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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech Integrated

SEM: II - THEORY EXAMINATION (2025 - 2026)

Subject: Digital Electronics and IoT 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:-

- (1.1) What is the binary equivalent of $(25)_{10}$? (CO1 K1) 1
- (a) 11001
 (b) 11101
 (c) 10101
 (d) 10011
- (1.2) For $Y = A'BC' + AB'C' + ABC' + A'B'C + A'BC$ min terms are (CO1 K2) 1
- (a) 3,4,5,6
 (b) 2,4,6,7
 (c) 1,2, 3, 4, 6
 (d) 4,5,6,7
- (1.3) If A and B are the inputs of a half adder, the sum is given by _____ (CO2,K2) 1
- (a) A AND B
 (b) A OR B
 (c) A XOR B
 (d) A EX-NOR B
- (1.4) Which of the following codes is used for labelling the cells of a Karnaugh map. (CO2,K2) 1
- (a) Hexadecimal
 (b) 8421 binary
 (c) octal
 (d) Gray

- (1.5) When both inputs of a SR latch (NAND) are 0, the output:(CO3 K1) 1
- (a) Sets the latch
 - (b) Resets the latch
 - (c) Maintains previous state
 - (d) Invalid State
- (1.6) What is the function of a flip-flop in sequential circuits? (CO3 K1) 1
- (a) Perform Arithmetic operations
 - (b) Store one bit of information
 - (c) Generate Clock pluses
 - (d) Decode Binary data
- (1.7) In PISO Resister, clock pulse required for input and output are____.(CO4,K1) 1
- (a) $n \& 1$
 - (b) $1 \& (n-1)$
 - (c) $2 \& 0$
 - (d) None of These
- (1.8) In a DRAM.....(CO4,K1) 1
- (a) Periodic refreshing is not required
 - (b) Information is stored in a capacitor
 - (c) Information is stoted in a latch
 - (d) Both read and write operations can be performed simutaneously
- (1.9) LDR sensor is used to measure:(CO5,K2) 1
- (a) Light intensity
 - (b) Temperature
 - (c) Humidity
 - (d) Sound
- (1.10) Arduino digital pins can output which signals?(CO5,K2) 1
- (a) Analog only
 - (b) Digital only
 - (c) Both analog and digital
 - (d) PWM (Digital with analog-like behavior)

2. Attempt all parts:-

- (2.1) Convert $(156)_{10}$ to binary, octal, and hexadecimal. 2
- (2.2) Design a 4:1 multiplexer using 2:1 multiplexer.(CO2,K3) 2
- (2.3) What is a sequential circuit? How does it differ from a combinational circuit? (CO3 K1) 2
- (2.4) What is the significance of the clock signal in a flip-flop?(CO4,K1) 2
- (2.5) Mention any two key characteristics of IoT.(CO5,K2) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) Perform the subtraction of $(25)_{10} - (43)_{10}$ in 2's compliment method? (CO1,K2) 6

(3.2)	Implement NOT, OR, AND & NOR Gates using NAND Gate only. (CO1 K2)	6
Answer any one of the following:-		
(3.3)	Implement a full adder with two half adder and an OR gate. (CO2,K3)	6
(3.4)	$F(w,x,y,z) = \sum m(0,1,2,5,6,8) + d(3,4,7,11)$. Minimize the given function using K-MAP in SOP form. (CO2, K3)	6
Answer any one of the following:-		
(3.5)	Convert a JK flip flop into T and D flip flop. (CO3 K2)	6
(3.6)	What is a master-slave flip-flop? Explain its working with suitable diagram. (CO3 K1)	6
Answer any one of the following:-		
(3.7)	Show the timing diagram of '1111' in : a)Serial-in serial-out shift register b) Parallel-in serial-out shift register .(CO4,K2)	6
(3.8)	Design 3 bit asynchronous down counter with negative trigger, also show the timing diagram. (CO4,K2)	6
Answer any one of the following:-		
(3.9)	Describe at least five key characteristics of IoT with suitable examples.(CO5,K2)	6
(3.10)	Explain the functions of the Perception Layer, Network Layer, and Application Layer in IoT architecture.(CO5,K2)	6
SECTION-C		50
4. Answer any <u>one</u> of the following:-		
(4.1)	(i) Simplify using De-Morgan's Law of given equation $Y = ((A+BC) (A'B'+C))'$ (CO1 K2) (ii) Convert the following: (CO1 K2) (a) $(3456)_{10} = ()_{BCD}$ (b) $(1010)_2 = ()_{GREY}$ (c) $(1111)_2 = ()_{EXCESS\ 3}$ (d) $(11100001111)_2 = ()_8$ (e) $(1100111100111)_2 = ()_{16}$	10
(4.2)	(i)What is hamming code? Encode a binary word 1101 into the even parity hamming code.(CO1 K2) (ii) Simplify the BCD addition of $(788)_{10}$ and $(879)_{10}$ (CO1 K2)	10
5. Answer any <u>one</u> of the following:-		
(5.1)	Explain and design BCD to Excess 3 code conversion circuit. (CO2, K3)	10
(5.2)	Design a combinational circuit that will compare two 2-bit numbers.(CO2,K3)	10
6. Answer any <u>one</u> of the following:-		
(6.1)	Discuss the working of S-R flip-flop with truth table, characteristic equation and excitation table. (CO3 K2)	10
(6.2)	Explain the procedure to convert SR flip-flop to JK Flip-flop including conversion table (CO3 K2)	10
7. Answer any <u>one</u> of the following:-		
(7.1)	Design and explain the operation of MOD-8 synchronous down counter. (CO4,K3)	10
(7.2)	$T_A = A_n X + B_n X$, $T_B = A'_n X$, $Y = (A_n + B_n) X'$. For the given equation design the	10

logic diagram using T flip flop. Draw the state table and the state diagram. (CO4, K3)

8. Answer any one of the following:-

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| (8.1) | Explain the working of sensors and actuators in detail. Classify their types with examples and applications.(CO5,K2) | 10 |
| (8.2) | Explain the role of data in IoT. How does IoT use real time data for decision making. Enumerate your answer with its application and characteristics? (CO5,K2) | 10 |

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