United International University (UIU)

Department of Computer Science and Engineering

CSE 225: DIGITAL LOGIC DESIGN, Midterm Summer 2019

Total Marks: **30** Duration: 1 hour 45 Min

Answer Any 2 Questions from Q1 to Q3

1.	(a) (i) What are the largest and smallest signed integers in a 6-bit computer system ? (ii) What is the equivalent BCD code of $(3E)_{16}$? (b) Add $(6334)_{10}$ and $(3756)_{10}$ with the help of their BCD representation. (c) Use 2's complement system to show the binary equivalent of the operation $(-34)_{10}+(-5)_{10}$ and verify the results.	[2] [2] [2]
2.	(a) Express the function in (i) Sum-of-Minterms and (ii) Product-of-Maxterms forms $F(A,B,C) = (AB + C')(B + AC)(AC' + B)$ (b) Find the complement of the expression, $\overline{(A+B)} + B.\bar{C}(\bar{B} + \bar{A}.\bar{C})$	[4] [2]
3.	(a) Find out the simplified expression for the following Boolean expression using algebraic manipulation. $(b + c' + bc')(bc + ab' + ac)$ (b) Reduce the Boolean expression to minimum number of literals: $\overline{\overline{CD} + A} + ACD + AB$	[4] [2]

Answer Any 1 Question from Q4 to Q5

4.	You have to design a digital circuit that will take a 4 bit binary number as input. It will test if the given number is in the Fibonacci series or not. Fibonacci series starts with 0 and 1 and any number is a sum of previous two numbers. For example, 3rd Fibonacci is 0+1=1, and then 1+1=2 and so on. If the given input is Fibonacci, the circuit will produce a output 1 or 0 else. Find the expression for the output and draw a logic diagram.	[6]
5.	You have to design a digital circuit that will take two 2-bit binary numbers as input and produce a single bit output. The output is 0 if the difference between the numbers is even and 1 if the difference is odd. For example if the given numbers are "00" and "11" the output will be 1 and if the inputs are "00" and "10" the output will be 0. Find the expression for the output and draw a logic diagram.	[4] [2]

Answer Following 2 Questions (Q6 and Q7)

6.	(a) Optimize the following function using K-map. You have to show the minimized sum-of-product (SOP) form. F(A, B, C, D) = AB' + AC +ABD' + A'C'D' + C'D' + A'CD' (b) Find the simplified product-of-sum (POS) for the following Boolean function F together with the don't-care conditions d: $F(W, X, Y, Z) = \prod_M (4, 5, 6, 7, 9) + \sum d(0, 1, 8, 14, 15)$	[6]
7.	Optimize the following function using K-map. In your solution, you have to show (i) all prime implicants, (ii) essential prime implicants and (iii) minimized Sum-of-Product form. $F(A, B, C, D) = \Sigma_m (0, 3, 4, 6, 8, 11, 12) + \Sigma d (1, 7, 9, 14)$	[6]