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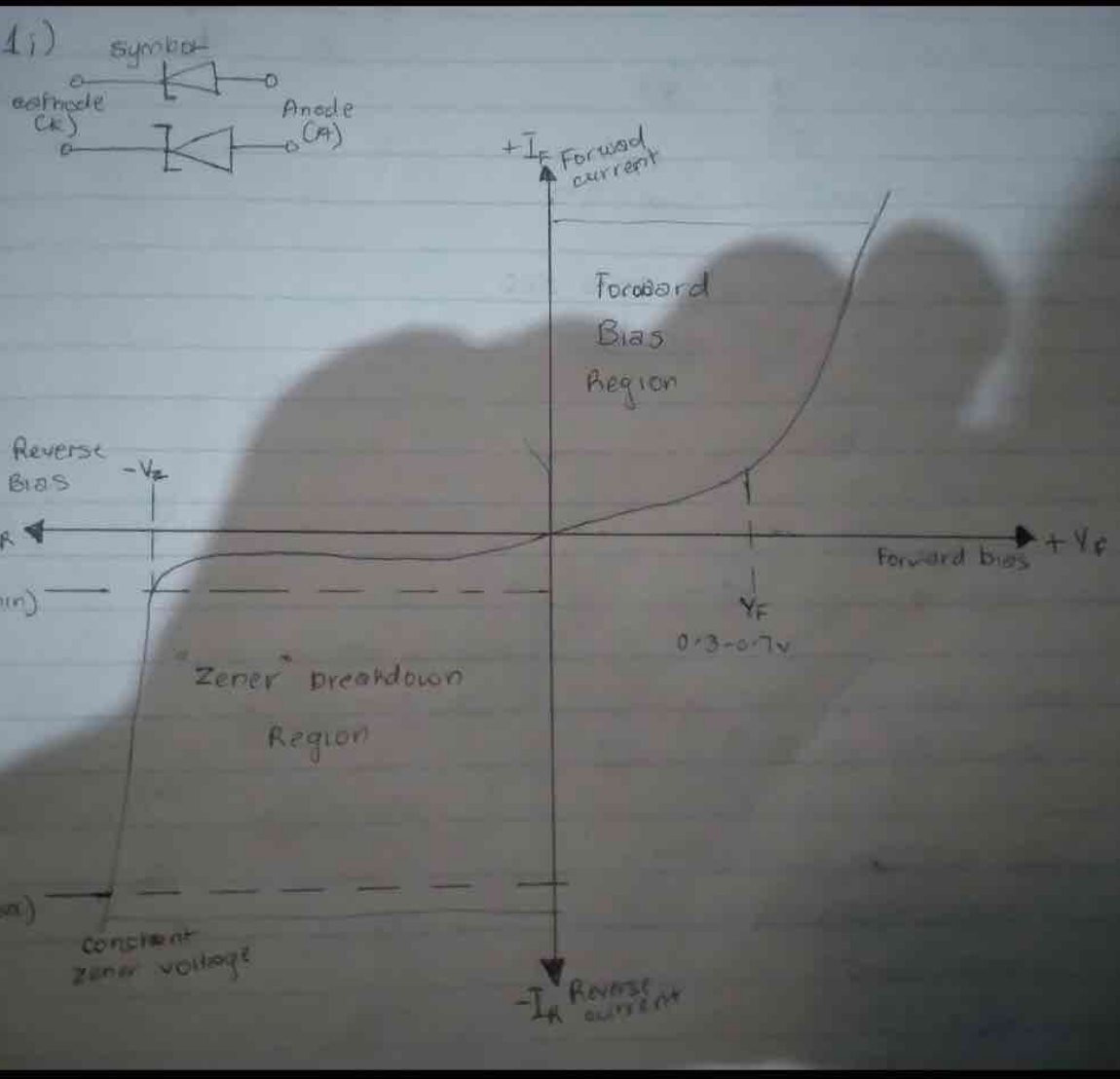
MATRIC NO: 18/ENG04/060
DEPT: ELECT/ELECT

Assignment

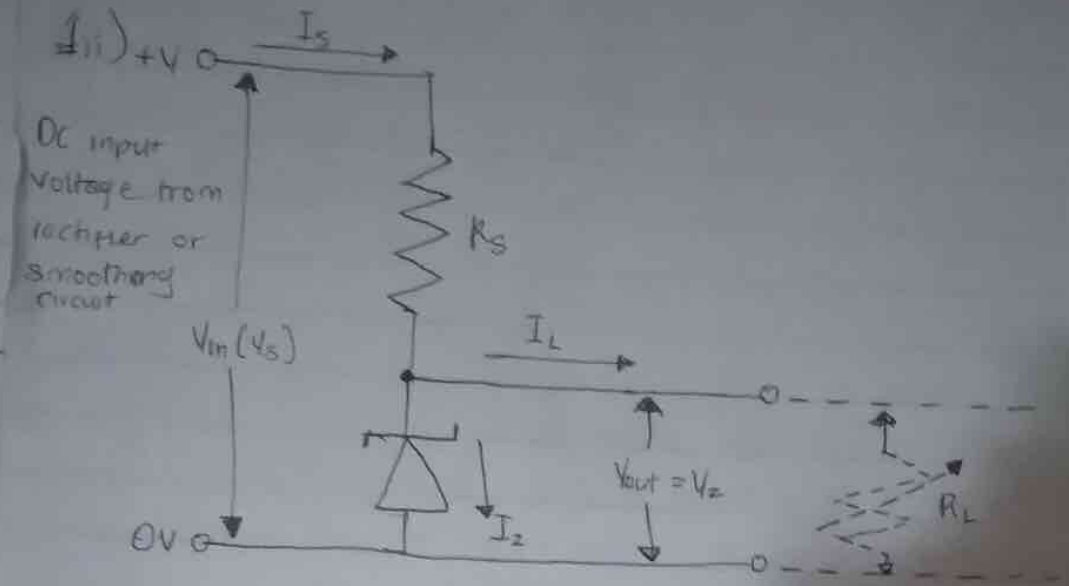
1) A zener diode regulator can be used to great effect to regulate or stabilise a voltage source against supply or load variations. The fact that the voltage across the diode in the breakdown region is almost constant turns out to be an important application of the zener diode as a voltage regulator.

The function of a regulator is to provide 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 and the zener diode will continue to regulate the voltage until the diodes current falls below the minimum $I_{Z(min)}$ value in the reverse breakdown region.

1i)


symbol
cathode (K)
Anode (A)
+I_F Forward current
Forward Bias Region
Reverse Bias
-V_R
-V_Z
+V_F
Forward bias
I_Z(min)
V_F
0·3-0·7V
"Zener" breakdown Region
I_Z(max)
constant zener voltage
-I_R Reverse current

1ii)



1

2i) $I_z = 500mA$

$P_z = 5w$, $V_S = 20V_{max}$

0.001 watt/volt = 1mA

x = 500mA

$x = 0.5$ watt/volt

~~$V_z = 0.5 \times 500$~~ $V_z = \frac{0.5}{5w} = 0.1V$

i) $R_S = \frac{V_S - V_z}{I_z}$

$= \frac{20 - 0.1}{500} = \frac{19.9}{500} = 0.04$

$= 0.04 \times 1000 = 40\Omega$

ii) $I_L = \frac{V_z}{R_L}$

I

$= \frac{0.1}{500} = 0.0002A$