1.

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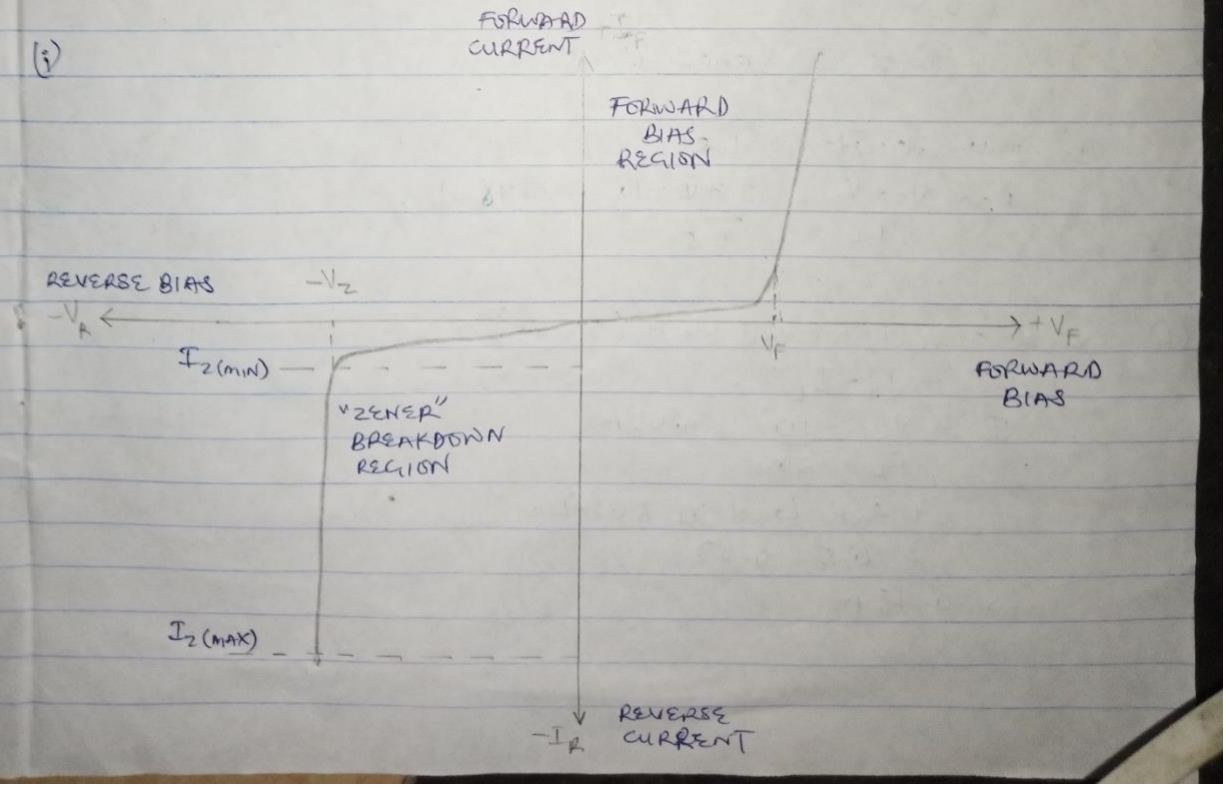
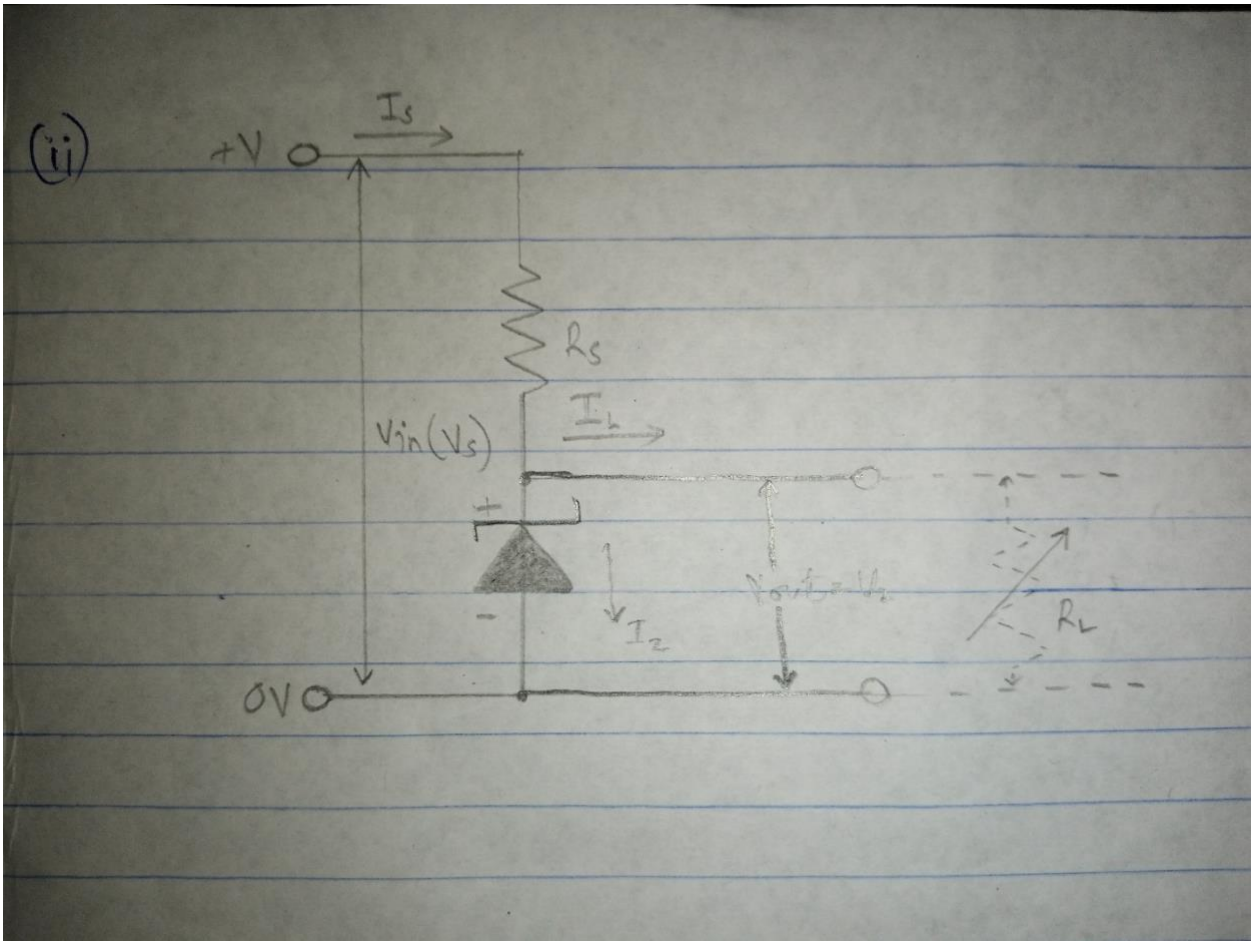
COURSE:
MATRIC: 18/ENG05/057
DEPT: MECHATRONIC ENGINEERING

