

North South University

Department of Computer Science and Engineering

Midterm, Summer -2021, 27/08/2021

Course No: **CSE231** Course Title: **Digital Logic Design**

Time: 1 hr 35 min (Exam Time – 1 hr 25 min, Answer Upload – 10 min)

Full Marks: 60

Rules and Regulations:

- 1) Time is fixed and wont be extended.
- 2) Scripts submitted after allocated time will receive the penalty for a late submission. So submit ontime whatever part you have completed.
- 3) If plagiarism is detected in any question and similarities are detected among multiple copies all copies will receive zero for all questions.
- 4) Please show your work when needed. We cannot give you partial credit if you do not clearly show how you arrive at a numerical answer.
- 5) No further clarification will be provided during the exam time. If there is a mistake in the question you should continue with that
- 6) Use clean papers to answer the solution.
- 7) Take pictures of the solution, compile them either in **a single pdf** or **create a zip folder of images. Multiple file upload won't be considered.**
- 8) 10 min have been allocated for file upload. If you believe you need more time, you should spare them from your exam time (1hr 25 min). Total time (1 hr 35 min) wont be extended.
- 9) During Mid you will have to keep your video on (as per the university policy)
- 10) You may be asked to share your screen anytime
- 11) If anyone is suspected with cheating/plagiarism, he /she will be called for viva.

- 1a) Represent the decimal number $(1004.1004)_{10}$ in 6
 (a) Binary (b) Octal (c) Hexadecimal

(Notes : Show detail work)

- b) Represent the following Decimal numbers into 8 bit Binary Number using any of your preferred method. Perform Addition on the Binary Numbers. 2+2
 (7) and (-13)

- 2) Consider the following truth table. 2+2+3
+4

A	B	C	F1
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

- a) Write down Boolean expression of F1 in Sum of Minterms
 b) Write down Boolean expression of F1 in Product of Maxterms
 c) Simplify your answer received in a) using formula only
 d) Simplify your answer in a) using K-map

(Note: You cannot use minterm number or symbols while writing the expression. Use variables only)

- 3) Implement the following Boolean expression using (a) Multiplexer (b) Decoder 3+3+2

$$F(a, b, c) = \sum(0, 1, 2, 5, 7)$$

- (c) Identify which functional module requires less no. of logic gates.

(Note: No scores will be given if the diagrams are not properly labeled with Input / Output names and dimensions)

- 4) For a given Boolean function $F(w, x, y, z) = \sum(0, 2, 3, 6, 7, 8, 9, 15)$, and its don't cares $d(w, x, y, z) = \sum(1, 5, 12)$ 7+5

a) Simplify the Boolean expression using K-map method

b) Implement the Simplified Expression using a Decoder

- 5) Design a 2 bit Magnitude Comparator circuit. Show block diagram, truth table and Boolean expression 5

- 6) Consider the following High-Level Programming Problem 4+3

```
if(x < y)
    sum = x + y
```

```
elseif (x > y)
```

```
    sum=x
```

```
else
    sum = x-y
```

Where A, B and C are 4 bit binary numbers. Result is a 4 bit output.

a) To solve it using digital circuits what functional modules are required. Draw their block diagram with proper labeling, naming, dimensions, bus width etc.

b) Connect the required modules towards solution. You may use any logic gates if required.

- 7) Design a **BCD to 7, 3,-2,-1** (weighted scheme) converter. Show all details of your work (Specification, Truth Table, Boolean Expression, K-map) 7