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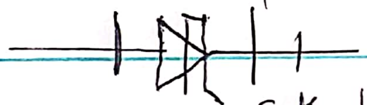
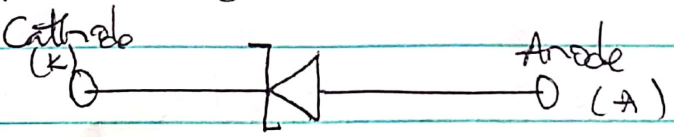
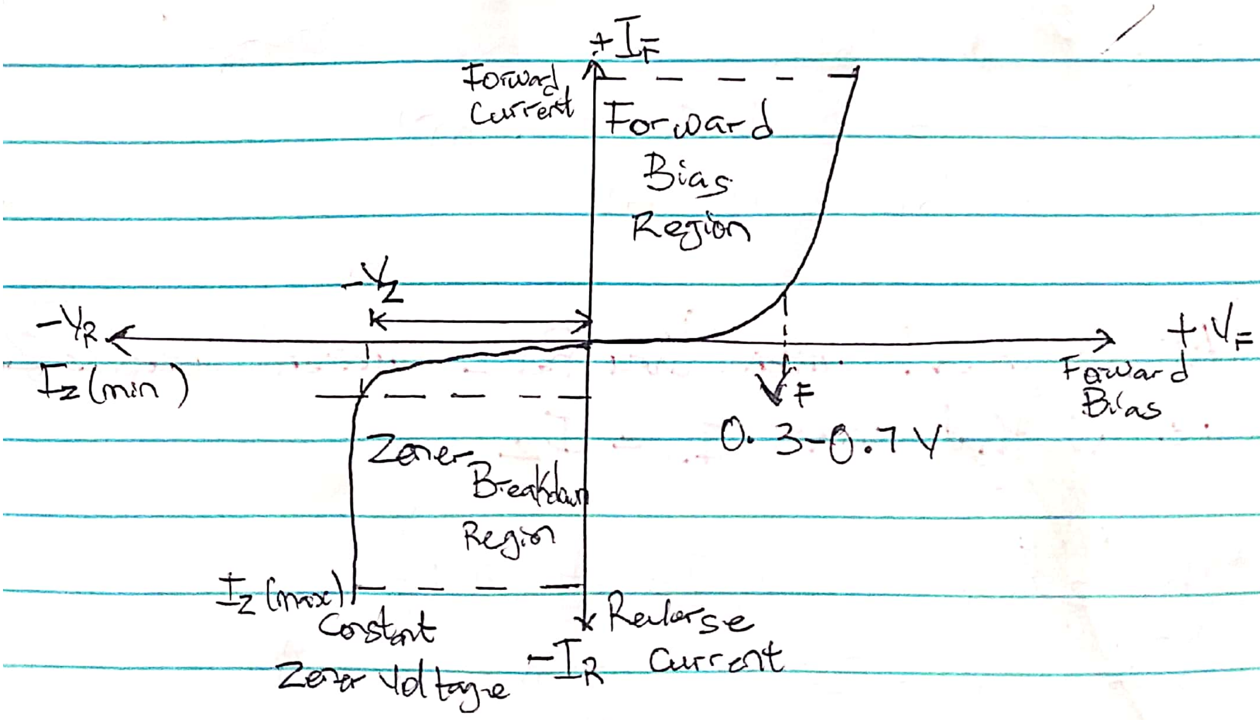
18/ENG05/048

For Zener Diode regulator, the resistor R_s is connected in series with the Zener diode to limit the current flow through the diode with the voltage source, V_s being connected across the combination.

