CS 250 Spring 2017 - Lab 03

Due in lab Feb. 07-10, 2017

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**Questions**

1. [15 points; 5 points for each for result] Does the timing of the 555 clock output match the predictions of the equations for frequency, t\_high, and t\_low that are given below the schematic? Show a calculation of the expected value for each of the three parameters..
2. [10 points] The 74HC163 is a 4-bit counter, but this lab needs only a 3-bit counter. How can you obtain a 3-bit counter from the output of a 4-bit counter? Which three of the output signals would you select and why?
3. Derive the Boolean expressions for each color of the stoplight, and simplify in terms of 2-input NAND and NOR gates. Show your work to earn credit. Your Boolean expression must be in terms of QA, QB, QC, and QD, for the counter outputs, and/or D0 – D7 for the eight decoder/demux outputs. Draw the final schematic diagram using NAND and NOR gates for each color.
   1. [10 points] Green light Boolean expression and schematic.
   2. [10 points] Yellow light Boolean expression and schematic.
   3. [10 points] Red light Boolean expression and schematic drawing of gates.

1. Demonstrate your circuit to your TA. Full credit when the order and timing of lights is correct.
   1. [15 points] Green light turns on for 3 seconds, then
   2. [15 points] Yellow light turns on for 1 second, then
   3. [15 points] Red light turns on for 4 seconds.