# ECE 320 - Quiz #2 - Name _____

Semiconductors, pn Junction, ideal diodes - Spring 2022

1a) What are holes and electrons?

1b) The voltage drop across a silicon diode is about 0.7V.

- Does this voltage go up or down as temperature goes up?
- Why does this happen?

2) An 0603 resistor has the following dimensions

- L = 0.06cm
- W = 0.03cm
- H = 0.02cm

Determine the doping required to make a resistance of R ohms where

- R = 1200 + 100*(your birth month) + (your birth date).
- For example, May 14th would give R = 1714 Ohms

| R<br>1200 + 100*(your birth month) + (your birth date) | Required Doping of Boron<br>atoms / cc |
|---|---|
| | |

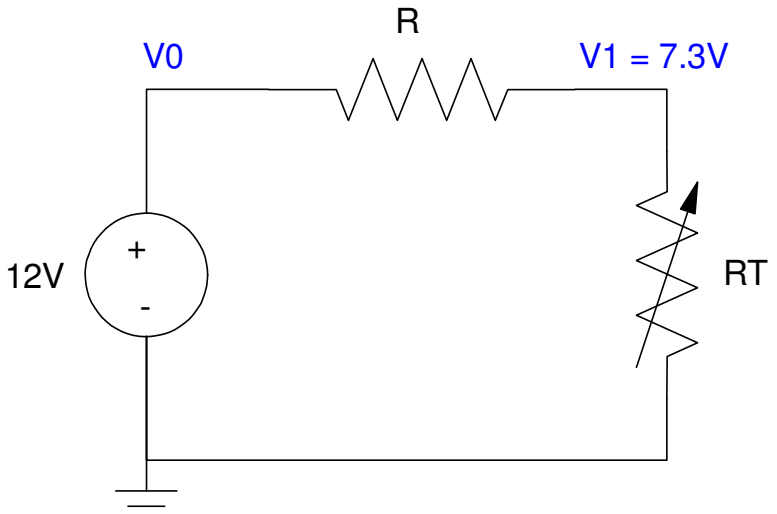
3) Thermistors: Assume the VI characteristics of a thermistor are

$$R_T = 2000 \exp\left(\frac{4350}{T+273} - \frac{4350}{298}\right)\Omega$$

where T is the temperature in degrees C. Determine RT and the temperature if V1 = 7.3V

- Let R be 1200 + ( your birth month ) * 100 + your birthday. ( March 14th would give R = 1714 Ohms )

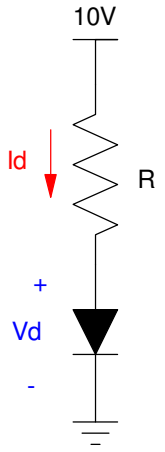
| R<br>1200 + 100*Month + Day | RT (Ohms)<br>Thermistor | Temperature (C) |
|---|---|---|
| | | |

