

Mahindra University Hyderabad

**École Centrale School of Engineering
Minor II**

**Program: B.Tech. Branch: Computation & Mathematics Year: Second Semester: Spring
Subject: Computer Organization (MA 2211)**

**Date: 20/04/2024
Time Duration: 1.5 Hours**

**Start Time: 10:00 AM
Max. Marks: 20**

Instructions:

- 1) All questions are compulsory.
- 2) Please start each answer on a separate page and ensure you clearly number the responses. Also, make sure to address all parts of each question together and in the correct order.
- 3) It is essential to provide an explanation of each step. Correct outcomes without any description will not be evaluated.

Q 01: Please select the correct option for the following questions and provide a proper explanation for the choice. Any correct choice without a valid justification will not be accepted. [01 × 08]

A) What is the primary motivation for using Boolean algebra to simplify logic expressions?

- i) It may make it easier to understand the overall function of the circuit
- ii) It may reduce the number of gates
- iii) It may reduce the number of inputs required
- iv) All of the above

B) What is the Boolean expression for the following truth table?

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

i) $Y = \bar{A} \bar{B} + A B$

ii) $Y = A \bar{B} + \bar{A} B$

iii) $Y = \bar{A} \bar{B} + A \bar{B}$

iv) $Y = A B + \bar{A} \bar{B}$

C) If $(B2F8)_{16} = (?)_{10}$. What will be the value of "Question Mark"?

i) 51246

ii) 45817

iii) 32678

iv) None of these

D) In a half adder, the carry output is high if the inputs are:

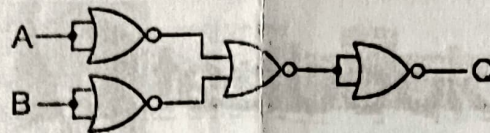
i) 1, 1

ii) 0, 0

iii) 0, 1

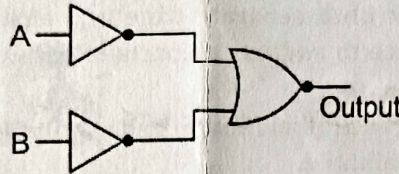
iv) 1, 0

E) The output of the logic circuit given below represents _____ gate.



- i) OR ii) NOR iii) AND iv) NAND

F) To which of the following logic gates is this combination of logic gates equivalent?



- i) NOR ii) NAND iii) AND iv) OR

G) One of De Morgan's theorems states that $\overline{(A + B)} = \bar{A} \cdot \bar{B}$. Simply stated, this means that logically, there is no difference between:

- i) A NOR and an AND gate with inverted inputs
 ii) A NAND and an OR gate with inverted inputs
 iii) An AND and a NOR gate with inverted inputs
 iv) A NOR and a NAND gate with inverted inputs

(H) The total number of minterms for three Boolean variables (α, β, γ) are:

- i) 0 ii) 2 iii) 4 iv) 8 v) None of these

Q 02: Multiply $(11010.1110)_2$ by $(1011.1101)_2$. Also, divide the octal number $(2276)_8$ by $(102)_8$. Show the calculation part. [03]

Q 03: Explain the Half Adder, including its design and logic diagram, with the help of a relevant example. [04]

Q 04: Write the truth table and the simplified Boolean expression with four inputs and one output for the following instances. Finally, design the combinational circuit for them. [02.50 × 02]

- i) The output is 1 when the binary value of the inputs is less than or equal to five.
 ii) The output is 1 when the binary value of the inputs is greater than or equal to 10.