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(FOR THE CANDIDATES ADMITTED **22UCS102**

DURING THE ACADEMIC YEAR 2024 ONLY) **REG.NO. :**

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER 202

BSC COMPUTER SCIENCE(AIDED & SF) **MAXIMUM MARKS: 75**

SEMESTER-I **TIME : 3 HOURS**

PART – III

24UCS102– DIGITAL COMPUTER FUNDAMENTALS AND ORGANIZATION

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. What is the 2's complement of the binary number 1010?

   a) 0101 b) 1110 c) 0110 d) 0010

2. Which Boolean algebra law is represented by the expression A·(B+C)=(A·B)+(A·C)?

   a) Commutative Law b) Distributive Law c) Associative Law d) Identity Law

3. What is the primary function of a multiplexer (MUX)?

   a) To combine multiple signals into one output based on control signals

   b) To decode binary input values into one of several outputs

   c) To encode data into a different format for transmission

   d) To store and retrieve data from memory locations

4. In which type of I/O system does the CPU use the same address space for both memory and I/O devices?

   a) Isolated I/O b) Memory-mapped I/O c) Direct Memory Access d) Asynchronous Data Transfer

5. Which of the following is not a type of Cache Memory Mapping?

   a) Direct Mapping b) Set-Associative Mapping c) Fully Associative Mapping d) Random Mapping

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. Define BCD (Binary-Coded Decimal).

7. What is the primary purpose of a Karnaugh Map in Boolean algebra?

8. What is the use of a Decoder in digital circuits?

9. Write is the purpose of handshaking in Asynchronous Data Transfer?

10. Define Associative Memory.

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Convert the decimal number 156 into Binary, Octal, And Hexadecimal number systems. Show all steps involved.

(OR)

b) Find the 9's and 10's complements of the Decimal Number 5486.

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12. a) Simplify the Boolean expression $\overline{\overline{A \cdot B} + C}$ using Boolean Algebra.

(OR)

b) Draw the Logic circuit for the Boolean function $F = A \cdot B + \overline{A} \cdot \overline{B}$ using basic logic gates.

13. a) Explain the operation of a full Adder circuit and derive its truth table.

(OR)

b) Explain the operation of a JK flip-flop and derive its characteristic table.

14. a) Describe the process of Asynchronous Data Transfer and its advantages over Synchronous Transfer.

(OR)

b) Differentiate between I/O bus and memory bus in terms of their use and design.

15. a) Explain the Memory Hierarchy in a computer system and discuss the role of each level.

(OR)

b) Describe the working principle of Associative Memory and the role of Match Logic in it.

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16. a) i) Convert the hexadecimal number '2F7A' to its binary, decimal, and octal equivalents. Show all steps involved in each conversion.

ii) Convert a binary fraction, 1101.101, to its decimal equivalent.

(OR)

b) Explain in detail the Arithmetic operations in binary, including addition, subtraction (1's complement and 2's complement), multiplication, and division. Provide examples for each operation.

17. a) Simplify the following Boolean expression using Karnaugh Map:

$$F(A, B, C, D) = \sum(0, 1, 4, 5, 8, 9, 12, 13)$$

(OR)

b) Explain DeMorgan's Theorems and verify them with Boolean algebra examples. Use the theorems to simplify the expression $\overline{(A \cdot B)} \cdot \overline{C}$

18. a) Draw the Logic circuit for a 4-to-1 Multiplexer and Explain its operations.

(OR)

b) Explain the operation of a PISO (Parallel-In Serial-Out) Shift Register with a diagram.

19. a) Describe the role of the DMA controller in data transfer operations and its impact on system performance.

(OR)

b) Compare and contrast Isolated I/O and Memory-Mapped I/O in terms of their implementation and performance.

20. a) Compare and contrast the three mapping techniques used in Cache Memory: Associative, Direct, and Set-Associative Mapping.

(OR)

b) Describe the communication process between the CPU and Input-Output Processor (IOP). How does this communication improve overall system performance?

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