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Printed Page:-4 **Subject Code:- CEC0101**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: I - THEORY EXAMINATION (2025 - 2026)
Subject: Digital Electronics and loT Systems

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. What is the binary equivalent of $(25)_{10}$?(CO1 K1) 1

(a) 11001
(b) 11101
(c) 10101
(d) 10011

1-b. What is the result of 1101 + 1010 in binary?(CO1 K1) 1

(a) 11111
(b) 10111
(c) 11001
(d) 10001

1-c. The output of full adder SUM is equal to (CO2,K1) 1

(a) $X \bullet Y \bullet Z$
(b) X + Y + Z
(c) $X + Y \bullet Z$
(d) $X \oplus Y \oplus Z$

1-d. One that is not the outcome of magnitude comparator is____ (CO2,K2) 1

(a) a < b
(b) a – b
(c) a > b
(d) a = b

1-e. SR latch made using NAND gates becomes active when inputs are:(CO3 K1) 1

(a) HIGH
(b) LOW
(c) Floating
(d) Pulsed

1-f. A Master-Slave flip-flop is used to: (CO3 K1) 1

(a) Amplify signal
(b) Avoid race condition
(c) Convert analog to digital
(d) Reduce noise

1-g. To provide parallel output , clock pulse are used in SIPO Register are_____.(CO4,K1) 1

(a) n+2
(b) n-2
(c) n
(d) 0

1-h. A 4-bit counter has a maximum modulus of _____.(CO4,K1) 1

(a) 3
(b) 6
(c) 8
(d) 16

1-i. LDR sensor is used to measure:(CO5,K2) 1

(a) Light intensity
(b) Temperature
(c) Humidity
(d) Sound

1-j. What is the voltage level of HIGH in Arduino UNO?(CO5,K2) 1

(a) 0V
(b) 2.5V
(c) 3.3V
(d) 5V

2. Attempt all parts:-

2.a. What is a universal gate? Give examples.(CO1,K1) 2

2.b. F(A,B,C) = Σm(1,4,5,7) minimize the given using K-MAP in SOP form. (CO2,K3) 2

2.c. With reference to a J-K flip-flop,what is racing? (CO3 K1) 2

2.d. Draw the timing diagram of '1010' in SIPO register.(CO4,K1) 2

2.e. Mention any two key characteristics of IoT.(CO5,K2) 2

SECTION-B 30

3. Attempt all parts:-

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

3.a.(i) Convert the following: (i) $4FA_{16}$ → Binary and Decimal (ii) 1011.101_2 → 6

Decimal and Octal(CO1 K2)

3.a.(ii)	Implement NOT, OR, AND & NOR Gates using NAND Gate only. (CO1 K2)	6
3.b. Answer any one of the following:-		
3.b.(i)	Explain full subtractor with proper logic circuit diagram.Implement it using half subtractor. (CO2,K2)	6
3.b.(ii)	Design a 16:1 MUX using 2:1 MUX. (CO2,K3)	6
3.c. Answer any one of the following:-		
3.c.(i)	Define race around condition with suitable diagram, how to remove it. (CO3 K2)	6
3.c.(ii)	Convert SR flip-flop to JK flip-flop. Provide truth table, conversion steps, and logic diagram. (CO3 K1)	6
3.d. Answer any one of the following:-		
3.d.(i)	Show the timing diagram of '1111' in : a)Serial-in serial-out shift register b) Parallel-in serial-out shift register .(CO4,K2)	6
3.d.(ii)	Design a MOD-8 Asynchronous UP counter using T flip-flops. Draw its timing diagram.(CO4,K2)	6
3.e. Answer any one of the following:-		
3.e.(i)	Discuss various real-world applications of IoT in healthcare, agriculture, and smart cities.(CO5,K2)	6
3.e.(ii)	What are sensors and actuators? Explain their working and types used in IoT with examples.(CO5,K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	(i)What is hamming code; encode a binary word 1111 into the even parity hamming code.(CO1 K2) (ii)What are universal gates.Implement OR,AND NOR using NAND gate. (CO1 K2)	10
4-b.	(i) Convert the following:(CO1 K2) (a) (3656)10= ( )BCD (b) (1110)2= ( )GREY (c) (1001)2= ( )EXCESS 3 (d) (10100001011)2= ( )8 (e) (1110111101101)2= ( )16 (ii) Simplify the following Y= ((AB)'+A'+AB)'	10

5. Answer any one of the following:-

5-a.	Explain and design BCD to gray code conversion circuit.(CO2,K3)	10
5-b.	Simplify the logic function F (A, B, C, D) = ∑ (1,4,8,12,13,15) +d (3,14) using K-map in SOP form and draw the logic circuit. Also minimize it using POS. (CO2,K3)	10

6. Answer any one of the following:-

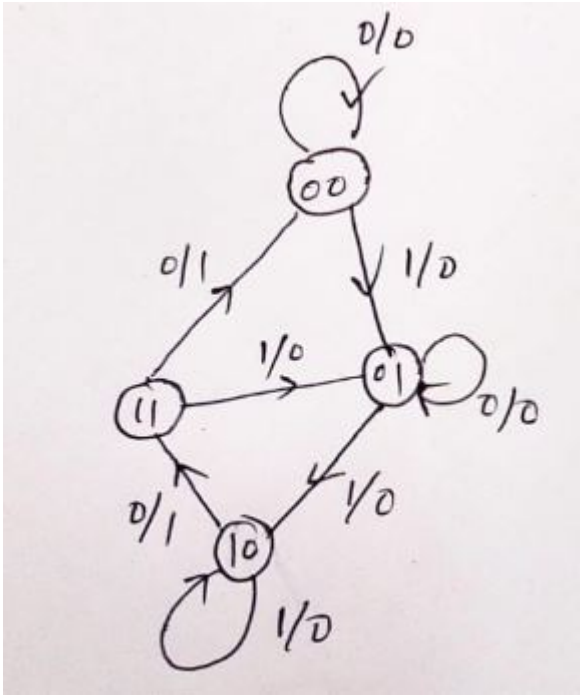
6-a.	Discuss the working of J-K flip-flop with truth table, characteristic equation, and excitation table.(CO3 K2)	10
6-b.	Design a 3 bit Synchronous DOWN counter and draw its logic circuit using T flip	10

flop. (CO3 K2)

7. Answer any one of the following:-

7-a. (i) Differentiate between RAM and ROM? (CO4,K3) 10
(ii) Draw circuit and state diagram for '1011' in Ring counter?(CO4,K3)

7-b. Design a synchronous sequential circuit using T flip flop Of the given state diagram showing state table (CO4,K3) 10



8. Answer any one of the following:-

8-a. Explain in detail the key characteristics of IoT: Interconnectivity, Heterogeneity, Scalability, Intelligence, and Security.Also discuss its key components?(CO5,K2) 10

8-b. Explain the 5-layer architecture of IoT: Perception, Network, Middleware, Application, and Business layers. Use a diagram.(CO5,K2) 10