Printed Page:- 04 Subject Code:- BMICSE0304

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech (Integrated)

SEM: III - THEORY EXAMINATION (2024- 2025)

Subject: Digital Logic 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-a. The Gray code equivalent of binary 1010 is: (CO1,K1) 1

(a) 1110

(b) 1101

(c) 1001

(d) 1111

1-b. The function F=A·(B+C) is equivalent to: (CO1,K2) 1

(a) AB+AC

(b) A+BC

(c) AB.AC

(d) A+B+C

1-c. How many AND gates are required for a 1-to-8 Demultiplexer? (CO2,K1) 1

(a) 2

(b) 6

(c) 8

(d) 5

1-d. Which signal has the highest priority in a priority encoder? (CO2,K1) 1

(a) a) Least significant input

(b) b) Most significant input

(c) c) Middle input

(d) d) Random input

1-e. Action in JK flip-flop when both J and K inputs are high. (CO3,K2) 1

(a) Reset the state

(b) Set the state

(c) No change

(d) Toggle the state

1-f. Maximum states in 3-bit Ring counter. (CO3,K2) 1

(a) 2

(b) 4

(c) 3

(d) 8

1-g. The key challenge in ensuring security in IoT is (CO4,K2) 1

(a) Standardizing the communication protocol

(b) Reducing device power consumption

(c) Managing large-scale networks

(d) Preventing unauthorized access to devices and networks

1-h. Actuators in an IoT system are responsible for_____. (CO4,K2) 1

(a) Collecting environmental data

(b) Storing and processing data

(c) Performing actions based on processed data

(d) Establishing communication between devices

1-i. Proximity sensors are used to: (CO5,K2) 1

(a) Measure temperature

(b) Detect the presence of an object without physical contact

(c) Measure light intensity

(d) Monitor humidity levels

1-j. How do pneumatic actuators create motion? (CO5,K2) 1

(a) Using electrical energy

(b) Using fluid pressure

(c) Using compressed air

(d) Using mechanical force

2. Attempt all parts:-

2.a. Sate the Demorgan's theorem. (CO1,K1) 2

2.b. Design 8:1 Mux usiNG two 4:1 Mux. (CO2,K3) 2

2.c. State one advantage of a synchronous counter. (CO3,K1) 2

2.d. How does IoT contribute to smart cities? (CO4,K2) 2

2.e.	Define LDR.(CO5,K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Implement the Boolean expression (i)AB+ CD+E (ii) (A+B). C. (D+E) using NAND gate. (CO1,K3)	6
3-b.	Minimise using K-Maps: F(A, B, C, D) = ∑m(1,3,7,11,15) + d(0,2,4). Implement the minimize expression using logic gates. (CO1,K4)	6
3-c.	Draw and explain full adder using two half-adders. (CO2,K3)	6
3-d.	Implement F (A, B, C, D) = Σ (0,1,3,4,8,9,15) using 8x1 multiplexer: If MSB i.e. A is used as input variable and B, C, D as select lines. (CO3,K3)	6
3.e.	Explain the working of a T flip-flop. (CO3,K2)	6
3.f.	Investigate the concept of interoperability in IoT devices and how it influences device integration and communication. (CO4,K4)	6
3.g.	Explain RFID, and how does it work is? (CO5,K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Minmize the F(W,X,Y,Z)=∑m(2,6,8,9,10,11,14,15) using Quine-McCluskey method. (CO1,K4)	10
4-b.	If the Hamming code sequence 1100110 is transmitted and due to error in one position, is received as 1110110, locate the position of the error bit using parity checks and give the method for obtaining the correct sequence. (CO1,K4)	10

5. Answer any one of the following:-

5-a.	Discuss and design a combinational circuit which converts the BCD to Excess-3. (CO2,K3)	10
5-b.	Design and explain carry look ahead adder. (CO2,K3)	10

6. Answer any one of the following:-

6-a.	Analyze the design of a 4-bit binary up-down counter and explain its working with a timing diagram.(CO3,K4)	10
6-b.	Illustrate the working of a 4-bit PISO register and describe its use in serial data transmission. (CO3,K3)	10

7. Answer any one of the following:-

7-a.	Outline the conceptual framework of IoT, focusing on the role of microcontrollers in bridging the physical and digital worlds. (CO4,K2)	10
7-b.	Examine the features of Arduino UNO and how it can be utilized in developing IoT applications. (CO4, K2)	10

8. Answer any one of the following:-

8-a.	Describe the process of programming an Arduino board using the Arduino IDE. Include steps for setting up the IDE, Write a program of LED blinking with Pushbutton. (CO5,K2)	10

8-b. Discuss the process of interfacing an ultrasonic sensor with Arduino to measure distance. Include the circuit diagram and code. (CO5,K3) 10