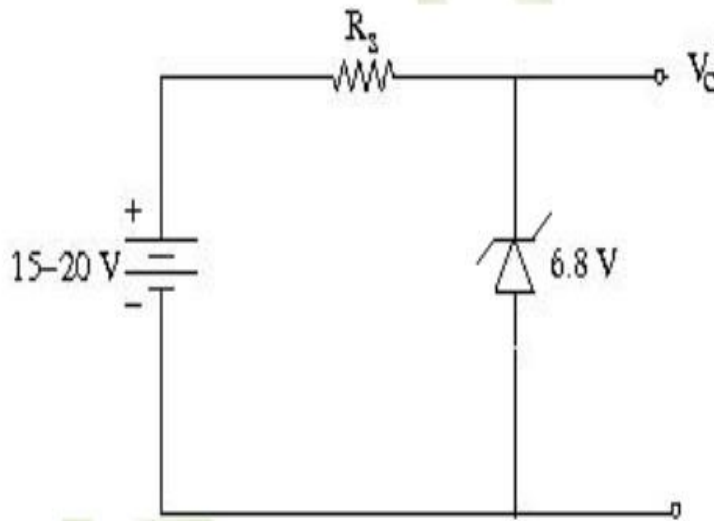


Q.13 A Zener regulator has an input voltage in the range 15V-20V and a load current in the range of 5 mA-20 mA. If the Zener voltage is 6.8V, the value of the series resistor should be



Attempt to the solution:

Let I_L, I_S, I_Z be the load, resistor and zener currents respectively.

Using Kirchoff's Current rule, we get

$$\Rightarrow I_S = I_L + I_Z \quad \text{..(1)}$$

Let V be the input voltage, V_Z be the zener voltage.

Now using Kirchoff's Voltage rule, we get

$$\Rightarrow R = (V - V_Z) / I_S \quad \text{..(2)}$$

Using (1) and (2), we get,

$$I_Z = (V - V_Z) / R - I_L \quad \text{...(3)}$$

In equation (3), I_Z is maximum when V is maximum and I_L is minimum. Similarly, I_Z is minimum when V is minimum and I_L is maximum. Thus,

$$I_{ZMAX} = (V_{MAX} - V_Z)/R - I_{LMIN}$$

$$I_{ZMIN} = (V_{MIN} - V_Z)/R - I_{LMAX}$$

This is where I am stuck at. The final answer is 390Ω .