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Mechatronics Engineering i

Q2) $V_s = 20V$
$V_z = ?$
max current = 500mA = Is
$P_z = 5W$

(i) $Is = \frac{V_z P_z}{V_z} = \frac{5}{500 \times 10^{-3}} = 10V$

∴ $V_z = 10V$

$R_s = \frac{V_s - V_z}{I_z} = \frac{20-10}{500 \times 10^{-3}} = \frac{10}{500 \times 10^{-3}} = 20\Omega$

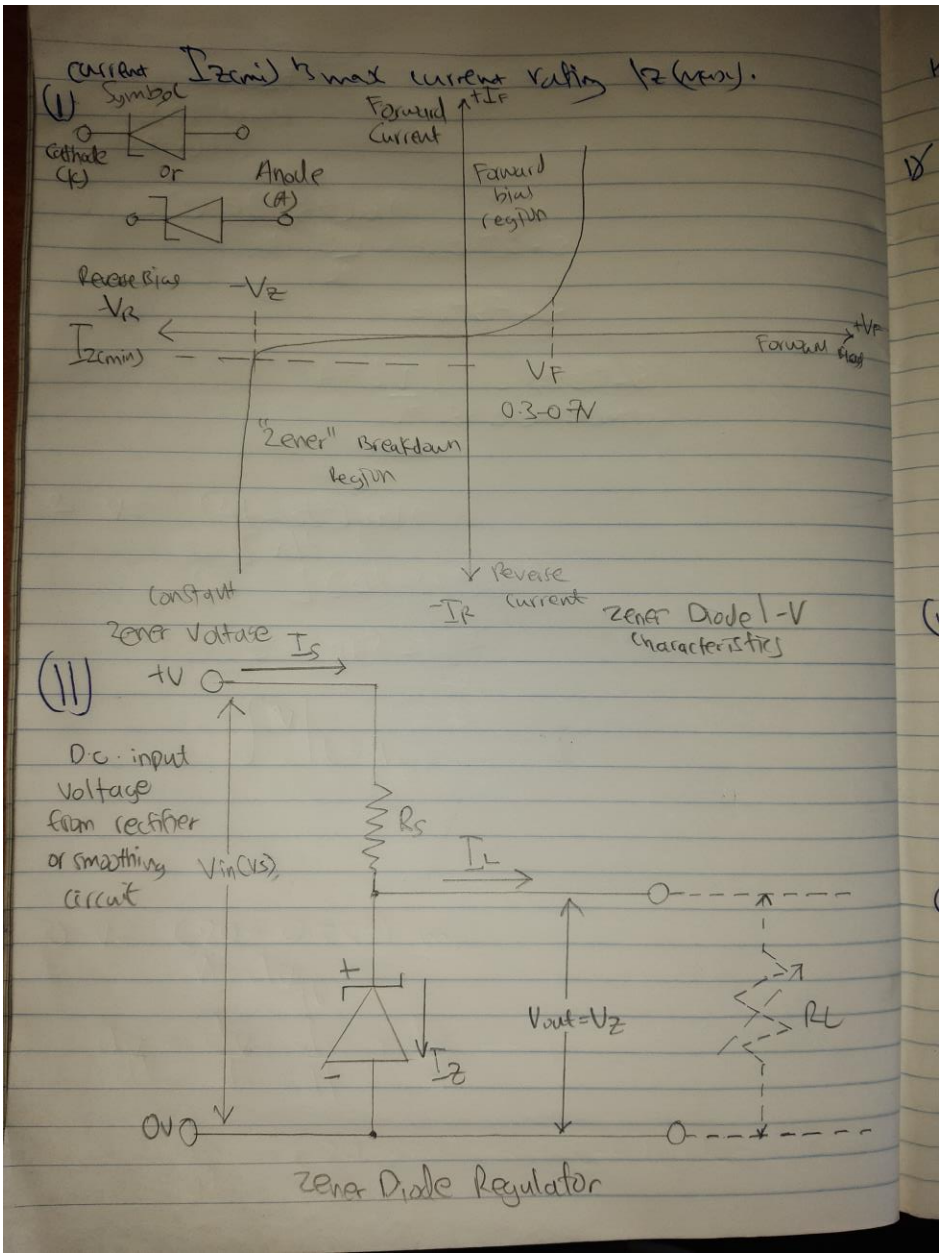
$R_s = 20\Omega$ //

(ii) $I_z = Is - IL$; $IL = \frac{V_L}{R_L} = \frac{10}{500} = 0.02A$
$= 20mA$

∴ $I_z = (500 - 20)mA = 480mA$ //

Q. (i) =

① The zener diode is used in its "reverse bias" or reverse breakdown mode, ie the diodes anode connects to the negative supply. The zener diode has a region in its reverse bias characteristics of almost a constant negative voltage regardless of the value of the current flowing through the diode is remains nearly constant even with large changes in current as long as the zener diode current remains between the breakdown


Current $I_{Z(min)}$ & max current rating $I_{Z(max)}$.
(I) Symbol
Cathode (K)
or
Anode (A)
Forward Current
$+I_F$
Forward bias region
Reverse Bias
$-V_R$
$-V_Z$
$I_{Z(min)}$
$+V_F$
Forward Bias
V_F
0.3-0.7V
"Zener" Breakdown Region
Constant Zener Voltage
Reverse Current
$-I_R$
Zener Diode I-V Characteristics
(II)
+V
I_S
D.C. input Voltage from rectifier or smoothing circuit
$V_{in(DC)}$
R_S
I_L
$V_{out}=V_Z$
R_L
I_Z
0V
Zener Diode Regulator