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BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – BCA(MAWT)-Hons-2024/BCA(MAWT)-Hons-2025
Course Name – Digital Logic
Course Code - BMT17201 (T)
(Semester I)

Full Marks : 40 **Time : 2:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 10=10

1. *Choose the correct alternative from the following :*

(i) Select how the value of a digit is influenced by its position in a positional number system.

a) Its binary equivalent
b) Both its position and symbol
c) Its position in the number
d) Its symbol

(ii) Construct the hexadecimal number 1A3F into binary.

a) 101010011110 .
b) 0001101000111111 .
c) 110010001111 .
d) 110101011111 .

(iii) Explain the correct formula of two inputs A and B for XNOR gate.

a) A.B + A'.B'
b) A.B' + A'.B
c) Both of these
d) None of these

(iv) If one input of an XOR gate is 0, what will the output be if the other input is 1?

a) 0
b) 1
c) Depend on the input
d) None of these

(v) Which situation causes a race condition in a JK flip-flop?

a) J = 1, K = 0
b) J = 0, K = 1
c) J = 1, K = 1
d) J = 0, K = 0

(vi) Show the correct alternative for the main function of Decoder in a combinational circuit?

a) To encode data
b) To select one of many inputs
c) To convert binary code into unique outputs
d) To multiplex data

(vii) Which of the following circuits can divide the frequency of a clock signal by 2

a) Decoder
b) Flip-flop
c) Encoder
d) Multiplexer

(viii) Which of the following can be used to implement any Boolean function of n variables?

a) Multiplexer
b) Demultiplexer

c) Decoder d) Encoder

(ix) Calculate the value of the (110101) – (100101) (binary number) using 1's complement.

a) 1010 b) 10000

c) 1011 d) 10101

(x) Choose from the following: UP-DOWN counter is also known as ____________.

a) Dual counter b) Multi counter

c) Multimode counter d) None of these

Group-B

(Short Answer Type Questions) 3 x 5=15

2. What type of sequential circuit is typically used in digital clocks to keep track of time?Which sequential circuit component is essential for building memory elements in computers? (3)
3. What is the purpose of an encoder in combinational circuits? (3)
4. Write a short note on De-Morgan's Law. (3)
5. Minimized the following expression using K-map and restate the simplified function using NOR and NOT gates only: F(A,B,C,D)=ΠM(1,2,3,7,8,9,10,11,14). (3)
6. Assess consensus theorem in Boolean algebra. (3)

OR

Justify how does K-Map method optimize Boolean functions. (3)

Group-C

(Long Answer Type Questions) 5 x 3=15

7. Show how to simplify the Boolean expression F(A,B,C,D)=A'B'C'D'+AB+A'CD+B'CF(A, B, C, D) = A'B'C'D' + AB + A'CD + B'CF(A,B,C,D)=A'B'C'D'+AB+A'CD+B'C using a 4-variable Karnaugh map. Explain the grouping of minterms and provide the simplified expression. Discuss how the minimized expression reduces the complexity of the digital circuit. (5)
8. Explain how Decoders can be used to implement memory address decoding in microcontrollers. Solve a practical example to demonstrate this application. (5)
9. Develop and explain the Karnaugh Map (KMap) method for minimization, providing an example involving four variables to illustrate its effectiveness. (5)

OR

Formulate and discuss the role of Boolean theorems in simplifying logic expressions, and create an example of a simplified expression using these theorems. (5)

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