United International University (UIU)

Department of Computer Science and Engineering
CSE 225: Digital Logic Design, Midterm Fall 2018
Total Marks: **30**   Duration: 1 hour 45 Min

Answer Any 2 Questions from Q1 to Q3

1.	(a) Find the value of r when $(144)_8 = (121)_r$.	[3]
	(b) Convert $(549)_{10}$ and $(984)_{10}$ to BCD format and then add them. You need to show all necessary steps.	[3]
2.	Express the following functions in Sum-of-Minterms and Product-of-Maxterms forms $$F(A, B, C) = B'C' + A'C + BC$$	[6]
3.	Prove the equivalence of the following Boolean equations, using algebraic manipulation:	
	(a) A'B + B'C' + AB + B'C = 1	[2]
	(b) ABC' + BC'D' + BC + C'D = B + C'D	[4]

Answer Any 2 Questions from Q4 to Q6

4.	Implement the following Boolean function together with the don't-care conditions d in a simplified Product-of-Sums form. $$F(A, B, C, D) = \sum(0, 1, 9, 11) , \quad d(A, B, C, D) = \sum(2, 8, 10, 14, 15)$$	[6]
5.	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. $$F(A, B, C, D) = \Sigma(0, 1, 2, 6, 9, 15), d(A, B, C, D)=\Sigma(3, 4, 11, 12, 13)$$	[6]
6.	(a) Optimize the following function using K-map. You have to show the minimized product of sum form. $$F(A,B,C,D) = AB' + AC + ABD' + A'C'D'$$	[4]
	(b) Using K-map find the Product-of-Maxterms of this function.	[2]

You MUST Answer Q7

7.	You have to design a combinatorial circuit that will be able to detect prime numbers given as input in binary. The input to the system will be any 4 bit binary number. The output of the circuit should be a single bit that will be 1 (high) if the input is a prime number and 0 (low) if the input is not a prime number. For example, if the input to the circuit is 0101 the output should be 1. Again if the input is 1010, the output should be 0. For this combinatorial circuit 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. OR You have to design a combinatorial circuit that will take a four bit binary number as input and will determine if the number of '1's in the input is odd (output will be 0) or even (output will be 1). For example, if the input is 0111 the output will be 0 and if the input is 1010 the output will be 1. For this combinatorial circuit you have to: i) find the expressions for the output bit bit in Sum-of-Products form and ii) draw the circuit diagram using basic gates.	[6]