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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

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 output of a NOR gate is 1 only when____.(CO1,K1) 1
- (a) Both inputs are 1
- (b) Both inputs are 0
- (c) One input is 1
- (d) One input is 0
- 1-b. The complement of $A+B$ is? (CO1,K1) 1
- (a) AB
- (b) $A'B'$
- (c) $A'+B'$
- (d) $A+B$
- 1-c. Half-adders have a major limitation in that they cannot _____(CO2,K2) 1
- (a) Accept a carry bit from a present stage
- (b) Accept a carry bit from a next stage
- (c) Accept a carry bit from a previous stage
- (d) Accept a carry bit from the following stages
- 1-d. The word demultiplex means _____. (CO2,K1) 1
- (a) One into many
- (b) Many into one

- (c) Distributor
- (d) One into many as well as Distributor
- 1-e. Basic difference between latch and flip-flop.(CO3,K2) 1
- (a) Latch stores one bit permanently
- (b) Latch is level-triggered
- (c) Flip-flop is clock-triggered
- (d) Flip-flop stores one bit permanently
- 1-f. Toggle condition for T flip-flop. (CO3,K1) 1
- (a) $T = 1$
- (b) $T = 0$
- (c) $J = 1$ and $K = 1$
- (d) $D = 1$
- 1-g. In IoT, scalability refers to the system's ability to.(CO4,K2) 1
- (a) Add more devices and expand capacity
- (b) Process data in real-time
- (c) Ensure data security across devices
- (d) Connect devices using a specific protocol
- 1-h. The primary function of IoT gateways is to____.(CO4,K2) 1
- (a) Process data from IoT devices
- (b) Enable communication between devices and the cloud
- (c) Monitor the performance of sensors
- (d) Increase the power supply to devices
- 1-i. Microcontroller is used in the Arduino UNO? (CO5,K1) 1
- (a) ATmega2560
- (b) ATmega328P
- (c) ATtiny85
- (d) ESP8266
- 1-j. GPIO stands for____.(CO5,K1) 1
- (a) General Purpose Inner Outer Propeller
- (b) General Purpose Input Output Pins
- (c) A. General Purpose Interested Old People
- (d) A. General Purpose Input Output Processor

2. Attempt all parts:-

- 2.a. Represent the -15 (decimal number) in signed binary number and unsigned binary number. (CO1,K3) 2
- 2.b. Define Half Adder. (CO2, K1) 2
- 2.c. Write the main purpose of a shift register. (CO3,K1) 2
- 2.d. What is the role of interoperability in IoT? (CO4,K2) 2

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

SECTION-B 30

3. Answer any five of the following:-

3-a. Perform the Ex-3 addition of (i) (99+99) (ii) (38+46) (iii) (47+33). (CO1,K3) 6

3-b. What is Hamming Code ? Generate Hamming Code for data 1100, assuming even parity. (CO1,K3) 6

3-c. Implement a full subtractor with two half subtractor and an OR gate. (CO2,K3) 6

3-d. Implement the Boolean function $f(A,B,C,D) = \sum m(2,4,6,9,10,11,13)$ with 8:1 multiplexers. (CO2,K3) 6

3.e. Compare the SR flip-flop and the JK flip-flop. (CO3,K4) 6

3.f. Evaluate the use of IoT in smart cities for traffic management, waste management, and energy optimization. (CO4,K5) 6

3.g. Explain RFID in detail. What are the main components of an RFID system? (CO5,K1) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Minimize the given using QM method, $F(A,B,C,D) = \sum m(0,2,3,6,7,8,10,12,13)$. (CO1,K4) 10

4-b. Minimize the function by K Map. and also perform the Logic implementation of the simplified function. $F(w,x,y,z) = \sum m(0,2,4,5,6,8,10,15) + d(7,13,14)$. (CO1,K4) 10

5. Answer any one of the following:-

5-a. Design 4 bit binary to gray converter. (CO2, K3) 10

5-b. Draw the logic diagram and explain the 1-to-16 Demultiplexer circuit. (CO2,K3) 10

6. Answer any one of the following:-

6-a. Explain the design and working of a 4-bit ripple counter with a neat circuit diagram. (CO3,K2) 10

6-b. Discuss the operation of a JK flip-flop, including its truth table and timing diagram. (CO2,K2) 10

7. Answer any one of the following:-

7-a. Investigate the IoT architecture at a high level, including the interaction of microcontrollers within this framework. (CO4,K2) 10

7-b. Evaluate the differences between Arduino UNO and Arduino NANO with respect to IoT applications. (CO4,K2) 10

8. Answer any one of the following:-

8-a. Define sensors and classify them based on their working principles and applications. Provide examples of each type. (CO1,K1) 10

8-b. Describe and Write a code of interfacing of LCD with Arduino UNO board. (CO5,K3) 10