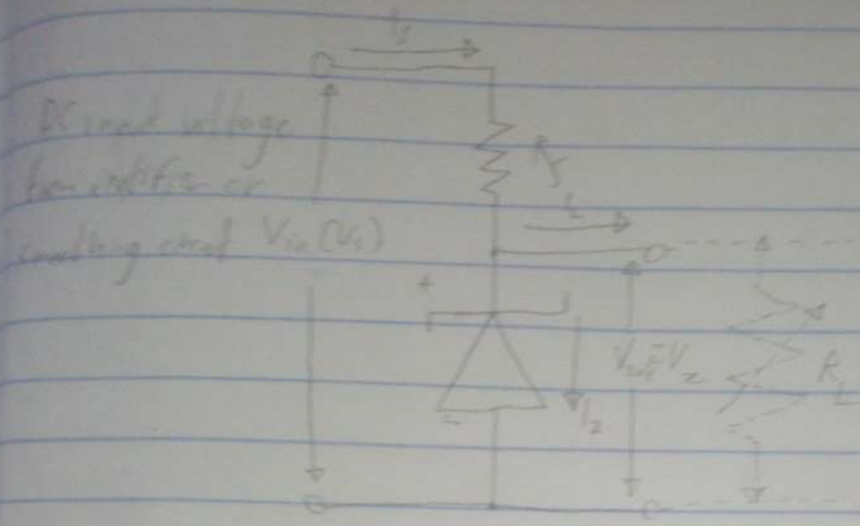

2) $P_z = 5W$

$I_z = 500mA$

$V_{max} = 20V_{max}$

i) $R_s = \frac{V_s - V_z}{I_z}$

~~$V_s = 0.318 V_{max}$~~

~~$= 0.318 \times 20$~~

~~$V_s = 6.36V$~~

$V_s = \frac{2V_{max}}{\pi} = \frac{2 \times 20}{\pi}$

$V_s = 12.73V$

$V_z = \frac{P_z}{I_z} = \frac{5W}{500mA} = 10V$

$R_s = \frac{12.73 - 10}{500mA} = \frac{12.72}{500mA} = 5.46\Omega$

ii) $I_L = \frac{V_z}{R_L} = \frac{10V}{500\Omega} = 20mA$

$I_z = I_s - I_L = 500mA - 20mA = 480mA$

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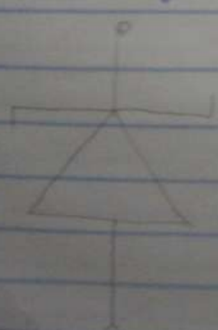
1) In a zener diode regulator, the resistor R_S is connected in series with the zener diode to limit the current flow through the diode with the voltage source V_S being connected across the combination. The stabilised output voltage V_{out} is taken from across the zener diode. The zener diode is connected 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. Resistor R_S is selected so to limit the maximum ~~breakdown voltage~~ current flowing in the circuit. With no load connected to the circuit, the load current will be zero ($I_L = 0$) and all the circuit current passes through the zener diode which in turn dissipates its maximum power. Also, a small value of the series resistor will result in a greater diode current when the load resistance R_L is connected and large as this will increase the power dissipation requirement of the diode. The load is connected in parallel with the zener diode so the voltage across R_L is always the same as the zener voltage.

$$V_R = V_Z$$

i)



ii)