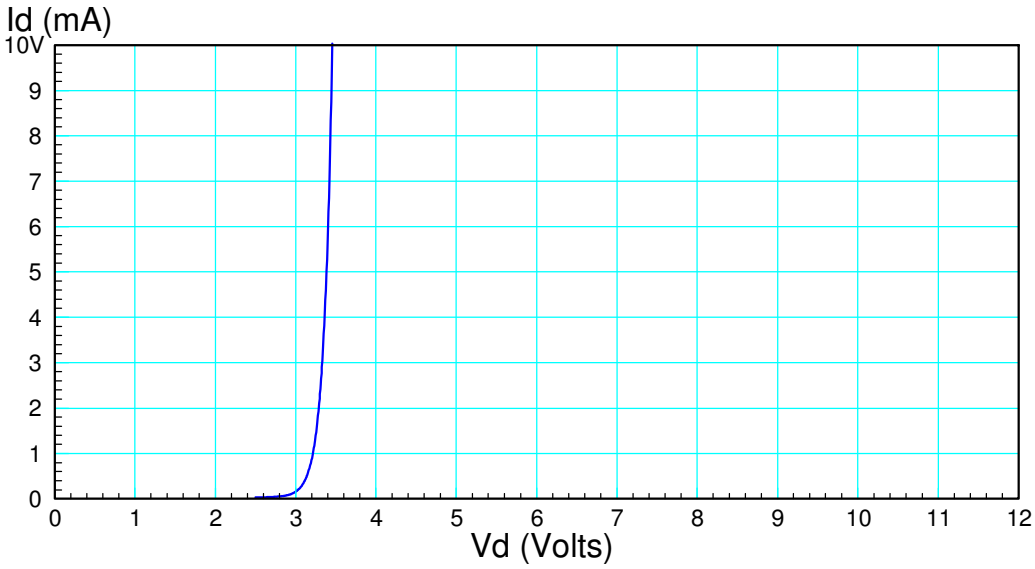


4) Load Lines: The VI characteristic for a diode is show on the graph below. Draw the load line for the following circuit and from the graph, determine Vd and Id

- Let R be 1200 + 100*(Birth Month) + (Birthday)

| R<br>1200 + 100*Month + Day | Load Line<br>x-intercept | Load Lie<br>y-intercept | Vd | Id |
|---|---|---|---|---|
| | | | | |



5) Diodes (nonlinear equations): Assume

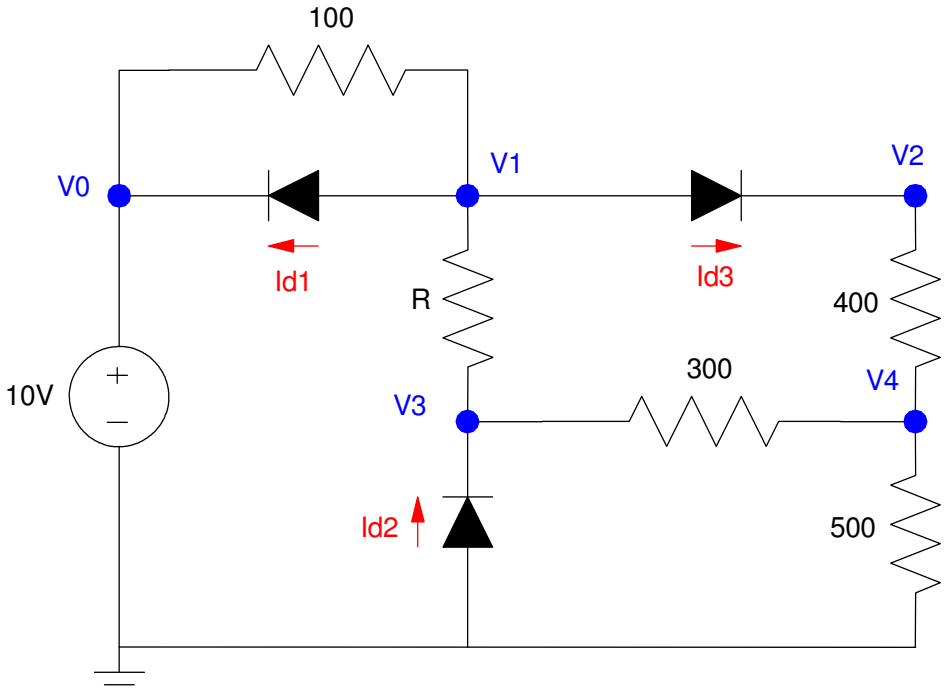
- The VI characteristics of a diode are

$$I_d = 10^{-11} \cdot \left( \exp\left( \frac{V_d}{0.038} \right) - 1 \right)$$

- R = 1200 + 100 * (your birth month) + (your birth date).

Write 7 equations so solve for 7 unknowns: V1, V2, V3, V4, Id1, Id2, Id3

- note: don't solve.



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