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COURSE: ENG 222 (Electrical Engineering II) Assignment 1

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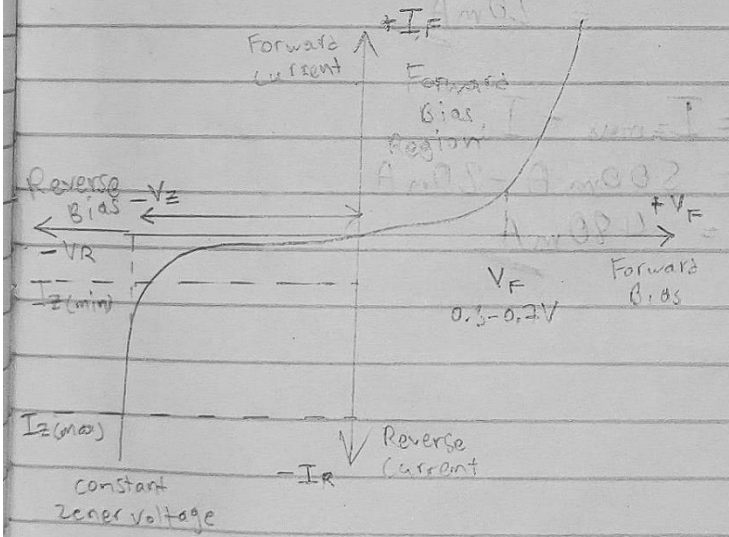
Mechatronics Engineering
ENG 222 Assignment

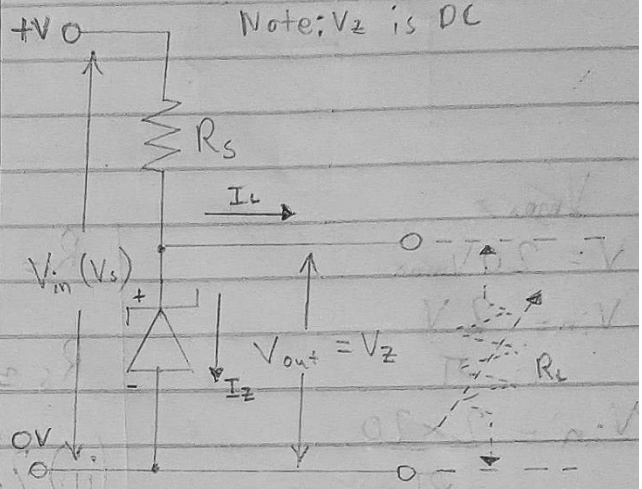
1.) A zener diode regulator is a type of voltage regulator. They are designed to have a specific reverse breakdown voltage called the zener voltage (V_z). It works like a regular signal diode, although when it is in the reverse bias, it does not conduct electricity until the threshold value (V_z) is exceeded.

(i.) Symbol:

I-V Characteristic Curve:

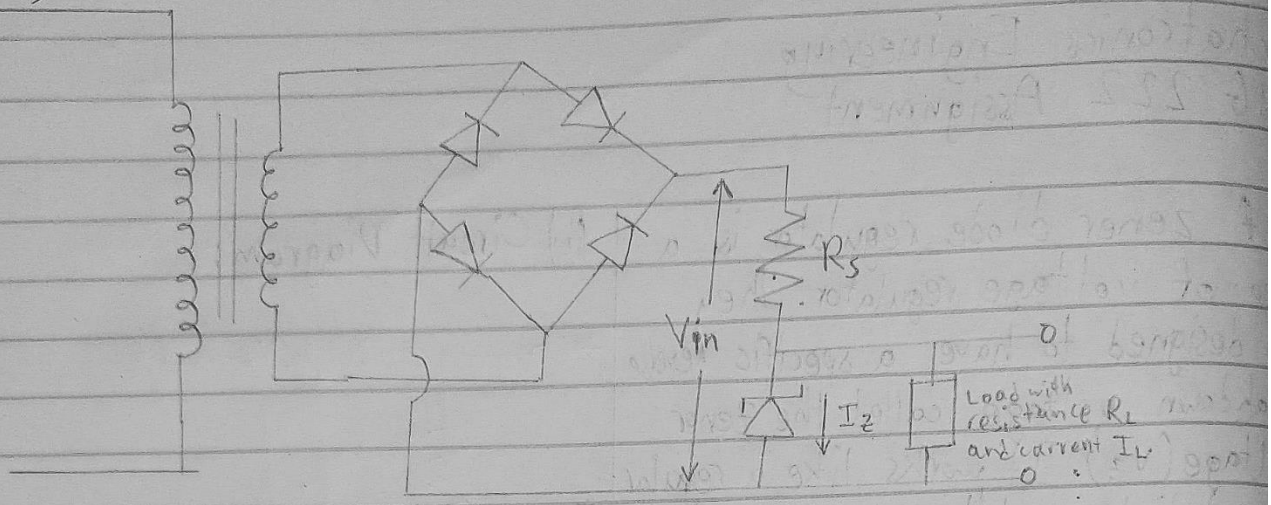


(ii.) Circuit Diagram:



R_L = Load Resistance
R_S = Series Resistor
V_{in} = Input Voltage
V_{out} = Output Voltage
I_L = Load Current
I_z = Zener Current
V_z = Zener Voltage

2.) Circuit diagram:



~~V_{max}~~ =

$V = 20 V_{max}$

$V_{in} = \frac{2V}{\pi}$

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

$\simeq 12.732V$

$I_{zmax} = 500mA = 0.5A$

$P_z = 5W$

$R_s = ?$

$I_{zmin} = ?$, $I_L = ?$

$V_z = ?$

(i) $P_z = I_{zmax} \times V_z$

$V_z = \frac{P_z}{I_{zmax}}$

$= \frac{5}{0.5}$

$V_z = 10V$

$R_S = \frac{V_{in} - V_z}{I_{zmax}}$

$R_S = \frac{12.732 - 10}{0.5}$

$R_S \simeq 5.464 \Omega$

(ii) Zener current at full load of $500 \Omega = I_{zmin}$

$I_L = \frac{V_z}{R_L} = \frac{10}{500}$

$= 0.02A$

$= 20mA$

$I_{zmin} = I_{zmax} - I_L$

$= 500mA - 20mA$

$= 480mA$