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Subject Code:- ACSE0304

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

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 five 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 one of the following:-

- 4-a. Simplify the logic function $F(A, B, C, D) = \prod M(3, 5, 6, 11, 13, 14, 15) + d(4, 9, 10)$ 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 one 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 one 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 one 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 one 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