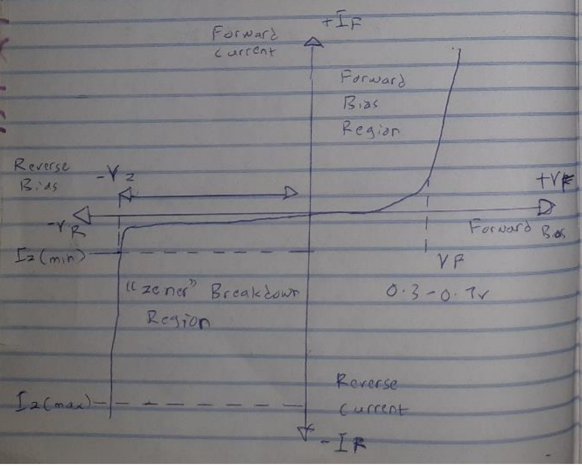
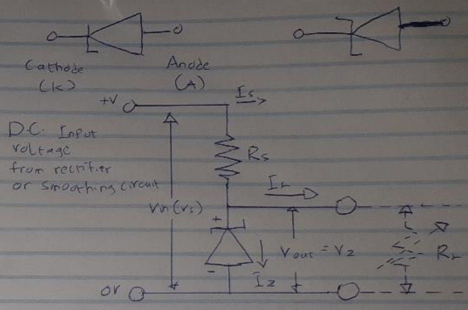
Mechanical

Solution

1) A resistor R_s is connected in series with the zener diode to limit the current flow through the diode with a voltage source V_s connected across the combination. The stabilised voltage output V_{out} is taken from across the zener diode. It is connected with it's cathode terminal connected to the positive rail of the DC supply.

Resistor R_s is selected to limit the maximum current flowing in the circuit.
With no load connected to the circuit, the load current will be zero ($I_L = 0$) and all current goes through the zener diode.
A small value of the series resistor R_s will result in a greater diode current when the load resistance R_L is connected.





2)

$P_z = 5w$

$I_z = 500mA$

20v max

To convert Vmax to VDC

$$V_{dc} = \frac{2V_{max}}{\pi}$$

$$V_S = \frac{2 \times 20}{\pi} = 12 \cdot 73 V_{DC}$$

Recall that $P = IV$

$$\therefore V_z = \frac{P_z}{I_z} = \frac{5}{500 \times 10^{-3}}$$

$$V_z = 10v$$

Recall that $V_z + V_R = V_s$

$$V_R = V_s - V_z$$

$$\frac{2 \times 20}{\pi} - 10$$

$$= 12 \cdot 73 - 10$$

$$= 2 \cdot 73v$$

$\therefore V = IR$

$$R = \frac{V}{I} = \frac{2 \cdot 73}{500 \times 10^{-3}}$$

$$R = 5 \cdot 46$$

Since its connected in series and same current flows

$$I_s = I_z + I_L$$

$$I_z = I_s - I_L$$

$$I_L = \frac{V_z}{R}$$

$$= \frac{10v}{500\Omega} = 0 \cdot 02A$$

$$= 20mA$$

$$I_z = 500mA - 20mA$$

$$= 480mA = 0 \cdot 48A$$

Braide Sogbete Steven
18/ENG06/016
Mechanical

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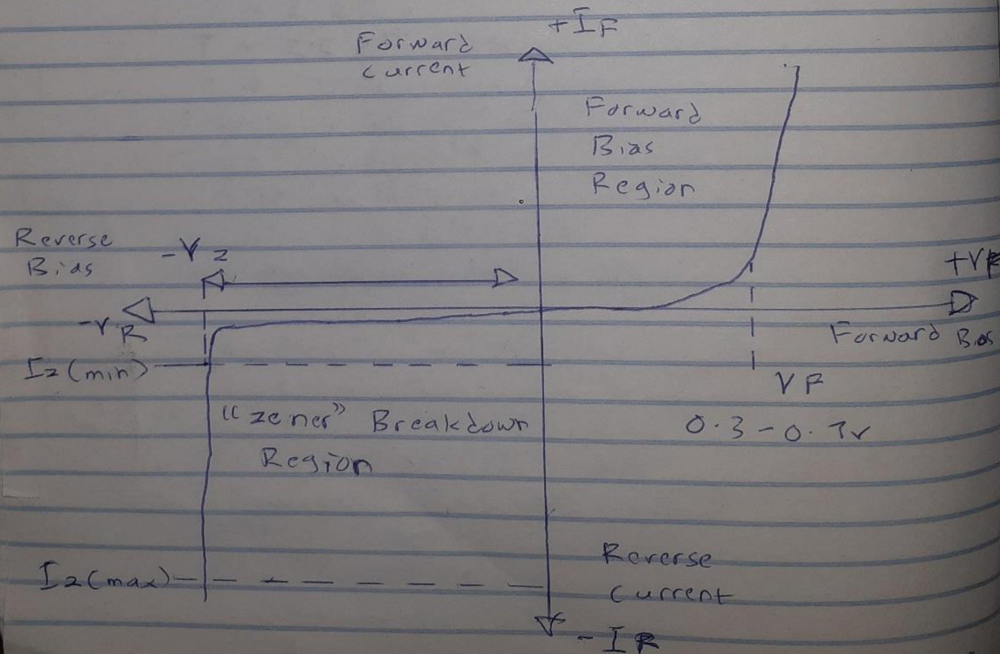

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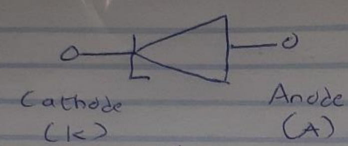

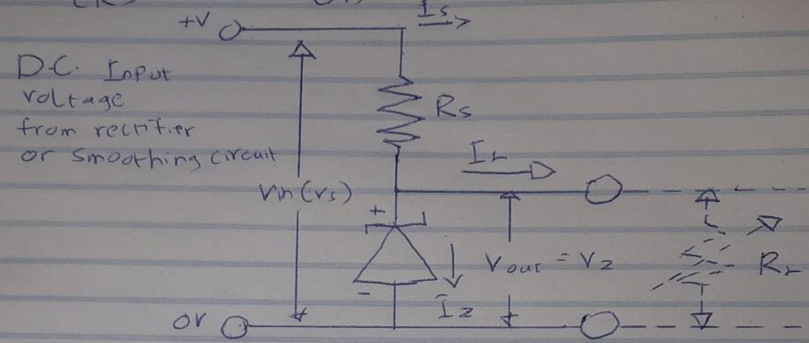

2) $P_Z = 5W$

$I_Z = 500mA$

20 V max

To convert Vmax to VDC

$V_{dc} = \frac{2V_{max}}{\pi}$

$V_S = \frac{2 \times 20}{\pi} = 12.73V_{DC}$

Recall that $P = IV$

$\therefore V_Z = \frac{P_Z}{I_Z} = \frac{5}{500 \times 10^{-3}}$

$V_Z = 10V$

Recall that $V_Z + V_R = V_S$

$V_R = V_S - V_Z$

$\frac{2 \times 20}{\pi} - 10$

$= 12.73 - 10$

$= 2.73V$

$\therefore V = IR$

$R = \frac{V}{I} = \frac{2.73}{500 \times 10^{-3}}$

$R = 5.46$

Since its connected in series and same current flows

$I_S = I_Z + I_L$

$I_Z = I_S - I_L$

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

$= \frac{10V}{500\Omega} = 0.02A = 20mA$

$I_Z = 500mA - 20mA$

$= 480mA = 0.48A$