Embedded Real-Time Systems (AME 3623)
Homework 1

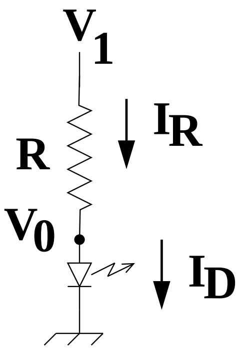
January 30, 2012

This homework assignment is due on Thursday, February 2nd at 5:00pm. Your work may be handed in electronically (use the **Homework 1** digital dropbox on D2L) or in hardcopy form (in person or in office).

This assignment must be done individually: do not share/discuss your answers with others or look at the answers of others.

Question 1

Consider the following circuit:



Assume that $V_f = 2V$ (the forward voltage of the diode).

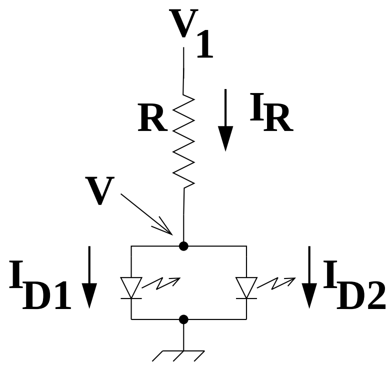
1. (10pts) What equations are always true, no matter the state of the diode?

2. (15pts) At what V_1 does the diode begin to conduct current?

3. (10pts) Assume that $R = 200\Omega$. Draw V_0 and I_D as a function of V_1 for interesting values of V_1. (use separate figures)

Question 2

Consider the following circuit:



Assume that $V_{f1} = 2V$, $V_{f2} = 1.5V$, and $R = 1K\Omega$.

1. (10pts) What equations are always true, no matter the states of the diodes?

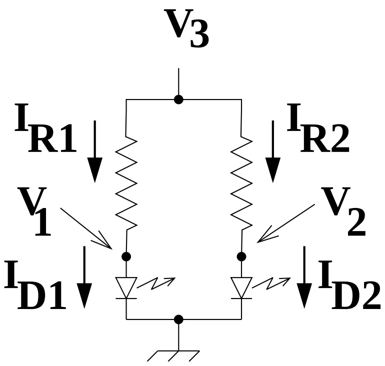
2. (10pts) What are the four possible cases for the diodes?

3. (10pts) At what V_1 does some diode begin to conduct current?

4. (10pts) At what V_1 do both diodes begin to conduct current?

Question 3

Consider the following circuit:



Assume that $V_{f1} = 2V$, $V_{f2} = 1.5V$, and $R_1 = R_2 = 1K\Omega$.

1. (10pts) What equations are always true, no matter the state of the diode?

2. (10pts) What are the four possible cases for the diodes?

3. (10pts) At what V_3 does some diode begin to conduct current?

4. (10pts) At what V_3 do both diodes begin to conduct current?

5. (10pts) When $V_3 = 5V$, what are I_{R1} and I_{R2}?

Question 4

1. (5pts) Given the binary number: 111001011. What is the decimal equivalent? Assume that this is an unsigned number. Show your work.

2. (5pts) Assume that we interpret 11001110 a signed 8-bit number (two's complement). Is it positive or negative? What is the decimal equivalent? Show your work.

3. (5pts) Assume that we interpret 01101100 a signed 8-bit number (two's complement). Is it positive or negative? What is the decimal equivalent? Show your work.

4. (5pts) Given the decimal number: 148. What is the binary equivalent? Show your work (all of the steps of the algorithm that we discussed in class).

5. (5pts) Given the decimal number: 563. What is the binary equivalent? Show your work.

Question 5

How much time did you spend on this homework assignment?