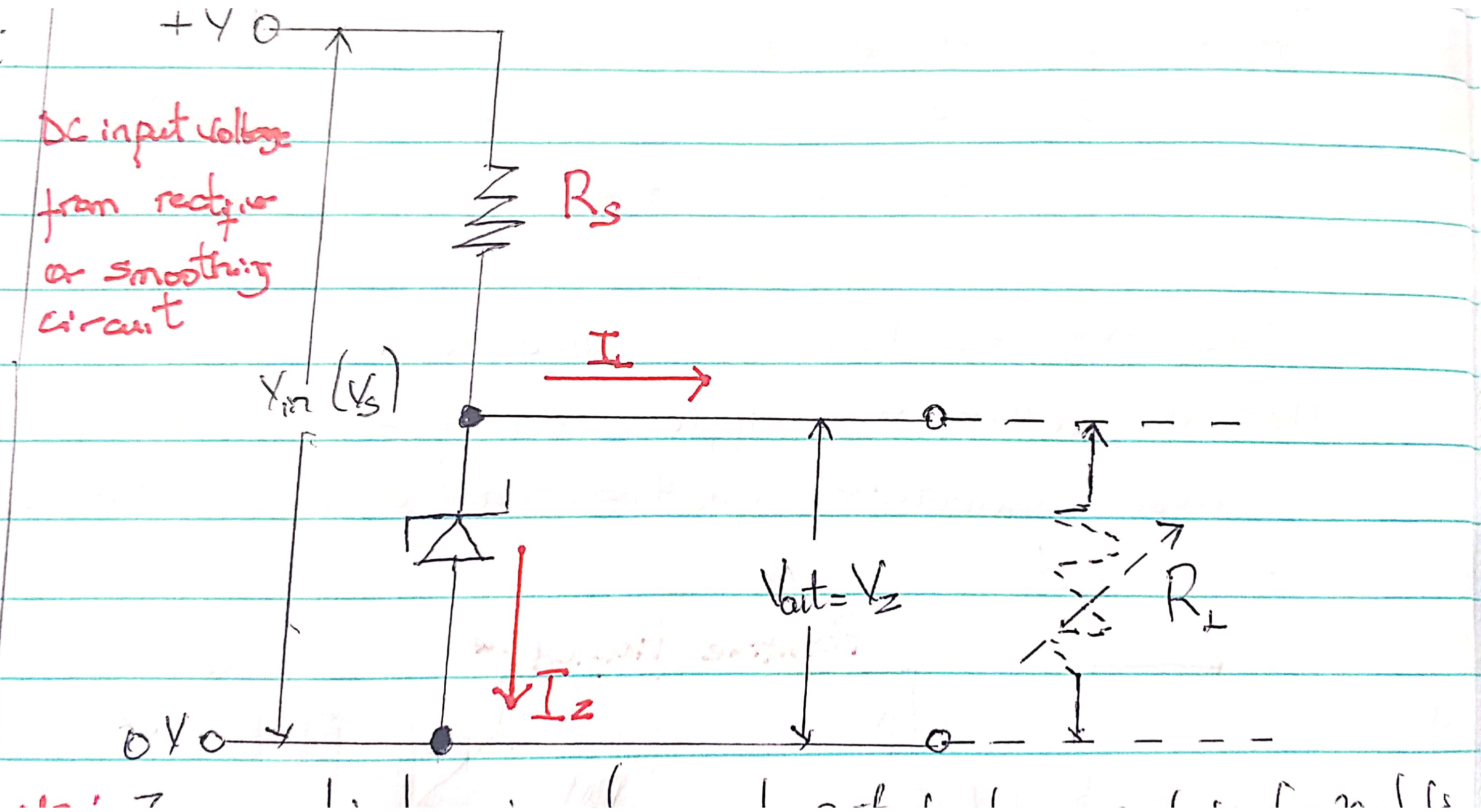
The stabilised output voltage V_{out} is taken from across the Zener diode and the zener diode is connected with its cathode terminal connected to the positive rail of the DC supply so, it is reverse biased and will be operating in its breakdown condition. The Resistor R_s is selected so to limit the maximum current flowing in the circuit. When there is no load connected to the circuit, the load current will be zero ($I_L = 0$) and all the circuit passes through the Zener diode which in turn dissipates its maximum power.


(symbol)





i:



+V
DC input voltage from rectifier or smoothing circuit
R_s
I_L
V_{in} (V_s)
$V_{out} = V_z$
R_L
I_z
0V

Qi

2 $P_z = 5W$ and $V_z = ?$

$I_z = 500mA$

$V_s = 20V_{max} = \frac{2 \times 20}{3.142} = 12.73V$

a) $P_z = I_z V_z$

$5 = 500 \times 10^{-3} \times V_z$

$V_z = 10V$

$R_s = \frac{V_s - V_z}{I_z} = \frac{12.73 - 10}{500 \times 10^{-3}}$

$R_s = 5.46\Omega$

(b) $I_s = I_z + I_L$

$\therefore I_z = I_s - I_L$

and $I_L = \frac{V_z}{R_L} = \frac{10}{500}$

$I_L = 20mA$

$I_s = 500mA$

Therefore $I_z = 500mA - 20mA$

$= 480mA$