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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - THEORY EXAMINATION (2021 - 2022)

Subject: Digital Logic & Circuit Design

Time: 03:00 Hours

Max. Marks: 100

General Instructions:

- 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

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1. Attempt all parts:-

- 1-a. The logical expression $Y = \sum m(0, 3, 6, 7, 10, 12, 15)$ is equivalent to (CO1) 1
- $\prod M(0, 3, 6, 7, 10, 12, 15)$
 - $\prod M(1, 2, 4, 5, 8, 9, 11, 13, 14)$
 - $\sum m(1, 2, 4, 5, 8, 9, 11, 13, 14)$
 - $\sum m(0, 2, 4, 6, 8, 10, 12, 14)$
- 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
- $\sum m(1, 3, 5, 7, 9)$
 - $\sum m(3, 5, 7, 9, 11)$
 - $\sum m(3, 5, 9, 11, 13)$
 - None of these
- 1-c. How many data select lines are required for selecting eight inputs? (CO2) 1
- 1
 - 2
 - 3
 - 4
- 1-d. One that is not the outcome of magnitude comparator is (CO2) 1
- $a > b$
 - $a - b$
 - $a < b$
 - $a = b$
- 1-e. When is a flip-flop said to be transparent? (CO3) 1
- When the Q output is opposite the input
 - When the Q output follows the input
 - When you can see through the IC packaging
 - 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 five 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

4. Answer any one of the following:-

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

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

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

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

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. $A(x,y,z) = \sum m(1,2,4,6)$, $B(x,y,z) = \sum m(0,1,6,7)$, $C(x,y,z) = \sum m(2,6)$ (CO5) 10

8-b. Draw the structure of a 4x4 static RAM and explain it's operation. (CO5) 10