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Printed Page:-3 **Subject Code:- BEC0301Z**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2025- 2026)

Subject: Digital System Design

Time: 2 Hours **Max. Marks: 50**

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 15

1. Attempt all parts:-

1-a. In four-variable K-map simplification, a group of eight adjacent ones leads to a term with (CO1,K3) 1

(a) one literal
(b) two literal
(c) three literal
(d) four literal

1-b. A code converter is a logic circuit that _____ (CO2,K2) 1

(a) Inverts the given input
(b) Converts into decimal number
(c) Converts data of one type into another type
(d) Converts to octal

1-c. _____ are the applications of flip flop. (CO3,K4) 1

(a) registers
(b) counter
(c) storage devices
(d) all of the above

1-d. How many flip-flops are required to construct a decade counter? (CO4,K3) 1

(a) 4
(b) 8
(c) 5
(d) 10

1-e. FPGA stands for: (CO5,K1) 1

(a) Complex Programmable Logic Device
(b) Configurable Programmable Logic Device
(c) Field Programmable Gate Array
(d) Combined Programmable Logic Device

2. Attempt all parts:-

2.a. Implement Y = AB + CD using NAND gate only. (CO1, K3) 2

2.b. Define encoder. (CO2,K2) 2

2.c. Using the characteristic table of an D flip-flop, construct the K-map and derive its characteristic equation.(CO3,K4) 2

2.d. What do you mean by sequential circuit? (CO4,K1) 2

2.e. Differentiate between volatile and non-volatile memory. (CO5,K2) 2

SECTION-B 15

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Minimize the function F(W, X, Y, Z) = m(1, 2, 6, 7, 8, 13, 14, 15) + d(0, 3, 5, 12) using K-Map (CO1,K4) 3

3.a.(ii) Minimize the function F (A,B,C,D,E) = ∑ m(0,2,4,7,8,10,12,16,18,20,23,24,25,26,27,28) using K-Map. (CO1,K4) 3

3.b. Answer any one of the following:-

3.b.(i) Design a full adder using two half adders and OR gate. Also write an expression for sum and carry output. (CO2, K3) 3

3.b.(ii) 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,K5) 3

3.c. Answer any one of the following:-

3.c.(i) Explain Johnson counter in detail with the help of circuit diagram. Write its another popular name. (CO3,K2) 3

3.c.(ii) Explain the race-around condition in JK flip-flop and write the three ways it can be avoided. (CO3,K2) 3

3.d. Answer any one of the following:-

3.d.(i) Design a MOD-5 synchronous UP Counter. (CO4, K4) 3

3.d.(ii) Design 3-bit ripple UP Counter. Draw its state diagram, state table and logic diagram. (CO4, K4) 3

3.e. Answer any one of the following:-

3.e.(i) Implement the following Boolean functions using PROM. (CO5,K4) 3
F1 (A, B, C) = ∑m(5,6,7),
F2 (A, B, C) = ∑m(3,5,6,7)

3.e.(ii) Implement the sum and carry expressions of full adder expressions using PLA and PAL. (CO5,K5) 3

SECTION-C 20

4. Answer any one of the following:-

4-a.	Perform the subtraction **$(110010_2) - (010101_2)$** using the 1'**s and 2's complement** method. (CO1,K3)	4
4-b.	A Hamming (12,8) received codeword is: **110101101001**. Find the error position and correct it. Use even parity (CO1,K3)	4

5. Answer any one of the following:-

5-a.	Design an **8-to-3 priority encoder** and explain how priority is handled. (CO2, K3)	4
5-b.	Design a 2 bit magnitude comparator. (CO2, K3)	4

6. Answer any one of the following:-

6-a.	Explain the working of a Universal Shift Register with the help of block diagram. (CO3,K2)	4
6-b.	Convert T flip-flop into D flip-flop. (CO3,K3)	4

7. Answer any one of the following:-

7-a.	Design 101 sequence detector using Mealy Machines. (CO4, K5)	4
7-b.	Explain the types of hazards and how redundant term help in reducing the hazards in circuits. (CO4, K3)	4

8. Answer any one of the following:-

8-a.	Differentiate between FPGA and CPLD. (CO5, K2) .	4
8-b.	Explain the working of ROM, PROM, EPROM, and EEPROM. (CO5, K2)	4