DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY OF BARISAL

Final EXAMINATION

Course Title: Digital Logic Design

Course Code: CSE-2103

3rd Semester

Session: 2020-21 (Admission Session 2019-20)

Time: 3 hour **Marks:** 60

Answer any five Questions from the followings.

1. a) Mention the Duality Principle. [2]

   b) Implement the function using NAND gate – [3]

   $$F = A'B + BC'$$

   c) Simplify the following Boolean function F using don't care condition – [5]

   $$F = B'DE' + A'BE + B'C'E' + A'BC'D'$$

   Simplify the following Boolean function D in product of Sums –

   $$D = BDE' + CD'E'$$

   d) List the limitation of K-map. [2]

2. a) Show that the dual of the exclusive-OR is also its complement. [3]

   b) Implement the following Boolean expression with exclusive-OR and AND gates: [3]

   $$F = AB'CD' + A'BCD' + AB'C'D + A'BC'D$$

   c) Write the Boolean equations and draw the logic diagram of the circuit whose outputs are defined by the following truth table: [6]

f_1	f_2	a	b	c
1	0	0	0	0
0	0	0	0	1
0	1	0	1	0
1	1	0	1	1
0	1	1	0	0
0	1	1	0	1
1	1	1	1	0
1	0	1	1	1

3. a) How a NAND/NOR latch store a bit? [2]

   b) Explain a clocked S-R FlipFlop with waveforms? [4]

   c) Define Race Around condition in J-K FlipFlop. How can you overcome the problem? Explain with an appropriate figure and waveforms. [6]

4. a) Design and explain the working principle of a 8-bit parallel adder [6]

   b) Using 2's complement system perform the following operations: [2]

      i) -65-88 ii) 34+55

   c) Draw a 8-bit parallel adder using 74LS283 ICs which will be able to perform both subtraction and addition operation. [4]

5. a) Explain the working principle of a 3-bit ripple counter with timing diagram. [5]

   b) What is Mod number? What is the method of designing a counter with "Mod Number" $<2^N$. [3]

   c) Draw the diagram of a Mod-13 down counter with state diagram. [4]

6. a) Explain the working principle of CMOS NAND and NOR gates. [5]

   b) Draw the circuit diagrams of TTL NAND and NOR gates. [4]

   c) Compare various characteristics of TTL and CMOS logic gate. [3]

7. a) Draw the logic diagram of a 1-of-16 decoder and explain its operation. Consider an enable input in your design. [5]

   b) Use 74LS138 ICs to design a 1 of 40 decoder. [5]

   c) Draw the logic diagram of 7442 IC. [2]

8. a) What is Multiplexer? Using 74HC151 ICs, design a 16-input MUX and explain its operation. [5]

   b) With appropriate diagram explain the working principle of a 1 line to 16 line Demultiplexer. [4]

   c) Draw the diagram and truth table of an Octal to binary encoder. [3]