ECE 320 - Quiz #2 - Name _____

Semiconductors, pn Junction, ideal diodes - Spring 2021

1) For semiconductors, current can flow using either holes or electrons.

1a) What are holes?

1b) Why is the resistance of n-type silicon slighly less than the resistance of p-type silicon?

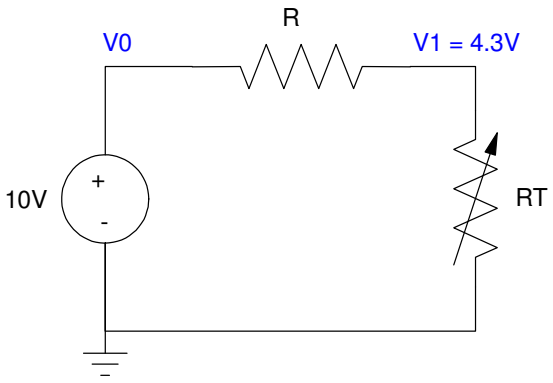
2) Thermistors: Assume the VI characteristics of a thermistor are

$$R_T = 1000 \exp\left(\frac{4440}{T+273} - \frac{4440}{298}\right) \ \Omega$$

where T is the temperature in degrees C. Determine RT and the temperature if V1 = 4.3V

Let R be 1000 + (your birth month) * 100 + your birthday. For example, March 14th would give R = 1514 Ohms.

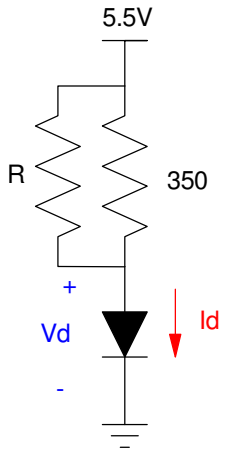
R 1000 + 100*Month + Day	RT (Ohms) Thermistor	Temperature (C)

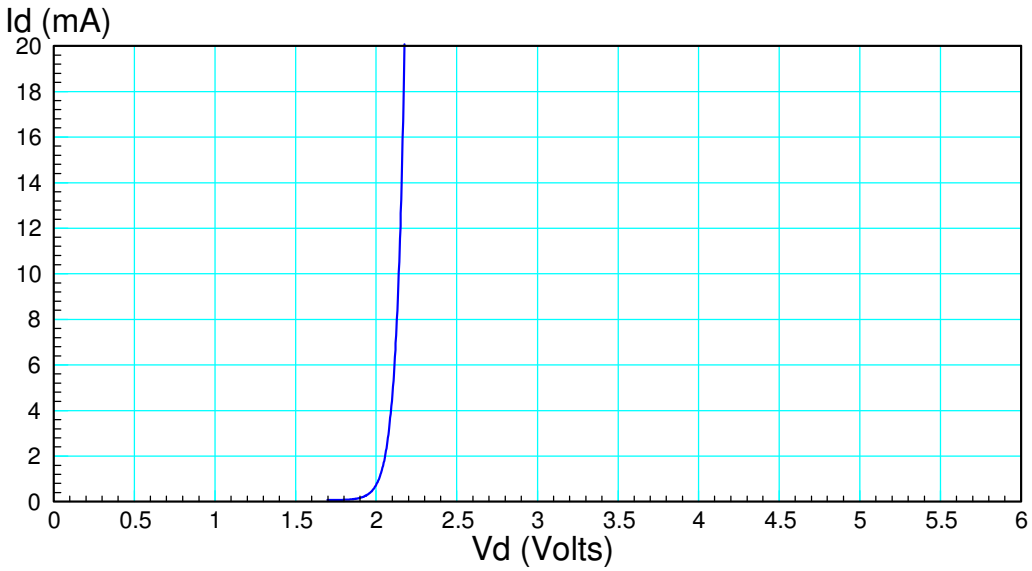


3) Load Lines: The VI characteristic for a diode is show on the graph below. Draw the load line for the following circuit and from the graph, determine Vd and Id

- Let R be 1000 + 100*(Birth Month) + (Birthday)

