallel with a variable voltage source so that it is reverse biased, a zener diode conducts when the voltage reaches the diode's reverse breakdown voltage.

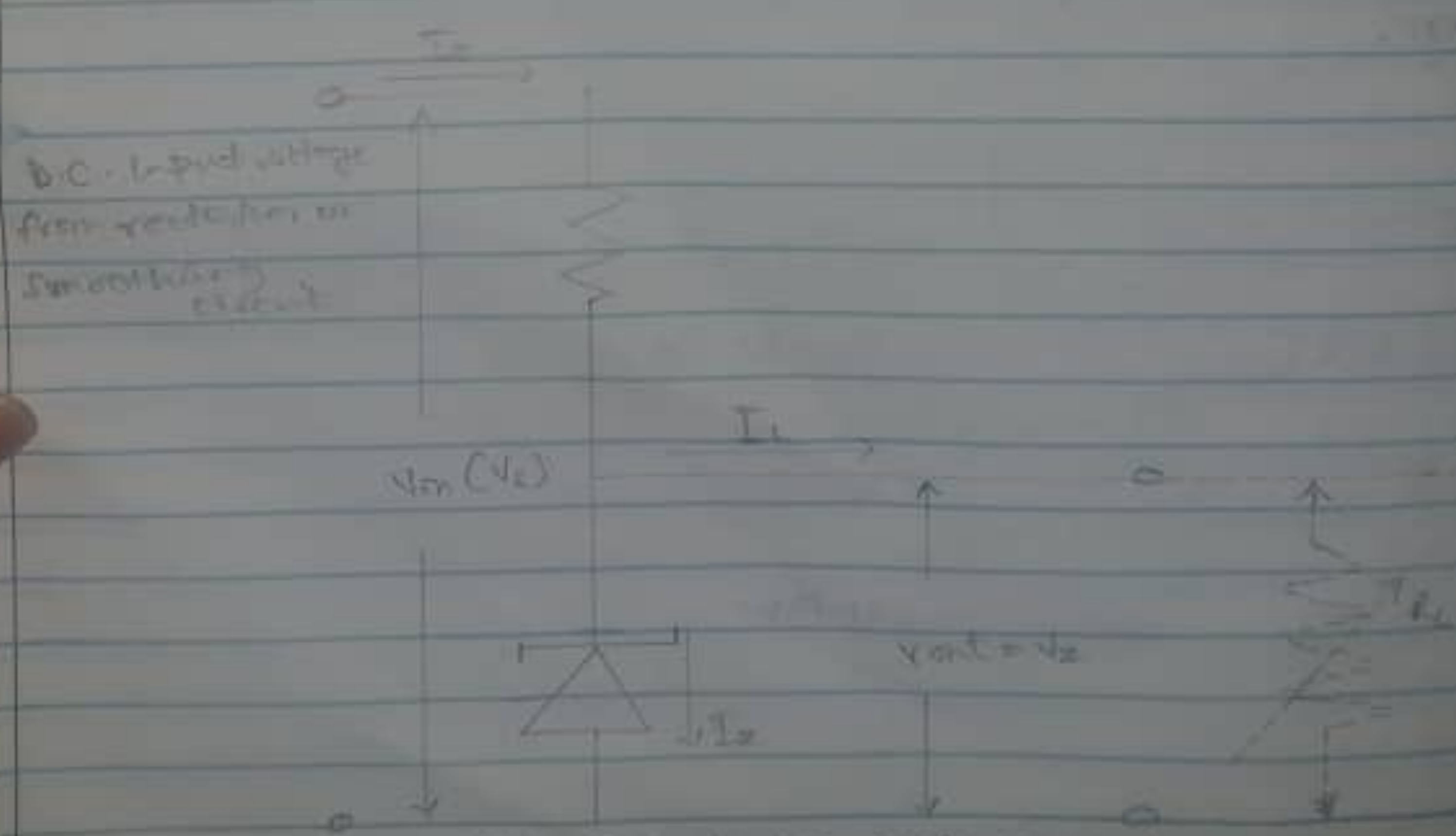
The zener diode is like a general-purpose signal diode consisting of a silicon PN junction. When biased in the forward direction it behaves just like a normal signal diode passing the rated current, but as soon as a reverse voltage of the device, the diodes breakdown voltage is reached at which point a process called Avalanche Breakdown occurs in the semiconductor depletion layer and a current starts to flow through the diode to limit this increase in voltage.



SYMBOL.



ZENER DIODE I—V Characteristic CURVE



ZENER DIODE CIRCUIT diagram

2nd $I_z = 500mA = 500 \times 10^{-3}$

$P_z = 5W$

$V = 20V_{max} = V_{DC} = 2V_m / \pi$

$= \frac{2 \times 20}{\pi}$

$= 12.73 V_{DC}$

Recall $P = IV$

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

$= 10V$

Also Recall $V_z + V_R = V_s$

$\therefore V_R = V_s - V_z$

$= 12.73 - 10$

$= 2.73V$

$V = IR$

$R = \frac{V}{I}$

$= \frac{2.73}{500 \times 10^{-3}}$

$= 5.46\Omega$ Ans.

(b) $I_s = I_z + I_L$

$\therefore I_L = \frac{V_z}{R}$

$= \frac{10}{500}$

$= 0.02A$

$= 20mA$

Recall $I_s = I_z + I_L$, $\therefore I_z = I_s - I_L$

$= 500mA - 20mA$

$= 480mA$

$= 0.48A$ Ans.