Laboratory 5
CSE 3381
Combinational Logic Code Converters

This experiment will allow students to gain experience in the design of small combinational digital logic circuits.

PART 1 PRE-LAB: Part 1will involve the design of a 1-digit BCD adder with a single carry-out bit. Your circuit will accept two 4-bit BCD digits and provide the four-bit sum digit and a carry-out bit. Please review BCD addition to familiarize yourself with the notion of illegal output digits in case you have forgotten. For the Pre-Lab in part 1, please do the following:

a) Draw the circuit diagram using no more than two 7483, one 7400, and one 7410chips.
b) Give all design data that you may have generated to support your circuit diagram including all truth tables, algebraic equations, and logic simplification maps.

PART 1 PRE-LAB: LAB INSTRUCTOR'S INITIALS: _____

PART 1 DEMONSTRATION: Construct the circuit that you designed in Part 1 of the Pre-lab. If it does not function properly, debug it and correct it. When it is working properly, demonstrate its' correct functionality to the lab instructor.

LAB INSTRUCTOR'S INITIALS: _____

PART 2 PRE-LAB: Design a combinational circuit that converts a four-bit Gray code number into an equivalent four-bit binary number. The Gray code values to be used can be obtained from Table 1-6 in our textbook. Implement the circuit with one 7486 quad-XOR gate chip.

c) Show the circuit diagram.
d) Give an explanation of how you derived the circuit diagram for this circuit. Your explanation can consist of information such as truth tables, algebraic equations, and logic simplification Maps.

PART 2 PRE-LAB: LAB INSTRUCTOR'S INITIALS: _____

PART 2 DEMONSTRATION: Construct the Gray Code to Binary circuit and demonstrate its' correct operation to the lab instructor.

LAB INSTRUCTOR'S INITIALS: _____

PART 3 PRE-LAB: Design a combinational logic circuit with four input lines that represents a decimal digit in BCD and four output lines that generate the 9's complement on the input digit. Provide a fifth output that detects an error in the input BCD number.

The output should be equal to logic-1 when the four inputs have one of the unused combinations of the BCD code. You may use any type or number of gates that you wish, but you should try to minimize the total number of chips used and your lab grade will reflect this.

e) Show all design information generated to determine your circuit
f) Draw the circuit diagram of the circuit

PART 3 PRE-LAB: LAB INSTRUCTOR'S INITIALS: _____

PART 3 DEMONSTRATION: Construct the 9's complementer circuit and show the lab instructor that it functions correctly.

LAB INSTRUCTOR'S INITIALS: _____

POST-LAB WRITEUP: Turn in your (neatly written and correct) truth tables and data from your experiment, circuit diagrams, maps, and your lab sheet with the instructor's initials.