Day May 29, 2018
Time: 10:15-12:00 AM
Room #: 41103 & 41107

1. (a) Design a combinational circuit that generate the 9's complement of a BCD digit. (10%)
   (b) Assume you have the BCD adder as shown in the lecture and show it as a block. Design a BCD adder-subtractor circuit use the BCD adder block and the result of (a). (15%)

2. Design a 3-bit binary adder-subtractor with overflow detector. (10%)

3. Design a modulo-6 binary adder. (10%)

4. Design a four-way, 3-bit multiplexer that use only NOR gates. (5%)

5. (a) Design a code convertor which used to convert a binary code to Gray code. (5%)
   (b) Design a 2,4,2,1 to decimal decoder using the unused combinations of the 2,4,2,2 code as don't care conditions. (5%)

6. Construct a 4-to-16 lines decoder with multiple 2-to-4 lines decoders and some extra gates. (10%)

7. Use a 4-to-1 multiplexer and external gates to implement the following two Boolean functions, respectively. (a) $F_1 = \sum(1,3,4,11,12,13,14,15)$ $and$ $(b)$ $F_2 = \sum(1,2,5,7,8,10,11,13,15)$. ( 5% each, total 10%)

8. Implement a full binary subtractor with two 4-to-1 multiplexers. (5%)

9. Construct a 16-to-1 multiplexer with two 8-to-1 and one 2-to-1 multiplexers. Use block diagrams. (5%)

10. Design an eight-input priority encoder with inputs D0 through D7, with input D0 having the highest priority and input D7 the lowest priority. (5%)

11. Design a combinational circuit that compares unsigned two 3-bit numbers to check if they are unequal. The circuit output is equal 1 if the two numbers are unequal and 0 otherwise. (5%)