United International University (UIU)
Department of Computer Science and Engineering
CSE 1325: Digital Logic Design, Midterm Fall 2020

Total Marks: **20** Duration: 1 hour + 15 minutes for upload

[Any examinee found adopting unfair means including copy from another examinee will be expelled from the trimester/program as per UIU disciplinary rules.]

Answer Any 2 Questions from Q1 to Q3 (Do not mix-up answers of two questions)

1.	a) Find the binary representations for i) the BCD number: 0100 | 1000 | 0110 ii) the Excess3 number: 1100 | 0111 b) Encode the numbers $(396)_{10}$ and $(654)_{10}$ to BCD (Binary Coded Decimal) and perform the BCD addition.	[2] [2]
2.	a) Find the complement of the Boolean expression X'Y'Z + X'YZ + XYZ'. You have to show the answer in one of the standard forms. b) Prove the identity of the given Boolean equation using **algebraic manipulation.** You have to write the identity/formula you use in every step. $$wxy' + xy'z' + xy + y'z = x + y'z$$	[2] [2]
3.	a) Convert the Boolean expression into Product-of-Maxterms - $$F(A,B,C) = B'C' + AB + A'B$$ b) Convert the Boolean expression into Sum-of-Minterms - $$F(X,Y,Z) = (YZ' + Y'Z)(Y' + X'Z)$$	[2] [2]

Answer Any 1 Question from Q4 to Q5

4.	Design a circuit that will take a 4-bit binary number as input and determine if there are at least two adjacent '1' bits in the input. The output of the circuit will be i) HIGH or '1' if at least two adjacent input bits are '1'. ii) LOW or '0' otherwise For example, if the input is 0110 or 1111, the output will be '1'. For the input 1010 or 1001, the output will be '0'. Find a minimized expression for the output function in Sum-of-Products form and draw the circuit diagram using basic gates.	[4]
5.	Design a circuit that will take a 4-bit binary number (WXYZ) as input and determine if W is complement of Y. The output of the circuit will be i) HIGH or '1' if W is complement of Y, i.e., W != Y. ii) LOW or '0' otherwise. For example, if the input is 0110 or 1101, the output will be '1'. For the input 1010 or 0001, the output will be '0'. Find a minimized expression for the output function in Sum-of-Products form and draw the circuit diagram using basic gates.	[4]

Answer Any 2 Question from Q6 to Q8

6.	Optimize the following function using K-map. You have to show (i) all prime implicants, (ii) essential prime implicants and (iii) minimized Sum-of-Product (SOP) form using selection rule. $$F(A,B,C,D) = \sum m(1,3,4,9,10,11,15) + \sum d(2,12,14)$$	[4]

7.	Optimize the following function using K-map. You have to show the minimized Sum-of-Product (SOP) form. $$F(A,B,C,D) = AB'C + AB'D + A'BC + A'BD$$	[4]
8.	Find the simplified product-of-sum (POS) for the following Boolean function F together with the don't-care conditions d: $$F(A,B,C,D) = \prod M(1,3,5,9,11,15) + \sum d(2,4,7,10,12)$$	[4]