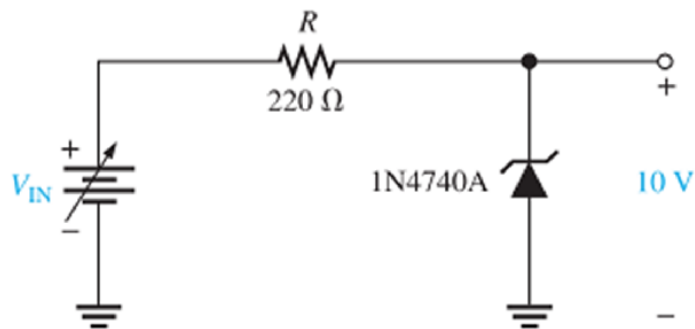


Electronic Engineering

Shee3: Zener Diodes

1- What are the ratings of V_{IN} in figure (1) if

$$I_{ZK} = 0.25\text{mA}, P_{D(\text{max})} = 1\text{W}, V_Z = 10\text{V} ?$$



$$I_{ZM} = \frac{P_{D(\text{max})}}{V_Z} = \frac{1\text{ W}}{10\text{ V}} = 100\text{ mA}$$

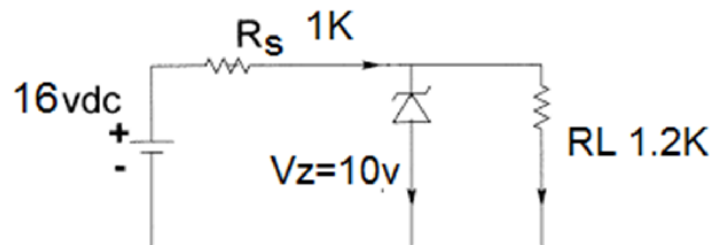
$$V_R = I_{ZK}R = (0.25\text{ mA})(220\ \Omega) = 55\text{ mV}$$

$$V_{IN(\text{min})} = V_R + V_Z = 55\text{ mV} + 10\text{ V} = 10.055\text{ V}$$

$$V_R = I_{ZM}R = (100\text{ mA})(220\ \Omega) = 22\text{ V}$$

$$V_{IN(\text{max})} = 22\text{ V} + 10\text{ V} = 32\text{ V}$$

2- For fixed regulation in figure (2) , calculate V_L , I_L , I_{ZK} , I_{ZM}



~~so~~ assume Zener open $\therefore V_L = \frac{16 \times 1.2}{1 + 1.2} = 8.73$
 $\therefore 8.73 < 10V_z$ \therefore Zener off (open)
 (V_z)
 \rightarrow and $V_L = 8.73$
 $\rightarrow V_R = V_{in} - V_L = 16 - 8.73 = 7.27V$
 $\rightarrow I_L = \frac{V_L}{R_L} = \frac{8.73}{1.2K} = 7.27mA$
 $I_R = \frac{16 - 8.73}{1K} = 7.27mA$
 $\therefore P_Z = V_Z I_Z = 0$

3- Repeat problem (2) if R_L replaced with 3K

b) % $R_L = 3K$ repeat problem
 $\therefore V_L = \frac{16 \times 3K}{1K + 3K} = 12V$
 $V_L > V_Z \therefore$ Zener on
 $\therefore V_Z = V_L = 10V$
 $I_L = \frac{10}{3K} = 3.33mA$
 $I_R = \frac{16 - 10}{1K} = 6mA$
 $P_Z = V_Z I_Z = (2.67mA)(10) = 26.7mW$
 $I_Z = I_R - I_L = (6 - 3.33)mA = 2.67mA$