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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech (Integrated)

SEM: III - THEORY EXAMINATION (2022 - 2023)

Subject: Digital Logic & Circuit Design

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. 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 ____ expression consists of several product terms logically added. (CO1) | 1 |
| | (a) Sum of products | |
| | (b) Canonical POS form | |
| | (c) Minterm | |
| | (d) Switch | |
| 1 | The 2's complement of Binary number 00101 is _____. (CO1) | 1 |
| | (a) 10101 | |
| | (b) 11011 | |
| | (c) 1000 | |
| | (d) 101011 | |
| 1 | One that is not the outcome of magnitude comparator is (CO2) | 1 |
| | (a) $a > b$ | |
| | (b) $a - b$ | |
| | (c) $a < b$ | |

(d) $a = b$

- 1 An eight-line multiplexer must have as inputs _____. (CO2) 1
- (a) four data inputs and three select inputs
 - (b) eight data inputs and two select inputs
 - (c) eight data inputs and three select inputs
 - (d) eight data inputs and four select inputs
- 1 How many flip-flops are required to construct a decade counter? (CO3) 1
- (a) 4
 - (b) 8
 - (c) 5
 - (d) 10
- 1 The D flip flop obtained from SR flip flop by just putting _____. (CO3) 1
- (a) one inverter between S & R terminal
 - (b) connecting S & R terminal together
 - (c) feedback the output in feed to the S & R terminal using XOR gate
 - (d) None of These
- 1 In Moore models, the output is function of only ____ (CO4) 1
- (a) present state
 - (b) input state
 - (c) next state
 - (d) mid state
- 1 How many types of sequential circuits are? (CO4) 1
- (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
- 1 The full form of EPROM is _____ (CO5) 1
- (a) Easy Programmable Read Only Memory
 - (b) Erasable Programmable Read Only Memory
 - (c) Eradicate Programmable Read Only Memory
 - (d) Easy Programmable Read Out Memory OR gate

1	PLDs with programmable AND and fixed OR arrays are called _____. (CO5)	1
	(a) PAL	
	(b) PLA	
	(c) APL	
	(d) PPL	

2. Attempt all parts:-

2.a.	Perform the binary subtraction of 111011- 111000. (CO1)	2
2.b.	Implement full adder using half-adder? (CO2)	2
2.c.	Derive the characteristic equation of D flip flop. (CO3)	2
2.d.	Define race, critical race and non-critical race. (CO4)	2
2.e.	Differentiate between ROM and RAM. (CO5)	2

SECTION B

30

3. Answer any five of the following:-

3	Realize all the basic logic gates operation using universal gates. (CO1)	6
3	Find the simplified form of $Y = A'B'C' + A'B'C + AB'C + A$ using K-map. (CO1)	6
3	Define Encoder. Design priority Encoder (CO2)	6
3	Design a 2 bit magnitude comparator. (CO2)	6
3.e.	Draw the truth table, characteristic table and excitation table of a T flip flop and J-K flip flop. (CO3)	6
3.f.	What is the modulus of the counter? Design mod-5 ripple counter. (CO4)	6
3.g.	Draw the 1-bit SRAM cell. (CO5)	6

SECTION C

50

4. Answer any one of the following:-

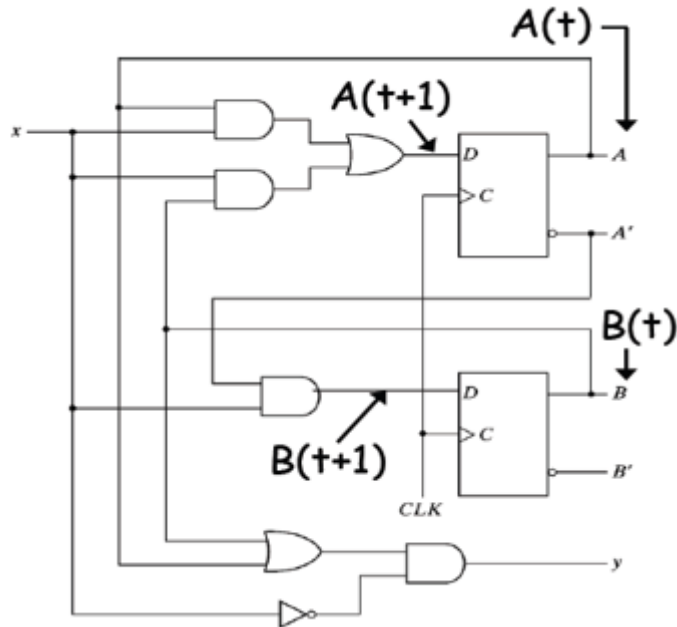
4	Minimize the four variable logic function using Quine Mc-Clusky Method (CO1) $F(A, B, C, D) = \sum m(0, 1, 3, 7, 8, 9, 11, 15)$	10
4	Construct the hamming code for data 01101101. Use even parity (CO1)	10

5. Answer any one of the following:-

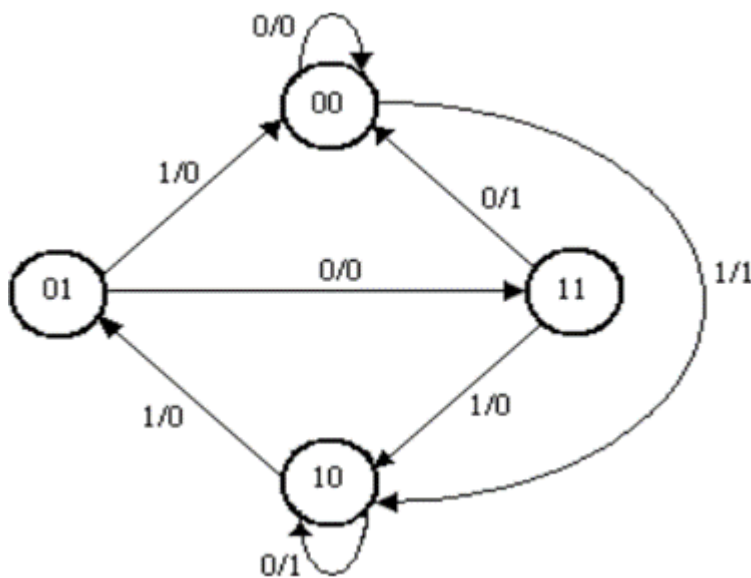
5	Implement $F(A, B, C, D) = m(0, 1, 2, 4, 5, 7, 11, 15)$ using 8:1 MUX. (CO2)	10
5	Design a combinational circuit that accepts a three-bit number and generates an output binary number equal to the square of the input number. (CO2)	10

6. Answer any one of the following:-

- 6 Define counters. Draw the logic diagram for synchronous counter that count from 0000 to 1111. Explain how it counts the numbers. (CO3) 10
- 6 What is a flip-flop? Convert SR flip flop to D flip flop. (CO3) 10
7. Answer any one of the following:-
- 7 Derive the state table and state diagram for the sequential circuit shown in fig. (CO4) 10



- 7 A sequential Circuit has one input and one output. The state diagram is shown in figure. Design the sequential circuit using T Flip-flop. (CO4) 10



8. Answer any one of the following:-
- 8 What is a FPGA? Explain the characteristics of FPGA? (CO5) 10
- 8 Implement the following functions using PROM, PAL, PLA. (CO5) 10
- i) $F1(x,y,z) = \sum m(1,2,4,6)$
- ii) $F2(x,y,z) = \sum m(0,1,6,7)$

iii) $F_3(x,y,z) = \sum m(3,5)$