

# 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

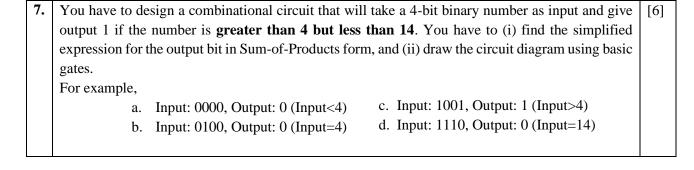
#### Answer Any Two Questions from Q1 to Q3

	1	a) Represent the numbers (911) <sub>10</sub> and (119) <sub>10</sub> in BCD, and then show the steps necessary to form	[3]
		their sum.  b) Determine the radix $r$ in the following case: $(911)_r = (1101)_{10}$	[3]
F	2/	a) Simplify the following Boolean Expression (using algebraic manipulation) to an expression	[2]
	_	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]
	<b>/</b>	prime implicants and essential prime implicants, and apply the selection rule.	
		$F(W, X, Y, Z) = \Sigma_m(4, 6, 7, 8, 12, 15)$	
		$d(W, X, Y, Z) = \Sigma_m(2, 3, 5, 10, 11, 14)$	
Ī	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



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)