

World University of Bangladesh (WUB)
Department of Computer Science & Engineering
Semester Final Examination
Program: B. Sc in CSE, Batch: 64B
Course Title: Digital Logic Design, Course Code: CSE 06193141

Time: 2.0 Hours

Marks: 40

Answer any four of the following five questions including 1.b. and 3.a.

Section- A

1. (a) A digital clock displays time in binary. At **4:30**, what would the binary representation of the hour and minute look like? Convert these to hexadecimal format. A data transmission system uses hexadecimal codes for error checking. Analyze the advantages of hexadecimal representation over binary for a message like 101101011011101101011011101101011011.3+2
(b) A robot navigation system simplifies its route calculations using $F=AB+A'CF = AB + A'CF=AB+A'C$. Analyze how this simplification affects the overall performance of the logic circuit. A device's memory is addressed using hexadecimal numbers. If the memory location is given as **2F3**, determine its binary and octal equivalents for programming.2+3
2. a You're programming a microcontroller that only accepts binary input. Convert the decimal temperature reading **45°C** into binary to feed into the controller. An industrial machine pauses unexpectedly due to a glitch in its combinational circuit. Analyze the K-map for the Boolean function to identify the hazard and propose a solution.3+2
b A railway crossing uses a JK flip-flop to control the barrier. Analyze its behaviour if the input toggles rapidly due to sensor malfunction. A lighting system uses the Boolean function $F=A+BCF = A + BCF=A+BC$, where AAA is the main switch, BBB is a sensor, and CCC is a timer. Simplify FFF to reduce the circuit complexity. (CO4)2+3

Section- B

3. a Evaluate whether a 6-bit binary system is sufficient to represent all possible levels of brightness in a lighting control system. Justify your answer. Design a digital clock that displays time in binary format with a toggle option to switch to hexadecimal representation.3+2
b Create an algorithm for a software application to efficiently convert any number from decimal to binary, octal, or hexadecimal, and provide pseudocode. A Boolean function $F=AB+A'B'+CF = AB + A'B' + CF=AB+A'B'+C$ is implemented in a circuit. Evaluate the reliability of the circuit in reducing propagation delays if designed with NAND gates instead of basic gates. (CO3)2+3

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| 4. | a | Recall the binary representation for the decimal number 25 . Design a binary counter for a parking system that counts cars entering and leaving a parking lot. | 3+2 |
| | b | Define BCD (Binary-Coded Decimal) and mention one application. Explain why digital systems predominantly use binary numbers instead of decimal numbers. | 2+3 |
| 5. | a | Recall the associative law for both AND and OR operations in Boolean algebra. Describe the steps to convert a decimal number into its octal equivalent using an example. | 3+2 |
| | b | What are the functions of AND, OR, and NOT gates in a logic circuit? Illustrate how an XOR gate can be used in an error-detection circuit. | 2+3 |