Printed Page:- Subject Code:- AMICSE0304

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M. Tech. (Int)

SEM: III - THEORY EXAMINATION (2021 - 2022)

Subject: Digital Logic & Circuit Design

Time: 03:00 Hours Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises of three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.

SECTION A 20

1. Attempt all parts:-

1-a. The logical expression Y = $\sum$m(0, 3, 6, 7, 10, 12, 15) is equivalent to (CO1) 1

1. πM(0, 3, 6, 7, 10, 12, 15)
2. πM(1, 2, 4, 5, 8, 9, 11, 13, 14)
3. $\sum$m(1, 2, 4, 5, 8, 9, 11, 13, 14)
4. $\sum$m(0, 2, 4, 6, 8, 10, 12, 14)

1-b. A switching function f(A, B, C, D) = A'B'CD + A'BC'D + AB'C'D + AB'CD + A'BCD can also be written as (CO1) 1

1. $\sum$m(1, 3, 5, 7, 9)
2. $\sum$m(3, 5, 7, 9, 11)
3. $\sum$m(3, 5, 9, 11, 13)
4. None of these

1-c. How many data select lines are required for selecting eight inputs? (CO2) 1

1. 1
2. 2
3. 3
4. 4

1-d. One that is not the outcome of magnitude comparator is (CO2) 1

1. a > b
2. a – b
3. a < b
4. a = b

1-e. When is a flip-flop said to be transparent? (CO3) 1

1. When the Q output is opposite the input
2. When the Q output follows the input
3. When you can see through the IC packaging
4. When the Q output is complementary of the input

1-f. A basic S-R flip-flop can be constructed by cross-coupling of which logic gates? (CO3) 1

1. AND or OR gates
2. XOR or XNOR gates
3. NOR or NAND gates
4. AND or NOR gates

1-g. How many flip-flops are required to construct a decade counter? (CO4) 1

1. 4
2. 8
3. 5
4. 10

1-h. A 4-bit counter has a maximum modulus of _____ (CO4) 1

1. 3
2. 6
3. 8
4. 16

1-i. FPGA stands for _____ (CO5) 1

1. Full Programmable Gate Array
2. Full Programmable Genuine Array
3. First Programmable Gate Array
4. Field Programmable Gate Array

1-j. Which of the following comes under secondary memory/ies? (CO5) 1

1. Floppy disk
2. Magnetic drum
3. Hard disk
4. All of the Mentioned

2. Attempt all parts:-

2-a. Define positive logic and negative logic. (CO1) 2

2-b. Define Multiplexer. (CO2) 2

2-c. Enlist the Difference between latch and flip-flop. (CO3) 2

2-d. Define primitive flow table with example. (CO4) 2

2-e. How many 16K * 4 RAMs are required to achieve a memory with a capacity of 64K and a word length of 8 bits? (CO5) 2

SECTION B 30

3. Answer any <u>five</u> of the following:-

3-a. Construct the Hamming code for the 4 bit data 1010. Consider the even parity. (CO1) 6

3-b. Implement the Boolean expression F(A,B,C) = ABC'+ A'B'+ AC' using both universal logic gates. (CO1) 6

3-c. Implement the DIFFERENCE and BORROW Boolean functions of half subtractor with multiplexer 2x1. (CO2) 6

3-d. Explain BCD Adder with proper logic circuit diagram. (CO2) 6

3-e. Discuss about static, dynamic and essential hazards in asynchronous sequential circuits. (CO4) 6

3-f. What is the modulus of the counter? Give difference between Synchronous and Asynchronous Counters. (CO3) 6

3-g. Explain difference between PLA and PAL. (CO5) 6

SECTION C 50

4. Answer any one of the following:-

4-a. Minimize the given four variable logic function using Quine Mc-Clusky Method:- (CO1) 10

F(A, B, C, D) = ∑m (0,1, 2, 3,5, 7, 8, 9, 11, 14)

4-b. Simplify the logic expression using K map:- (CO1) 10

F(A, B, C, D, E) = ∑m(0, 5, 6, 8, 9, 10, 11, 16, 20, 24, 25, 26, 27, 29, 31)

5. Answer any one of the following:-

5-a. Design a combinational circuit that accepts a three-bit number and generates an output binary number equal to the square of the input number. (CO2) 10

5-b. Design 4 bit Gray to binary converter. (CO2) 10

6. Answer any one of the following:-

6-a. Explain universal shift register in detail. (CO3) 10

6-b. Explain the Master-Slave Flip-Flop. How it overcome the race condition of J-K flip-flop? Use proper logic diagram. (CO3) 10

7. Answer any one of the following:-

7-a. Describe the working of asynchronous decade counters. (CO4) 10

7-b. Design mod-10 synchronous counter. Implement it using JK-flip flops. (CO4) 10

8. Answer any one of the following:-

8-a. Implement the following functions using PLA. A(x,y,z) = ∑m(1,2,4,6), B(x,y,z) = ∑m(0,1,6,7) ,C(x,y,z) = ∑m(2,6) (CO5) 10

8-b. Draw the structure of a 4×4 static RAM and explain it's operation. (CO5) 10