CS3220 Spring 2017

**Assignment #1 (8 points): Due Feb 17th  6 pm.**

In this assignment, you will write an x-max tree using your Qurtus.

You can do your assignment with another class mate. Your code includes both part 1 and part 2. You can also look at timer.v and timer\_test.v for your reference.

**Part 1** (5 points): X-mas tree

Using Qurtus red LEDs, you will demonstrate your state machine works correctly.

State 1. Blink the upper half red lights for 3 times (1/n sec ON, 1/n sec OFF).  
State 2. Blink the bottom half red lights for 3 times (1/n sec ON, 1/n sec OFF).  
State 3. Blink both upper and bottom read lights alternatively for 3 times (1/n sec ON, 1/n sec OFF.)  
repeat states 1,2, and 3. N is initially 2.

**Part 2** (3 points): Controllable X-mas tree

Now, you want to change the speed of X-mas tree using KEY switches.

KEY [0] slows down blinking speed by 1/4 sec. (MAX value is 2 sec.)   
KEY [1] increases blinking speed by 1/4 sec. (can't be less than 1/4 sec.)   
RESET: reset

Additional outputs for debugging and testing

* Display the blinking speed in HEX3 (7-segement display) based on the following rule.

If blinking speed ½ sec: display 2 // default state

If blinking speed ¼ sec: display 1

If blinking speed ¾ sec: display 3

If blinking speed 1 sec: display 4

If blinking speed 1 & ¼ sec: display 5

If blinking speed 1 &1/2 sec: display 6

If blinking speed 1 &3/4 sec: display 7

If blinking speed 2 sec: display 8

You can use the rest of HEX values for your own debugging information.

For the DE0 pin assignment, please use the provided csv file.

What to submit:

1. Report (a brief description about how you implemented and the challenges). Please include the partner names. (1 page). Please submit a pdf file for your report. (File name should be **report.pdf**) You should submit a report individually.
2. Submit your Qurtus archived file. (Use Qurtus 🡪Project 🡪 Archive Project) option to generate an archived file.

Note:

Depending on your design, some combination of KEY buttons might not work properly. As long as you can demonstrate that KEY buttons work, it is acceptable. In your report, you can describe when your KEY buttons work and known cases when KEY buttons do not work.

Additional explanation about 3 light states. Please do not use “for” statement in your Verilog code. This pseudo code is just for an example.

State 1: blink the upper half

for (ii = 0; ii <3;ii++){

RED\_OUT = 10b’1111100000;

RED\_OUT = 10b’0000000000;

}

State 2: Blink the bottom half

for (ii = 0; ii <3;ii++) {

RED\_OUT = 10b’0000011111;

RED\_OUT = 10b’0000000000;

}

State 3: Blink upper and bottom alternatively

for (ii = 0; ii <3;ii++) {

RED\_OUT = 10b’1111100000;

RED\_OUT = 10b’0000011111;

}