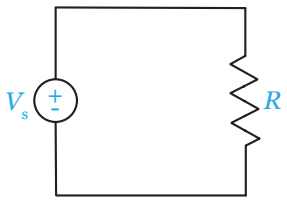
MEMS 0031 - Electrical Circuits
Quiz #2

Name: Solutions

Problem #1

Determine the resistance R that results in a current greater than 80 [mA] to be drawn, ensuring the power dissipated by the resistor is less than 2 [W], given V_s=10 [V].



The current must be greater than 80 [mA]. Applying Ohm's law to solve for the resistance:

$$V = iR \implies i = \frac{10\,[\text{V}]}{R} > 80\,[\text{mA}] \implies R < \frac{10\,[\text{V}]}{80\,[\text{mA}]} \implies R < 125\,[\Omega]$$

The power dissipated my be less than 2 [W]. Using our power equation:

$$P = i^2 R < 2\,[\text{W}] \implies R < \frac{w\,[\text{W}]}{(80\,[\text{mA}])^2} \implies R < 312.5\,[\Omega]$$

Well, this doesn't tell us much because R must be less than 125 as dictated by Ohm's law. Using the expression for power based upon voltage:

$$P = \frac{V^2}{R} < 2\,[\text{W}] \implies R > \frac{(10\,[\text{V}])^2}{2\,[\text{W}]} \implies R > 50\,[\Omega]$$

Therefore

$$50 < R\,[\Omega] < 125$$