

Mansoura University
 Faculty of Engineering
 Level 100 Students.
 Biomedical Engineering Program.



Subject: Digital Logic Design.
 Course Code: CSE 151.
 Date: 13/11/2019.
 Time allowed: 1 Hour.

Mid-Term Exam.

Name: _____

ID: _____

Assume any missing data....The exam is three questions.

*Books & notes are not allowed.

Attempt the following questions:

Max. Marks (30)

Question 1:

(14marks)

(1-a) Complete the following table of equivalent values.

(4marks)

| Binary | Base 4 | Octal | Hexadecimal |
|--------------|--------|---------|-------------|
| 110101.10101 | | | |
| | 103.21 | | |
| | | 165.016 | |

(1-b) Determine the value of base x if $(211)_x = (152)_8$

(2marks)

(1-c) Obtain the Complement of Boolean Expression:

(2marks)

- i) $A+B+A'B'C$
- ii) $AB + A(B+C) + B'(B+D)$

(1-d) Subtract the following numbers using 7's complement

(3marks)

i) $(10010)_8 - (7054)_8$

ii) $(6001)_7 - (12501)_7$

(1-e) Prove the following by use of a truth table: $A'BA' + A'BC + A'B'C = A'B + A'C$ (2marks)

Question 2:

(8marks)

(2-a) Use algebraic manipulation to convert the following equation to sum-of-product form:

$$(a + b)' \cdot (c + d)' + a \cdot (b + c)' \cdot d + (b \cdot c) \cdot d'$$

(3marks)

(2-b) Expand the function $F(x,y,z) = y + x'z$ to product of Maxterms form

(3marks)

(2-c) Prove the following Boolean equation using Boolean algebra:

(2marks)

$$xyz' + x'yz' + xy'z' + x'y'z' + z = 1$$

Question 3:

(13marks)

(3-a) Implement the following Boolean function F, together with the don't-care conditions d. Use minimum number of NAND gates for your implementation. (5marks)

$$F(A,B,C,D) = \Pi (8,9,11,12,13,15), \quad d(A,B,C,D) = \Sigma(0,2,7,14)$$

(3-b) Simplify the following function

(8marks)

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

Then, implement this function by using:

- i) OR-AND-NOT gates.
- ii) NAND gates only.
- iii) NOR gates only.

With my best wishes.

Dr. Mohammed Sabry & Dr. Mahmoud M. Saafan,

10:15 AM, Wednesday, 13th Nov. 2019.

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