Embedded Systems (CS [45]163)
Homework 1

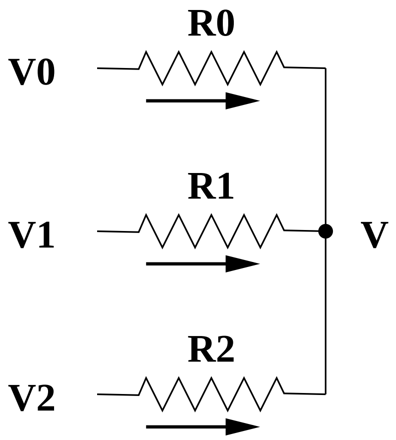
February 9, 2009

This homework assignment is due on Thursday, February 12th 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 under door).

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:



1. (20pts) Derive an equation for V given Vx and Rx, where $x = \{0, 1, 2\}$. Show your work.

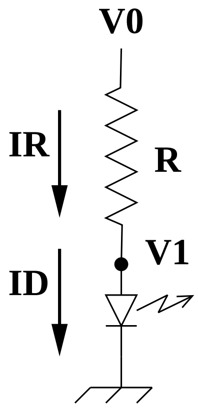
2. (10pts) Assume $R0 = 200$, $R1 = 100$ and $R2 = 50$. Simplify the equation for V.

3. (10pts) Fill in the following table.

$V2$	$V1$	$V0$	V
0	0	0	
0	0	5	
0	5	0	
0	5	5	
5	0	0	
5	0	5	
5	5	0	
5	5	5	

Question 2

Consider the following circuit:



Assume that $V_f = 1.2V$.

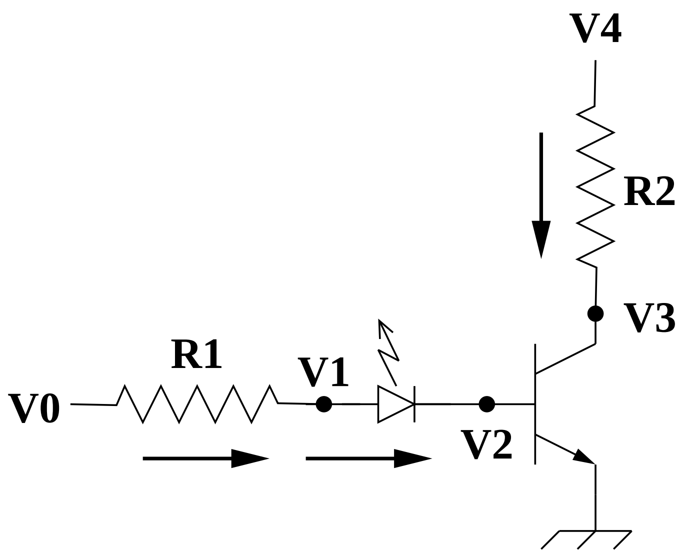
1. (20pts) Derive equations for $V1$ and ID for arbitrary $V0$ and R.

2. (10pts) Assume $V0 = 5V$. Show a plot of ID as a function of R.

3. (10pts) Assume $R = 100\Omega$. Show a plot of ID as a function of $V0$. Be sure to include all interesting values of $V0$.

Question 3

Consider the following circuit:



Assume $V_{fD} = 1V$, $V_{fT} = 0.5V$, $g = 100$, $R1 = 1K\Omega$, $R2 = 100\Omega$ and $V4 = 10V$.

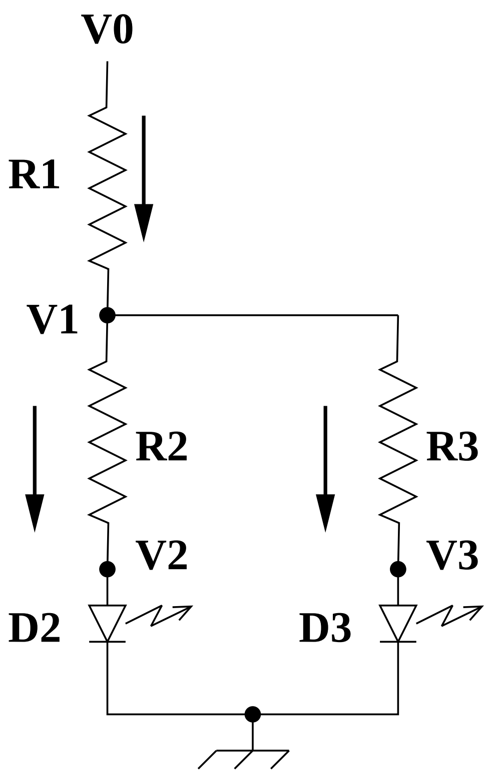
1. (10pts) Given $V0 = 5V$, what are $V3$ and $IR2$?

2. (10pts) Given $V0 = 1.6V$, what are $V3$ and $IR2$?

3. (10pts) Given $V0 = 1V$, what are $V3$ and $IR2$?

Question 4

Consider the following circuit:



Assume $R2 = R3 = 0$, $R1 = 500\Omega$, $V_{fD2} = 1V$ and $V_{fD3} = 2V$.

1. (10pts) Assume $V_0 = 0.8V$, what are $ID2$ and $ID3$? Show your derivation.

2. (10pts) Assume $V_0 = 1.5V$, what are $ID2$ and $ID3$? Show your derivation.

3. (10pts) Assume $V_0 = 2.5V$, what are $ID2$ and $ID3$? Show your derivation.

Question 5 (GRADUATE ONLY)

Consider the circuit from Question 4.

Assume $R2 = 300\Omega$ and $R3 = 400\Omega$.

1. (20pts) Show $V1$, $ID2$ and $ID3$ as a function of $V0$.

Question 6 (ALL)

How much time did you spend on this homework assignment?