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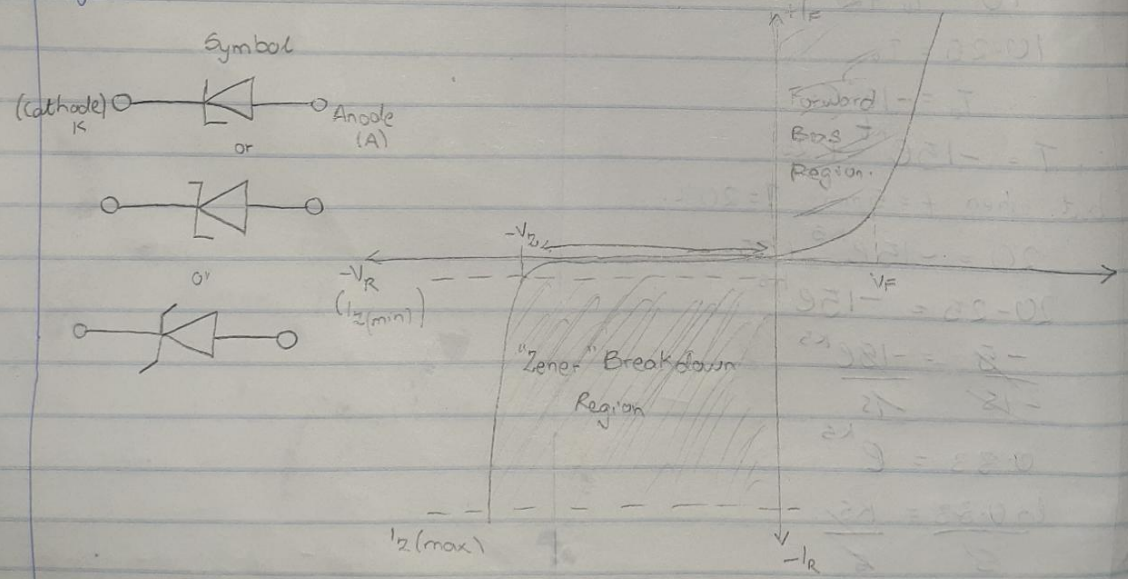
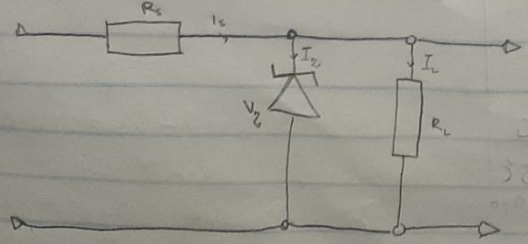
MATRIC NO: 18/ENG01/012
DEPT: CHEMICAL ENGINEERING
COURSE CODE & TITLE: ENG 222 BASIC ELECTRICAL ENGINEERING

1- Zener diode as a voltage regulator

The zener diode is like a general purpose signal diode. When biased in the forward direction, it behaves just like a normal signal diode, but when a reverse voltage is applied to it, the voltage remains constant for a wide range of current. There is a limit for reverse voltage, cause it will continue to increase until it reaches the breakdown voltage. (Avalanche Breakdown region). This ability to control itself (have a constant voltage in the reverse region, irrespective of the current flowing) can be used to great effect to regulate or stabilise a voltage source against supply or load variation. 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





Circuit diagram

Power of Zen
P = 5W
Imax = 500m
VS = 2 x
= 2x2
RS = VS - VZ
IZ
& IZ = 500m
VS = 12.732
VZ = ?
but P = IVZ
P/I = VZ
∴ VZ = 5
VZ = 10V
RS = (12.
RS = .5
Then Io = Iz
IL = VZ
RL
RL = 500Ω
IL = 10V
500
IZ = 500

Power of Zener diode

$P = 5W$

$I_{max} = 500mA$.

$V_S = \frac{2 \times V_{max}}{\pi}$

$= \frac{2 \times 20}{\pi} = 12.732V$.

$R_S = \frac{V_S - V_Z}{I_Z}$

& $I_Z = 500mA$

$V_S = 12.732V$

$V_Z = ?$

but $P = IV_Z$.

$\frac{P}{I} = V_Z$

$\therefore V_Z = \frac{5W}{500mA} = 10V$

$V_Z = 10V$.

$R_S = \frac{(12.732 - 10)V}{500mA}$

$R_S = 5.464\Omega$

Then $I_O = I_Z + I_L$.

$I_L = \frac{V_Z}{R_L}$

$R_L = 500\Omega$

$I_L = \frac{10V}{500\Omega} = 0.02A$

$= 20mA$

$I_Z = 500mA - 20mA$

$= 480mA$