

CSEE W3827
Fundamentals of Computer Systems
Homework Assignment 2

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Due October 6, 2015 at 10:10 AM

Write your name **and UNI** on your solutions

Show your work for each problem; we are more interested in how you get the answer than whether you get the right answer.

1. (10 points) Show how to implement the 7-segment decoder shown in class using a 4:16 decoder and OR gates (of any size) [UPDATE: You may use inverters if you wish, but it is not mandatory.]

2. (15 points) Show how to implement $F = \overline{A}B + BD + \overline{A}\overline{B}\overline{D} + \overline{B}C\overline{D}$ using a 4:1 mux whose select bits are A (most significant) and B .

3. (15 points) Design a circuit that takes a 4-bit number and increments it by one. It should operate cyclically, so when the input is 15, the output should be 0.

4. (20 points) Give a schematic that compares three 8-bit values A , B , and C . Your circuit should output 1 if $A > B > C$, 0 otherwise.
[UPDATE: Assume the 8-bit values are 2's complement. You may also assume that the values on A , B , and C will not cause overflow (i.e., no need for your implementation to handle overflow cases).]

5. (20 points) Design a histogram circuit that accepts eight 2-bit values and produces 4 4-bit values indicating how many times each of the four possible input values (00, 01, 10 and 11) appeared on the eight inputs. Provide a schematic for your design.

6. (20 points) Using full adders, design a circuit that accepts a seven-bit input and outputs the number of input bits that are 1 as a 3-bit binary number.