BASIC ELECTRICAL ENGINEERING ASSIGNMENT SOLUTION

(i) 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 whole wide range of currents. The reverse voltage can increase until the diode breakdown voltage is achieved. this point is called the "avalanche ~~region~~" breakdown region". At this point maximum current will flow through the zener diode. This point of breakdown is called the "zener voltage". At it's reverse bias, the diode has a constant negative voltage regardless of the current flowing through the diode and remains ~~const~~ nearly constant even with large changes in current as long as zener diode current remains ~~nearly constant~~ between the breakdown current and the maximum current.

(ii)

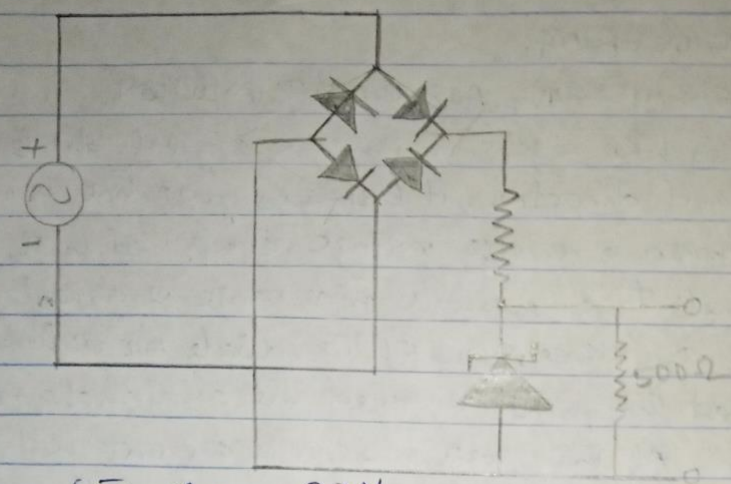



(ii)
+V
I_s
R_s
I_L
$V_{in}(V_s)$
+
-
I_z
$V_{out} = V_z$
R_L
0V

2.

(2) Power = 5W = P_z

$I_S = 500mA = 0.5A$



Sine $V_{max} = 20V$

$V_{DC} = 0.637 \times V_{max} = 0.637 \times 20 = 12.74V = V_S$

$\therefore$ 12.74 V produced from A.C source.

(a) Power = current × voltage

$5W = 0.5A \times V_2$

$V_2 = \frac{5}{0.5} = 10V$

$\therefore$ 10V is across the zener diode

Minimum resistor value:

$R_S = \frac{V_S - V_2}{I_2} = \frac{12.74 - 10}{0.5} = 5.48\Omega$ //

(b) zener current at full load (500 Ω)

$I_2 = I_S - I_L$

$I_L = \frac{V_2}{R_L} = \frac{10}{500} = 0.02A$

I_2 at full load of 500 Ω:

$= 0.5 - 0.02$

$\Rightarrow 0.48A$ //