

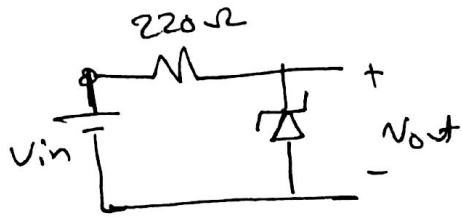
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Lec (6) Lec (08)

Zener diode (Revision)

EX(1)

Suppose Zener diode in The circuit shown with Specifications of



$V_Z = 10V$, $I_{ZK} = 0.25mA$ (min), $P_{Dmax} = 1W$

Find :- The input limits for Regulation

1 $I_{ZM} = \frac{P_{Dmax}}{V_Z} = \frac{1}{10} = 0.1A = 100mA$

2 $I_{ZK} = I_{Zmin} = 0.25mA$

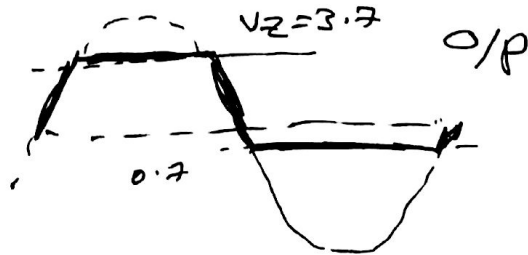
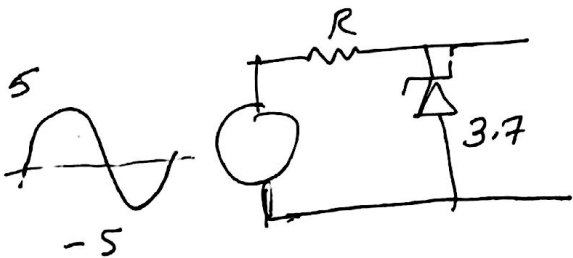
3 $\frac{V_{in(max)} - V_Z}{R_s} = I_{Zmax}$

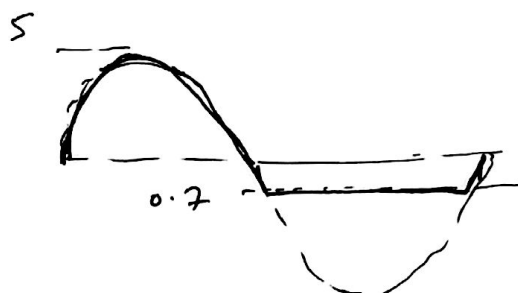
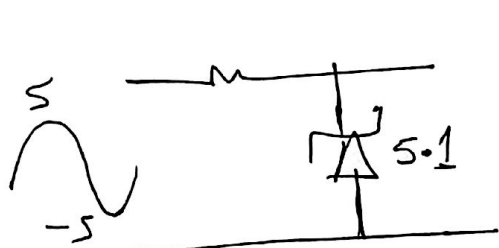
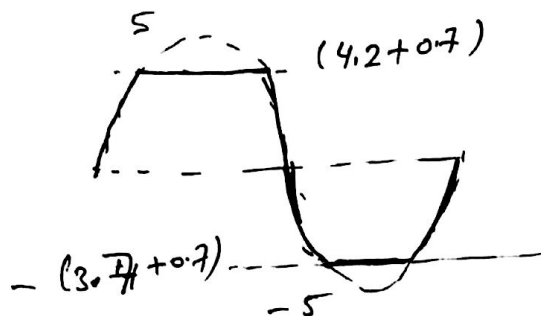
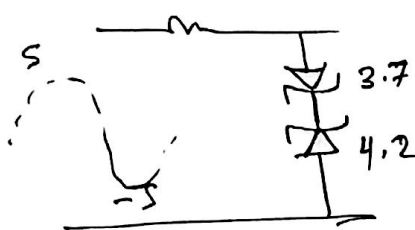
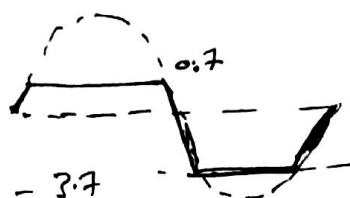
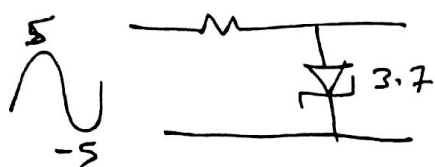
∴ $0.1 = \frac{V_{in(max)} - 10}{220} \Rightarrow V_{in(max)} = 32V$

4 $\frac{V_{in(min)} - V_Z}{R_s} = I_{Zmin}$

∴ $0.25 \times 10^{-3} = \frac{V_{in(min)} - 10}{220} \Rightarrow V_{in(min)} = 10.055V$

EX(2) Draw the output in the following circuits





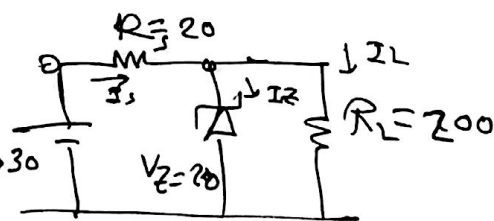
EX(3) Find I_{Zmax} , I_{Zmin} & $P_{R_s max}$, $P_{R_s min}$, P_{Zmax} , P_{Zmin}

Sol

$$I_{Smin} = \frac{V_{in(min)} - V_Z}{R_s} = \frac{24 - 20}{20} = 0.2A$$

$$I_{Smax} = \frac{30 - 20}{20} = 0.5A$$

$$I_L = \frac{V_Z}{R_L} = \frac{20}{200} = 0.1A$$



$$I_{Smin} = I_{Zmin} + I_L$$

$$0.2 = I_{Zmin} + 0.1$$

$$\therefore I_{Zmin} = 0.1A$$

$$I_{Zmax} = I_{Smax} - I_L = 0.5 - 0.1 = 0.4A$$

$$P_{Rmax} = I_{Smax}^2 R_s = (0.5)^2 \times 20 = 5W \rightarrow P_{Zmax} = I_{Zmax} V_Z = (0.4)(20) = 8W$$

$$P_{Rmin} = I_{Smin}^2 R_s = (0.2)^2 \times 20 = 0.8W \rightarrow P_{Zmin} = (0.1)(20) = 2W$$