R 1000 + 100*Month + Day	Load Line	Vd	Id
	show on graph		

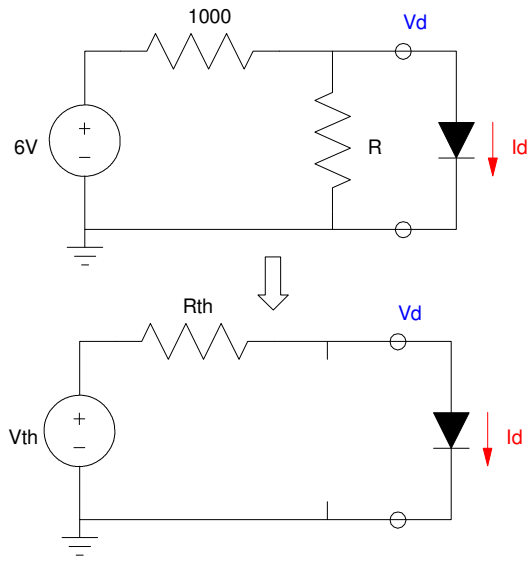


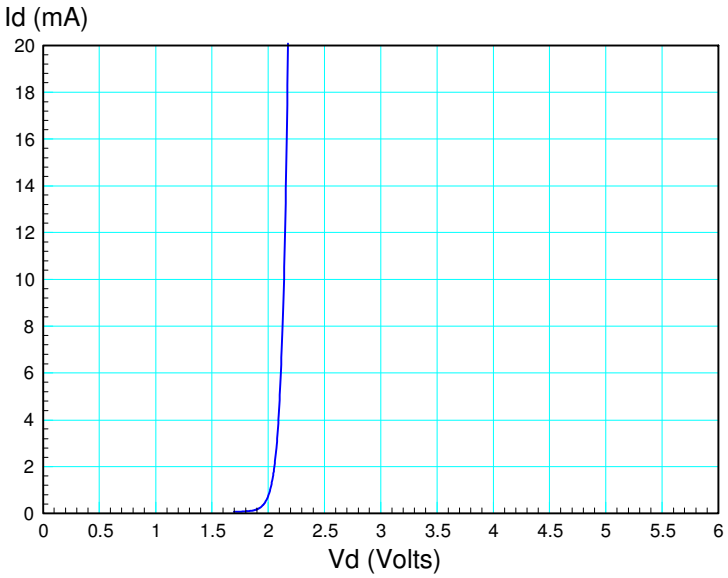


4) More Load Lines: Determine the Thevenin equivalent for the circuit up top. Then, draw the load line and determine Vd and Id.

- Let R be 1000 + 100*(Birth Month) + (Birthday)

R	Vth	Rth	Vd	Id



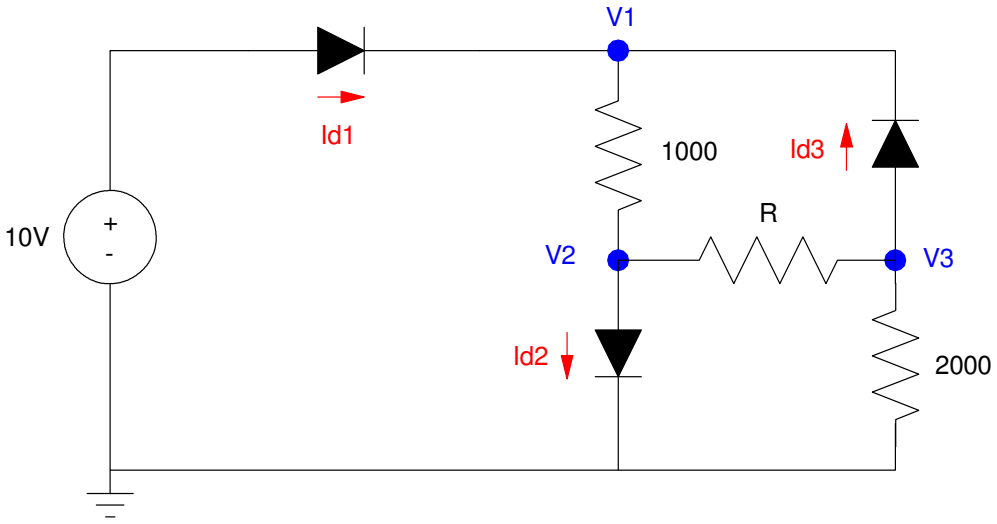


5) Assume the VI characteristics of the diodes below are:

$$V_d = 0.052 \ln \frac{I_d}{10^{-8}} + 1 \qquad I_d = 10^{-8} \exp \frac{V_d}{0.052} - 1$$

Write the voltage node equations for the following circuit (don't solve).

- Let R be 1000 + 100*(Birth Month) + (Birthday)



6) By symmetry, if you have three identical diodes in series, the voltage drop across each diode will be 1/3 of the total voltage. Assume the VI relationship for the diodes below are

$$V_d = 0.052 \ln \frac{I_d}{10^{-8}} + 1 \qquad I_d = 10^{-8} \exp \frac{V_d}{0.052} - 1$$

Write the voltage node equations for the following circuit.

- Let R be 1000 + 100*(Birth Month) + (Birthday)