



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY OF BARISAL

## B.Sc. Final Examination

Course Title: Digital Logic Design

Course Code: CSE-2103

2<sup>nd</sup> Year 1<sup>st</sup> Semester

Session: 2023-24 (Admission Session 2022-23)

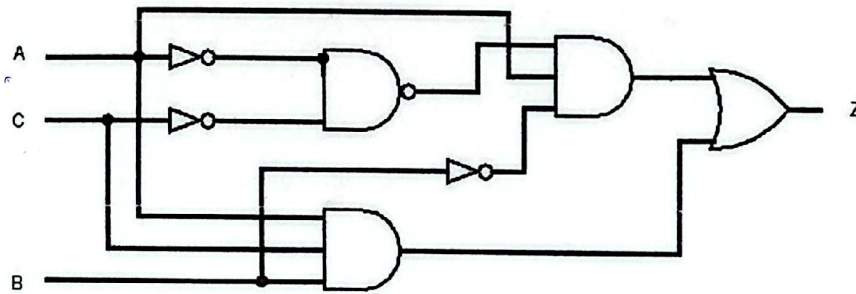
Time: 3 hours

Marks: 60

Answer any five Questions from the followings.

1. a) Design a logic circuit with inputs P, Q, R so that output S is HIGH whenever P is '0' or whenever Q=R=1. [3]

- b) Simplify the logic circuit shown below: [3]



- c) Use k-map simplification process to design a Full Adder. What is the limitation of a full adder? [6]

2. a) Explain how a S-R FlipFlop store a bit. [3]

- b) What is the limitation of S-R FlipFlop? Explain how the limitation can be resolved. [4]

- c) Define Race Around condition in J-K FlipFlop. How can you overcome the problem? Explain with an appropriate figure and waveforms. [5]

3. a) What is the limitation of a parallel adder? Using 74LS83 ICs, draw a 12 bit parallel Adder. [3]

- b) Explain how 2's complement system can facilitate arithmetic operations in digital computing. [3]

- c) Design and explain the working principal of a parallel adder/subtractor using 2's-complement system. [6]

4. a) Define a decade ripple counter. Design and explain the working principle of a Mod-11 decade ripple counter with its state transition diagram. [6]

- b) Explain the working principle of a presettable counter. [6]

5. a) Explain the working principle of a Synchronous up/down MOD-16 counter with an appropriate diagram. [7]

- b) Use two 74293 ICs to design a mod 50 counter. [5]

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6. a) Write short notes on the followings: [4]
- I) Fan-Out
  - II) Noise Immunity
  - III) Propagation delay
- Characteristics of TTL logic gate.
- b) Design and explain the working principle of a TTL NOR gate. [4]
- c) Draw the circuit diagram of a CMOS NAND gate. [2]
- d) A certain TTL IC output is rated at  $I_{OH}(\text{max}) = 800 \mu\text{A}$  and  $I_{OL} = 48 \text{ mA}$ . Express the IC's fan-out in terms of unit loads. [consider  $1\text{UL} = 40 \mu\text{A}$  in the HIGH state and  $1.6 \text{ mA}$  in the LOW state] [2]
7. a) Draw the logic diagram of a 74LS138 decoder IC. Also explain its working principle. [5]
- b) Use 74LS138 ICs to design a 1 of 24 decoder. [4]
- c) How Liquid Crystal Display (LCD) works? [3]
8. a) Use 74LS138 ICs to design a 1 of 32 decoder. [4]
- b) What is Multiplexer? Design an 8-input MUX and explain its operation. [4]
- c) How can you use a 74138 IC as a DEMUX. [2]
- d) Draw the logic diagram for the 7442 IC. [2]

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