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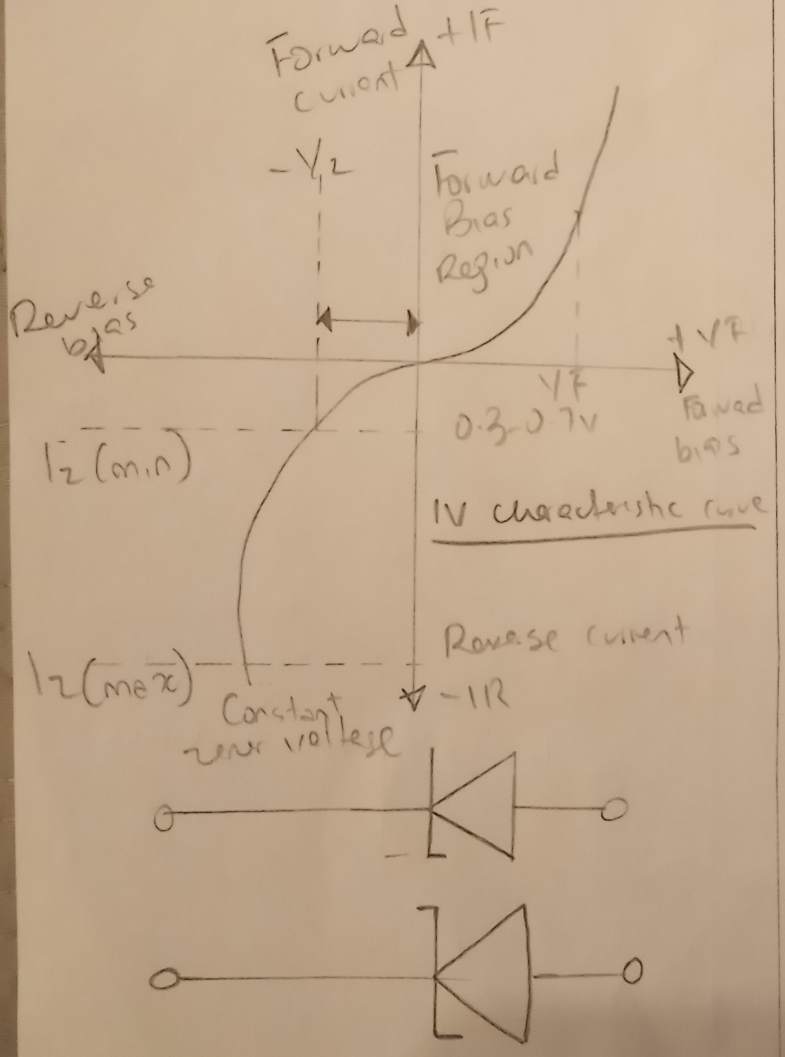
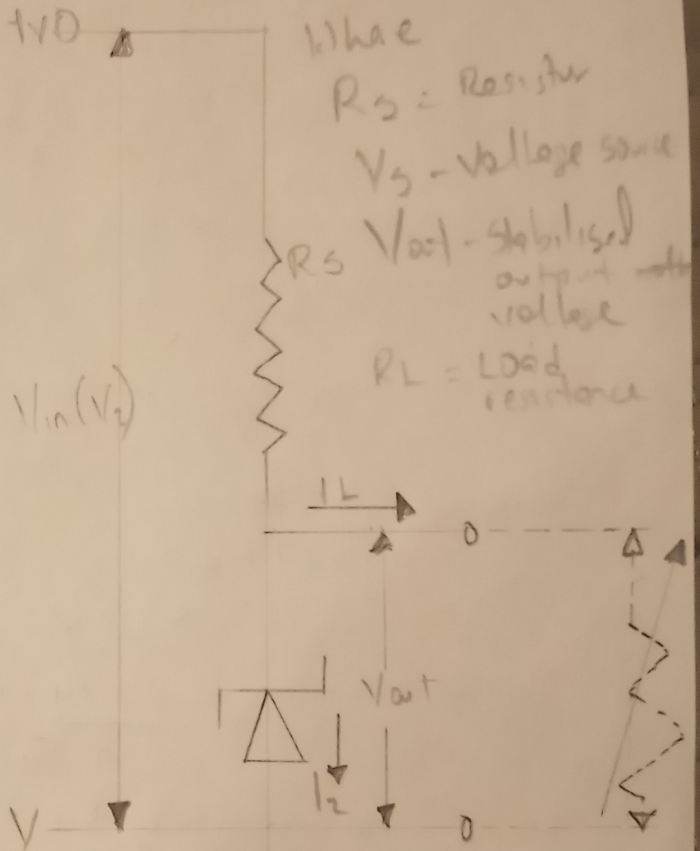
- 18/ENG06/002
- MECHANICAL ENGINEERING
- BASIC ELECT
- ENG 222

1] Describe a Zener diode Regulator, and
(i) Sketch the symbol and I-V characteristics curve,
(ii) Sketch and label the circuit diagram

A Zener diode is always operated in its reverse biased condition As such a simple voltage regulator circuit can be designed using a zener diode to maintain a constant DC output voltage across the load in spite of variations in the input voltage or changes in the load current.



IV characteristic curve



Where
R_S = Resistor
V_S - Voltage source
V_{out} - Stabilised output voltage
R_L = Load resistance

I_Z - Load Current across zener diode

2). The minimum value of the series Resistor to the Zener diode;

Firstly — Max Power = 5W
I_Z = 500 mA = 0.5A
V_S = 20Vmax

(i) Maximum current = $\frac{\text{Max Power}}{\text{Voltage}}$

$= \frac{5W}{V} = 0.5A$

$\therefore V = \frac{5W}{0.5A}$

$\therefore V_Z = 10V$

$\therefore$ The minimum resistance = $\frac{V_S - V_Z}{I_Z}$

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

$\therefore$ Minimum Resistance = $\frac{12.74 - 10}{0.5}$

$= 5.48 \Omega$

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

Load current $I_L = \frac{V_Z}{R_L} = \frac{10}{500}$

$= 0.02A$ or $20mA$

$I_Z = I_S - I_L$
$= 500 - 20$
$= 480 mA$.