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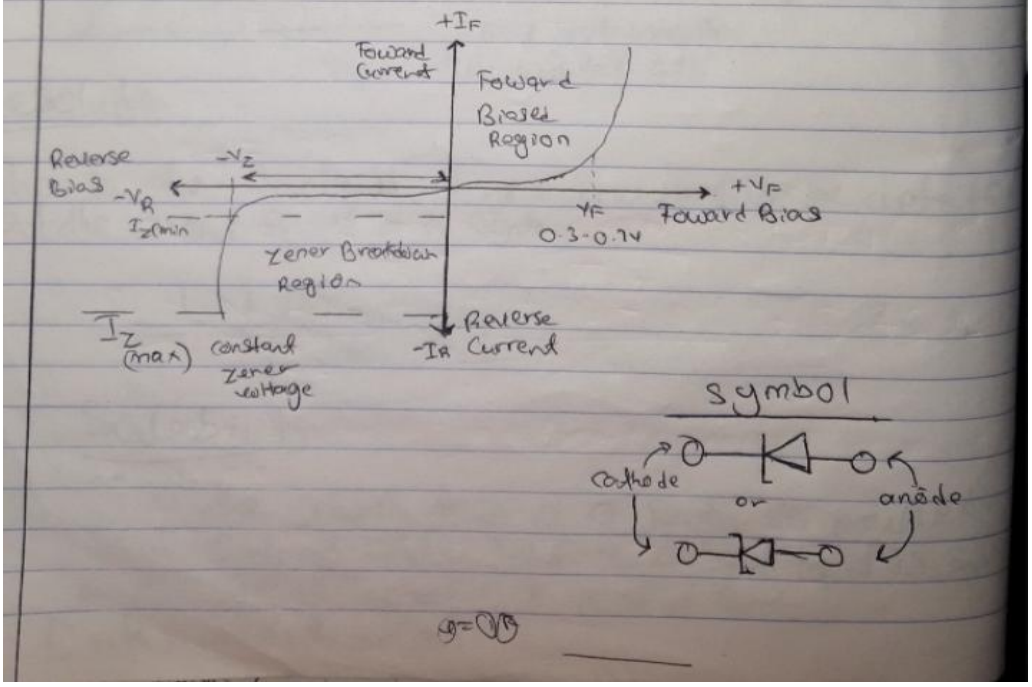
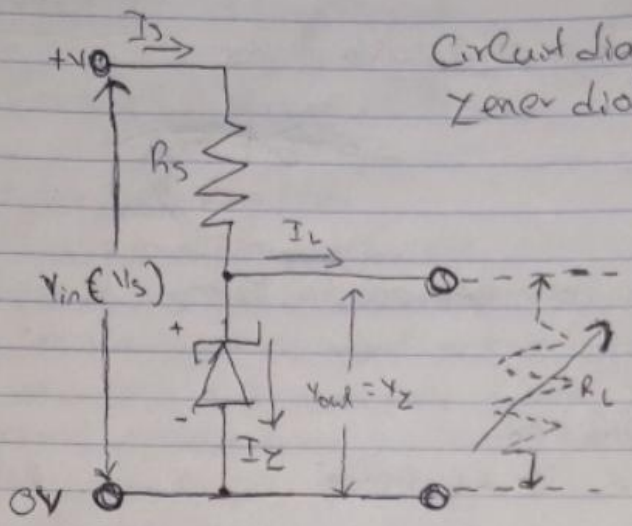
ENG222 Assignment

1. Zener diode Regulator

This is a voltage regulator circuit designed using a zener diode to maintain a constant DC output voltage across a load even if the input voltage is changing. When a zener diode is foward biased, it acts like a normal general purpose diode by passing the rated current. However, unlike a normal signal diode which blocks and current when reversed biased, the zener diode begins to conduct in the reverse direction. This happens when the voltage applied across the zener diode exceeds the rated voltage of the device and an Avalanche Breakdown occurs in the depletion layer and current starts to flow through the diode to limit this increase in voltage.





Circuit diagram of Zener diode voltage Regulator

(2) $P = 5W$, ~~50~~

$I_Z = 500mA \Rightarrow 0.5A$

$V_S \Rightarrow 20V_{max}$

(i) $V_Z = ?$

$P = I_Z V_Z$

$\frac{5}{0.5} = V_Z$

$V_Z = 10 Volts$

$V_S = 20V_{max}$

$V_{dc} = \frac{2V_{max}}{\pi} \Rightarrow \frac{2 \times 20}{\pi} = 12.73V$ (input voltage)

$R_S = \frac{V_S - V_Z}{I_Z} \Rightarrow \frac{12.73 - 10}{0.5} = 5.46\Omega$

$\therefore$ 5.46Ω is the minium value of the seres resistor to the Zener diode

(ii) I_2 at 500Ω full load

Current across the 500Ω resistor

$V = IR$

$I_L = V_2 / R_L \Rightarrow \frac{12.73}{500} \Rightarrow 0.025A$

but at full load

$I_2 + I_L = 0.5A$

~~$I_2 + 500 = 0.5$~~

$I_2 + 0.025 = 0.5$

$I_2 = 0.5 - 0.025$

$\Rightarrow 0.475A \Rightarrow 475mA$