Printed Page:- **Subject Code:-** AMICSE0304

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech(Integrated)

SEM: III - CARRY OVER THEORY EXAMINATION - APRIL 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. The output of a gate is HIGH when at least one of its inputs is LOW. It is true for (CO1) 1

(a) XOR

(b) NAND

(c) NOR

(d) OR

1-b. Represent the decimal number 5621 in BCD 8421 code. (CO1) 1

(a) 10101100010

(b) 110101100010

(c) 10101100011

(d) none of these

1-c. _____ can possibly be used for parallel-to-serial conversion. (CO2) 1

(a) Multiplexer

(b) Demultiplexer

(c) Decoder

(d) Encoder

1-d. A logic circuit which determines if one input is equal to another is called a _____. (CO2) 1

(a) comparator

(b) multiplexer

(c) encoder

(d) PROM

1-e. Internal propagation delay of asynchronous counter is removed by _____. (CO3) 1

(a) Ripple counter

(b) Ring counter

(c) Modulus counter

(d) Synchronous counter

1-f. Serial Counter is an example of _____. (CO3) 1

(a) Synchronous Counter

(b) Asynchronous Counter

(c) Johnson Counter

(d) None of These

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

(a) 3

(b) 6

(c) 8

(d) 16

1-h. Which is the delay elements for clocked system? (CO4) 1

(a) AND gates

(b) OR gates

(c) Flip-flops

(d) Multiplexers

1-i. A static memory is one in which _____ (CO5) 1

(a) Content changes with time

(b) Content doesn't changes with time

(c) Depends on situation

(d) Always dynamic with time.

1-j. Permanent Memory of a Computer is known as: (CO5) 1

(a) ROM

(b) CD-ROM

(c) RAM

(d) CPU

2. Attempt all parts:-

2.a. What is the essential characteristic of Hexadecimal number system over Binary number system? (CO1) 2

2.b. What is the main difference between Parallel-adder and Serial-adder? (CO2) 2

2.c. What is a shift register? (CO3) 2

2.d. Define static Hazard. (CO4) 2

2.e. What is the purpose of PLD? (CO5) 2

SECTION B **30**

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

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

3-b. Describe the sign magnitude, 2's complement and 1's complement notation for representing signed binary numbers. (CO1) 6

3-c. What is the logic implementation of half adder? Implement full adder using half adders. (CO2) 6

3-d. Implement Full subtractor using NOR gates only. (CO2) 6

3.e. Explain the working of Bidirectional shift register with suitable diagram. (CO3) 6

3.f. Define critical race in asynchronous sequential circuits. (CO4) 6

3.g. What are the differences between FPGA and PLD? (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Simplify the logic function F(A, B, C, D) = Π M (3, 5, 6, 11, 13, 14, 15) + d(4, 9, 10) using K-Map. Design the logic circuit with minimum number of NOR gates only. (CO1) 10

4-b. Perform the Hexadecimal subtraction of (FE8A.AA-3BCF.04) and octal subtraction of (756.42-345.23) using r's and (r-1)'s complement methods. (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a.	Design 4 bit binary to gray converter. (CO2)	10
5-b.	Implement a full adder using a decoder. (CO2)	10

6. Answer any <u>one</u> of the following:-

6-a.	Differentiate between asynchronous and synchronous counter. (CO3)	10
6-b.	Realize T Flip flop using only NAND gates and derive the characteristic equation of T flip flop. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	What is propagation delay in sequential circuit ? Explain the effect of propagation delay in asynchronous counters. (CO4)	10
7-b.	Define critical race and non-critical race. What is hazard? Also explain the elimination of hazard. (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	Design an Excess-3-to-BCD code converter using a (a) PROM, (b) PLA, (c) PAL. (CO5)	10
8-b.	Explain the detailed logic configurable block architecture of FPGA. (CO5)	10