

United International University (UIU)

Department of Computer Science and Engineering CSE 1325/225: DIGITAL LOGIC DESIGN, Midterm Fall 2021

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

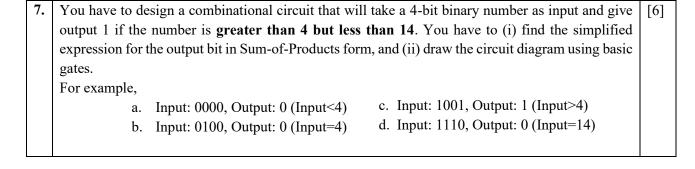
Answer Any Two Questions from Q1 to Q3

1	a) Represent the numbers $(911)_{10}$ and $(119)_{10}$ in BCD, and then show the steps necessary to form	[3]
	their sum.	F21
	b) Determine the radix r in the following case: $(911)_r = (1101)_{10}$	[3]
2/	a) Simplify the following Boolean Expression (using algebraic manipulation) to an expression containing a minimum number of literals:	[2]
	$A + B (C + \overline{A + C})$	
	b) Convert the following expression into both canonical SoP and canonical PoS forms:	[4]
	G(L,M,N) = (L+MN)(M+LN)	
3.	a) Prove that the following Boolean Function is self-dual. Then find its complement.	[3]
	$H(P,Q,R) = (\bar{P} + \bar{Q})(\bar{Q} + \bar{R})(\bar{R} + \bar{P})$	
	b) Reduce the following Boolean Expression (using algebraic manipulation) to three literals:	[3]
	$\overline{(\bar{X}\;\bar{Y}+Z)}+Z+XY+WZ$	

Answer Any Two Questions from Q4 to Q6

4	Optimize the following Boolean functions F together with the don't-care conditions d. Find all	[6]
4./	Optimize the following Boolean functions 1 together with the don't-care conditions d. 1 ind an	[o]
	prime implicants and essential prime implicants, and apply the selection rule.	
	$F(W, X, Y, Z) = \Sigma_m(4, 6, 7, 8, 12, 15)$	
	$d(W, X, Y, Z) = \Sigma_m(2, 3, 5, 10, 11, 14)$	
5.	Optimize the following Boolean functions using K-map in (i) product-of-sums form, (ii) sum of	[6]
	products form	
	$H(A, B, C, D) = \Pi_M(0, 2, 6, 7, 8, 9, 10, 12, 14, 15)$	
6.	Optimize the following expressions using K-map in (1) sum of products and (2) product of sums	[6]
	forms. Which one will you choose to implement the circuit diagram considering cost criteria?	
	$G(A,B,C,D) = A\bar{C} + \bar{B}D + \bar{A}CD + ABCD$	

Answer Any One Question from Q7 and Q8



8. You have to design a combinational circuit that will take a 4-bit binary number as input and give output 1 if the **number of '0's is even or equal to 3**. You have to (i) find the simplified expression for the output bit in Sum-of-Products form, and (ii) draw the circuit diagram using basic gates.

For example,

a. Input: 0110, Output: 1 (2 zeroes, even)

b. Input: 1111, Output: 1 (0 zeroes, even)

c. Input: 0001, Output: 1 (3 zeroes, 3)

d. Input: 0111, Output: 0 (1 zeroes, odd)