ECE 320 - Homework #2

Semiconductors, PN Junctions, Diode VI Characteristics. Due Wednesday, September 9th

Assume a thermistor has the temperature - resistance relationship of

 $R \approx 1000 \cdot e^{-0.04(T-25)}\Omega$

- 1) Explain why the resistance drops as temperature goes up.
- 2) Assume you have a thermistor with a voltage divider:



Use MATLAB, plot the voltage vs. temperature for -50C < T < 50C

Assume you have a power supply trying to push current through a PN junction



- 3) Explain what is meant by 'n-type' and 'p-type' material.
- 4) Assume the temperature was very high. Would this still be a PN junction? Why or why not?
- 5) Assume the temperature was very low. Would this still be a PN junction? Why or why not?
- 6) Assume Vin = +5V. Explain why current does / does not flow in this circuit.
- 7) Assume Vin = -5V. Explain why current does / does not flow in this circuit.

For the following circuits, write N equations to solve for N unknowns. You do not need to solve - just write the equations.

8) Diode circuit



Lab (Tuesday and Thursday - open lab in room 235):

9) Use a thermistor in the lab has the voltage-resistance relationship of

 $R\approx 1000\cdot e^{-0.04(T-25)}\,\Omega$

where T is temperature in degrees C. Use this thermistor to determine the temperature of three things. Some suggestions are

- Ice from a freezer,
- Boiling water
- Dried Ice
- A can of pop from the refrigerator
- A glass of ice water

Include your measurements and your calculations.