ECE 320 - Homework #2

Semiconductors, PN Junction. Due Monday, January 22, 2018

Semiconductors

1) What is the difference between n-type, p-type, and intrinsic silicon?

2) An 0805 resistor is made out of silicon with dimensions
   - Width & height: 1.25mm x 1.25mm
   - Length: 2mm

What does the doping level need to be to make this a 10k resistor using Boron (p-type semiconductor)?

3) A thermistor (i.e. a piece of silicon) has the following temperature - resistance relationship:

$$R = 1000 \cdot \exp\left(\frac{3903}{T} - \frac{3903}{298}\right)\ \Omega$$

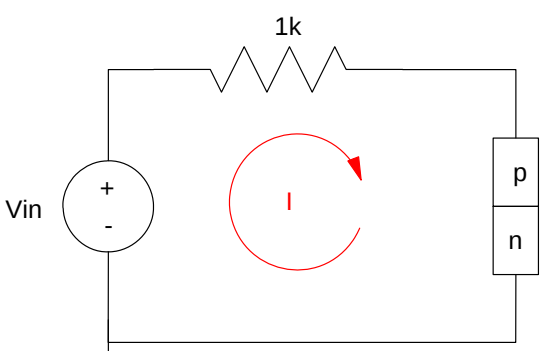
where T is the temperature in degrees Kelvin. In Matlab (or similar program),
   - Plot the resistance vs. temperature from -30C to +30C (243K to 303K)
   - Plot the voltage for the voltage divider shown below

4) If the voltage at the voltage divider is 6.00V, what is the temperature?

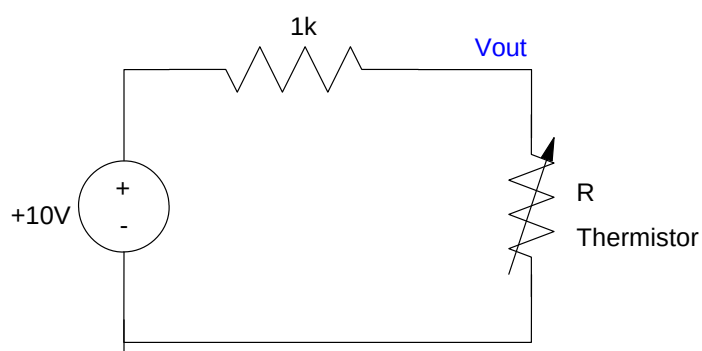
PN Junction

5) Will current flow in the following circuit if
   - Vin = +3V? Why?
   - Vin = -3V? Why?

6) Does this behave like a pn junction if
   - The temperature is really low (say, -100C)? Why?
   - The temperature is really high (say, +300C)? Why?



Problem 5 & 6



Problem 3 & 4