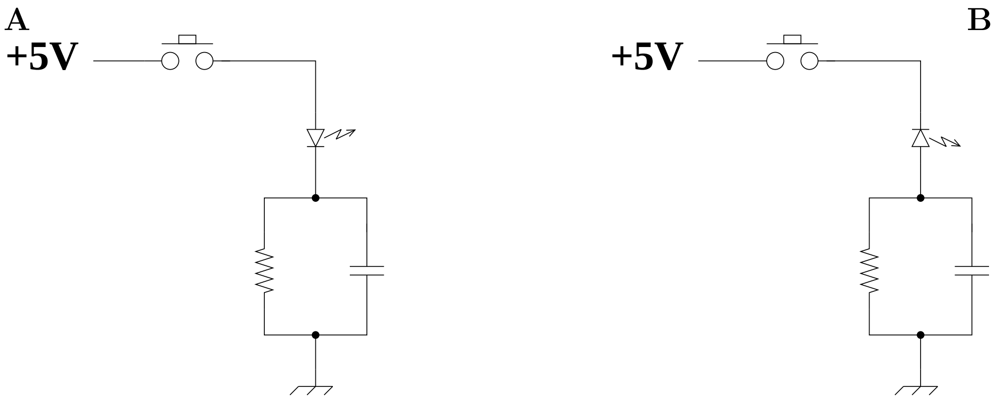
Embedded Systems (CS 503/591C)
Homework 2

November 20, 2003

This homework assignment is due Thursday, November 13. Feel free to discuss this assignment with the TAs, the instructor, or your fellow students. But - the work that you hand in must be your own.

Question 1

Consider the following circuits:



Please give answers to the following questions (with explanations):

1. Figure A: assume that at time $t = 0$ the switch transitions from an opened state to a closed state. Sketch the brightness of the LED as a function of time. Make sure to indicate the location of zero brightness and of 1 time constant.

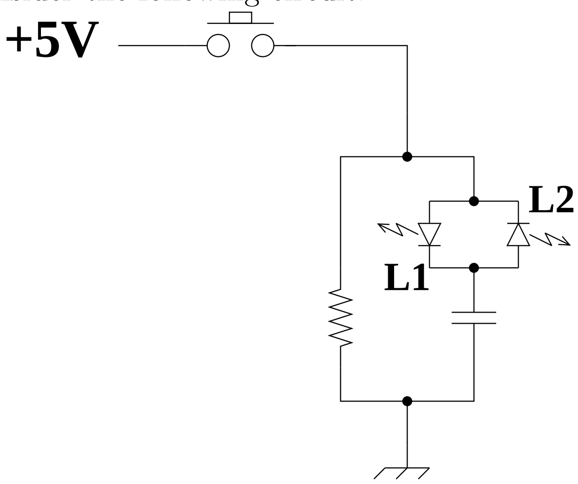
2. Figure A: assume that at time $t = 0$ the switch transitions from a closed state to an opened one. Sketch the brightness of the LED as a function of time.

3. Figure B: assume that at time $t = 0$ the switch transitions from an opened state to a closed state. Sketch the brightness of the LED as a function of time.

4. Figure B: assume that at time $t = 0$ the switch transitions from a closed state to an opened one. Sketch the brightness of the LED as a function of time.

Question 2

Consider the following circuit:



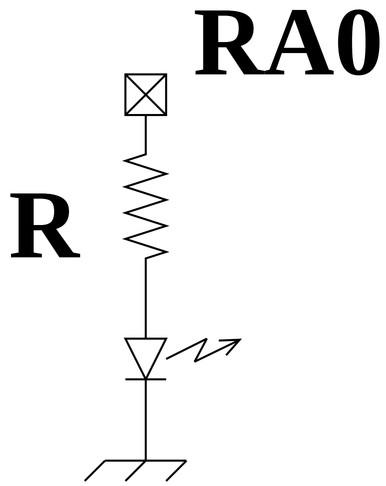
Please give answers to the following questions (with explanations):

1. Assume that at time $t = 0$ the switch transitions from an opened state to a closed state. Sketch the brightness of LED 1 and LED 2 as a function of time. Make sure to indicate the location of zero brightness and of 1 time constant.

2. Assume that at time $t = 0$ the switch transitions from a closed state to an opened state. Sketch the brightness of LED 1 and LED 2 as a function of time.

Question 3

Suppose we have a green "Super Bright" LED (specifically, RL5-G5030) connected to our PIC in the following way:



When the LED turns on, we would like it to be as bright as possible (within the specifications of our hardware).

1. What is the max current that our PIC can source?
2. What is the max sustained current that the LED can handle?
3. What is the max current we should use in this circuit?
4. What is the voltage drop across the LED at this current level (approximately)?
5. What is the appropriate resistance that we should use in the circuit in order to obtain maximum (safe) brightness?

Question 4

Suppose we want to modulate our piezoelectric speaker at $610.35Hz$.

1. What timer should we use?
2. How should we configure the timer?

Question 5

Suppose we want to flash an LED at $4.77Hz$.

1. What timer should we use?
2. How should we configure the timer?

Question 6

Suppose we want to sample a digital input line at precisely $2.155KHz$.

1. What timer should we use?
2. How should we configure the timer?

Question 7

How much time did you spend on this assignment?