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

**MCA Integrated**

**SEM: I - THEORY EXAMINATION (2025 - 2026)**

**Subject: Digital Logic 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**

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1. Attempt all parts:-

- 1-a. Which system works on discrete values.[CO1,K1] 1
- (a) Analog
- (b) Digital
- (c) Both
- (d) none
- 1-b. Which property is illustrated by  $A + B = B + A$ . [CO1,K2] 1
- (a) Associative law
- (b) Commutative law
- (c) Idempotent law
- (d) None
- 1-c. The output of a combinational circuit is dependent only on:[CO2,K1] 1
- (a) Present input
- (b) Past input
- (c) Memory
- (d) Clock signal
- 1-d. The only unweighted code that is self-complementing is: [CO2,K2] 1
- (a) BCD
- (b) Excess-3
- (c) Gray code
- (d) 8421 code
- 1-e. The basic building block of a sequential circuit is:[CO3,K1] 1

- (a) Logic gate  
 (b) Latch  
 (c) Multiplexer  
 (d) Decoder
- 1-f. Circuits that use a clock are known as:[CO3,K1] 1  
 (a) Combinational Circuits  
 (b) Sequential Circuits  
 (c) Asynchronous Circuits  
 (d) Synchronous Circuits
- 1-g. A table which contains the states, input and output is known as: [CO4,K1] 1  
 (a) State table  
 (b) Truth table  
 (c) Transition diagram  
 (d) Function table
- 1-h. The diagram that shows the transition of states is known as:[CO4,K1] 1  
 (a) State diagram  
 (b) Karnaugh map  
 (c) Truth table  
 (d) Boolean diagram
- 1-i. The term IoT was coined in?[CO5,K1] 1  
 (a) 1995  
 (b) 1999  
 (c) 2005  
 (d) 2010
- 1-j. The term IIoT stands for:[CO5,K1] 1  
 (a) Industrial Internet of Things  
 (b) Internal Internet of Things  
 (c) Intelligent Internet of Technology  
 (d) Integrated IoT
2. Attempt all parts:-
- 2.a. Explain the working principle of a digital system with a real-life example. [CO1, K2] 2
- 2.b. Construct a block diagram of a Combinational circuit. [CO2,K3] 2
- 2.c. Explain the purpose of memory in a sequential circuit.[CO3,K2] 2
- 2.d. Explain the significance of a State Table in FSM design.[CO4,K2] 2
- 2.e. Discuss Arduino Uno.[CO5,K2] 2
- SECTION-B** 30
3. Attempt all parts:-
- 3.a. Answer any one of the following:-
- 3.a.(i) Convert (ACB.8D)<sub>16</sub> into binary and then convert it into octal number 6

system.[CO1,K5]	
3.a.(ii) Analyze the role of Don't Care conditions in K-map simplification. Give an example.[CO1,K4]	6
3.b. Answer any one of the following:-	
3.b.(i) Construct a 4:1 Multiplexer with truth table and diagram.[CO2,K5]	6
3.b.(ii) Implement the function $F(A,B,C)=\Sigma(1,2,4,5)$ using 4:1 Mux.[CO2,K5]	6
3.c. Answer any one of the following:-	
3.c.(i) Construct the truth table and characteristic table of JK Flip Flop using NAND gate.[CO3,K5]	6
3.c.(ii) Compare synchronous and asynchronous counters with suitable circuit diagram.[CO3,K4]	6
3.d. Answer any one of the following:-	
3.d.(i) Explain the concept of sequence detection in FSM with example.[CO4,K2]	6
3.d.(ii) Explain the role of a Mealy machine in sequential circuit design.[CO4,K2]	6
3.e. Answer any one of the following:-	
3.e.(i) Discuss the role of sensors in IoT with example.[CO5,K2]	6
3.e.(ii) Differentiate between IoT and IIoT in detail.[CO5,K4]	6
<b>SECTION-C</b>	<b>50</b>
4. Answer any <u>one</u> of the following:-	
4-a. Discuss in detail Logic Gates along with their circuit diagram and truth table.[CO1,K3]	10
4-b. Design a simplified logic circuit for $F(A,B,C,D)=\Sigma(0,1,2,3,7,8,10)$ using K-map and draw the circuit diagram.[CO1,K5]	10
5. Answer any <u>one</u> of the following:-	
5-a. Design a BCD-to-Excess-3 Code Converter.[CO2,K5]	10
5-b. Explain Combinational Circuit with suitable diagram and its types. Illustrate the applications of Combinational circuits in real-world systems.[CO2,K2]	10
6. Answer any <u>one</u> of the following:-	
6-a. Describe Flip Flop along with its various types in detail. [CO3,K2]	10
6-b. Analyze Counter in detail. Judge the role of propagation delay in counter design.[CO3,K4]	10
7. Answer any <u>one</u> of the following:-	
7-a. Differentiate between Moore and Mealy machines in terms of outputs, states, and applications.[CO4,K4]	10
7-b. Discuss in detail the types of hazards and their prevention methods.[CO4,K2]	10
8. Answer any <u>one</u> of the following:-	
8-a. Explain in detail the concept of smart city with IoT applications .[CO5,K2]	10
8-b. Discuss IoT in detail along with the features and characteristics.[CO5,K2]	10