

Mahindra University Hyderabad
École Centrale School of Engineering
Minor I

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

Date: 06/03/2023
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 any five of the following questions and explain your choice correctly. Any correct choice without a valid justification will not be accepted. [01 × 05]

— a) 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) $Y = \bar{A}\bar{B} + AB$
 ii) $Y = A\bar{B} + \bar{A}B$
 iii) $Y = \bar{A}\bar{B} + A\bar{B}$
 iv) $Y = AB + \bar{A}\bar{B}$

— b) Which logic gate has an output that is the inverse of its input?

- i) OR gate ii) AND gate ☒ iii) NOT gate iv) XOR gate v) None of these

— c) The total number of minterms for three Boolean variables (A, B, C) are:

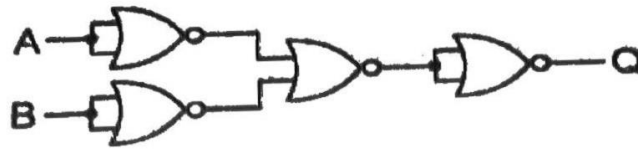
- i) 0 ii) 2 iii) 4 ☒ iv) 8 v) None of these

d) The simplified SoP (Sum of Product) form of the following Boolean expression:
 $(A + \bar{B} + \bar{C}) \cdot (A + \bar{B} + C) \cdot (A + B + \bar{C})$ will be

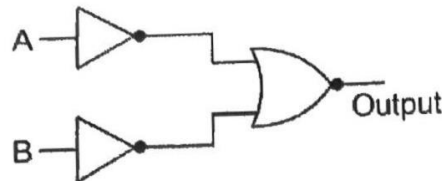
- i) $(\bar{A} \cdot B + \bar{C})$ ii) $(A + \bar{B} \cdot \bar{C})$ iii) $(\bar{A} \cdot B + C)$ iv) $(A \cdot B + C)$

— 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 gate is this combination of logic gates equivalent?



i) NOR

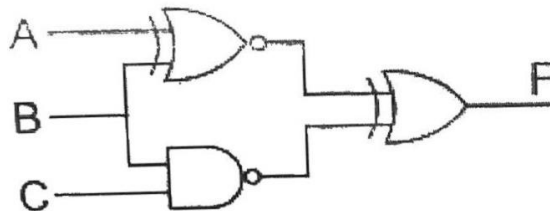
ii) NAND

iii) ~~AND~~

iv) OR

Q 02: Please answer the following question with a detailed description and include an appropriate diagram where necessary. It is highly recommended that you provide an explanation of each step. [05 × 03]

a) In the following circuit, determine the output F as the sum of minterms among the given four choices.



i) $\Sigma(2, 4, 6)$

ii) $\Sigma(0, 1, 6, 7)$

iii) $\Sigma(0, 1, 2, 4, 5, 6)$

iv) $\Sigma(2, 4, 5, 7)$

Hint: Create the corresponding truth table.

b) Please write the truth table and the simplified Boolean expression with four inputs and one output for the given instances. Finally, design the combinational circuit for them.

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 ten.

c) What is K-map. Demonstrate the K-map used for three variables x, y, z, and for four variables w, x, y, z. Finally, use K-maps to minimize the following Sum of Product expansions.

i) $F_1 = xy\bar{z} + x\bar{y}\bar{z} + \bar{x}yz + \bar{x}\bar{y}\bar{z}$

ii) $F_2 = xy\bar{z} + x\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z}$