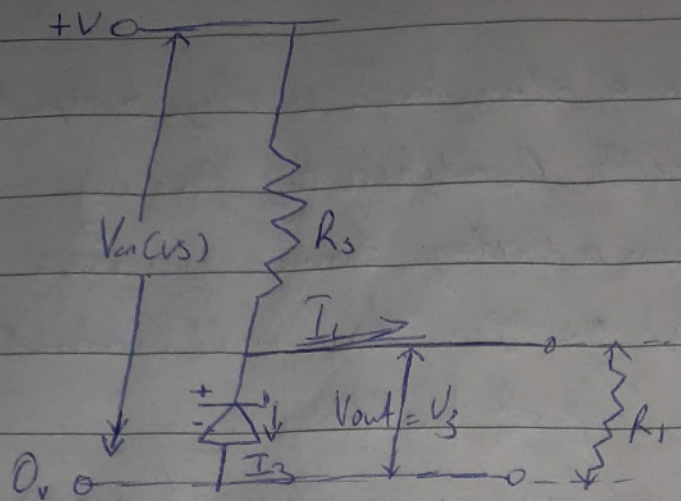
NNAMDI PRECIOUS CHEMICAL ENGINEERING
19/ENG01/021 ENG 222
Assignment

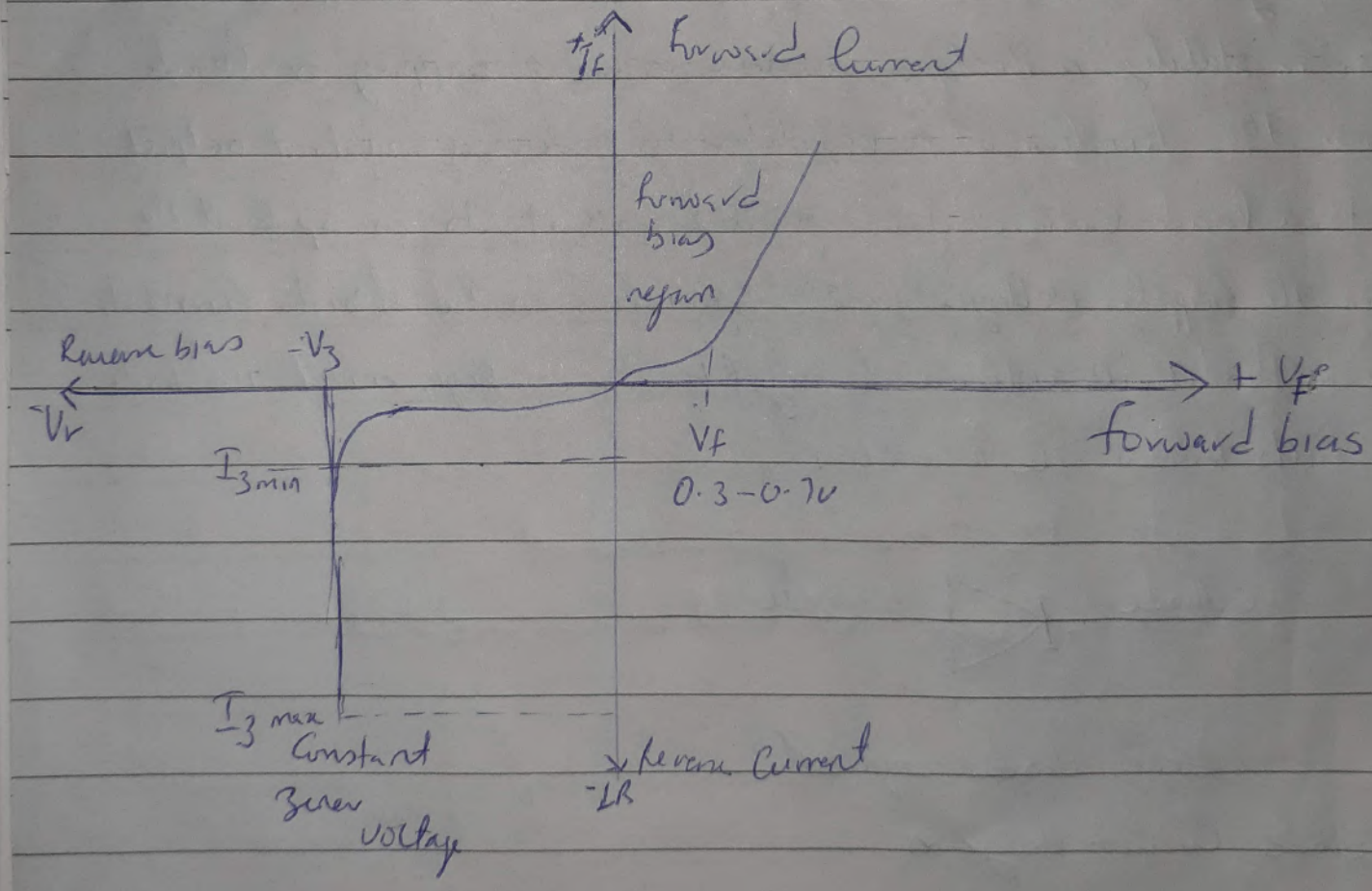
1) Zener diode can be used to produce a stabilised voltage output with low ripple under varying load current condition By passing a small current through the diode from a voltage source through a suitable current limiting resistor (R_s) the Zener diode will conduct sufficient current to maintain a voltage drop of V_{out}

The zener diode is used in it's reversed biased or reverse breakdown mode i.e the diode anode connects to the negative supply. This diode has the ability to control itself and can therefore be used in effects to regulate or stabilize a voltage source against supply or load variations. The function of a regulator to produce 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. The zener diode will continue to regulate the voltage until the diode current falls below the minimum

Zener diode symbol

Zener diode Circuit diagram





THE ZENER DIODE I-V CHARACTERISTICS CURVE

Q A 5W maximum

2) Solution

Maximum Current = $\frac{\text{Power}}{\text{Voltage}}$, $500mA = 0.5A = I_3$

$V_S = 20V$

$P = 5W$

$R_L = 500\Omega$

$I_3 = \frac{P}{V_3}$

$V_3 = \frac{P}{I_3} = \frac{5}{0.5} = 10V$

i) Minimum Value of the Series resistor, R_S

$R_S = \frac{V_S - V_3}{I_3} = \frac{20-10}{0.5} = 20\Omega$

ii) The Current across the diode at full load of 500Ω

$I_L = \frac{V_3}{R_L} = \frac{10}{500} = 0.02A$ or $200mA$

$I_3 = I_S - I_L = 500 - 200 = 300mA$

Zener diode Current at full load = 300mA