

United International University Department of Computer Science and Engineering CSE 1325/CSE225 Digital Logic Design, Mid Exam, Fall 2019

Total Marks: 30, Time: 1 hour 45 minutes

Answer Any 2 Questions from Q1 to Q3

- 1. (a) Find the value of x, for when $(346)_7 = (501)_x$ [3]
 - (b) Convert $(2346)_{10}$ and $(8555)_{10}$ into their BCD form and perform BCD addition. [3]
- 2 (a) Convert the following expression into sum of minterms and product of maxterms. [3]

$$F(A, B, C) = AC + BC' + A'B'$$

(b) Prove the following Boolean Theorem using Boolean Algebra:

$$(A+B)(A'+C)(B+C) = (A+B)(A'+C)$$

[3]

- 3. Reduce the following Boolean Expression to the indicated numbers of literals using Boolean Algebra Manipulation. [3+3=6]
 - (a) A'B(D' + C'D) + B(A + A'CD) to one literal.
 - (b) (A'+C)(A'+C')(A+B+C'D) to four literals.

Answer Any 2 Questions from Q4 to Q6

4. Optimize the following function using K-map technique. In your solution, you have to show (i) all prime implicants, (ii) all essential prime implicants and (iii) minimized sum-of-products form. [6]

$$F(A, B, C, D) = \sum m(0, 4, 6, 8, 14)$$

$$d(A, B, C, D) = \sum m(2, 5, 7, 9, 10, 11, 13)$$

5. Optimize the following Boolean function F in i) simplified sum-of-products (SOP) and ii) simplified product-of-sums (POS) form. Among minimized SOP and POS, which one do you think will be easy to implement and why? [4+2=6]

$$F(A, B, C, D) = \sum m(1, 5, 6, 7, 11, 12, 13, 15)$$

6. Optimize the following function using K-map. You have to show the minimized product-of-sums form.

$$F(A, B, C, D) = (A' + B' + D')(A + B' + C')(A' + B + D')(B + C' + D')$$

Answer Any 1 Question from Q7 to Q8

- 7. You have to design a combinational circuit that will take a 4-bit binary number as input, and output 1 if the input is even but not divisible by 3. For example:
 - Input 0100: output 1 (even number)
 - Input 0101: output 0 (odd number)
 - Input 0110: output 0 (even number but also divisible by 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. [6]

- 8. You have to design a combinational circuit that will take a 4-bit binary number as input, and output 1 if the input contains at least 2 zeros. For example:
 - (a) Input 0000: output 1 (4 zeros)
 - (b) Input 0001: output 1 (3 zeros)
 - (c) Input 0011: output 1 (2 zeros)
 - (d) Input 0111: output 0 (1 zero)

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. [6]