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Subject Code:- BCSIOT0302

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Logic Design and Microcontroller

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 two's complement of 1010 is: (CO1,K1) 1

(a) 101

(b) 1110

(c) 0110

(d) 1011

1-b. The prime implicant which has at least one element that is not present in any other implicant is known as _____ . (CO1,K1) 1

(a) Essential Prime Implicant

(b) Implicant

(c) Complement

(d) Prime Complement

1-c. In a 4-bit Johnson counter sequence, there are a total of how many states or bit patterns? (CO2,K1) 1

(a) 1

(b) 3

(c) 4

(d) 8

1-d. Characteristics equation of S_R flip flop is ----- (CO2,K1) 1

(a) Qn+1 = S + R Qn

(b) Qn+1 = S' + R Qn

(c) Qn+1 = S + R'Qn

(d) Qn+1 = S'+ R'Qn

1-e. What is stored in the H & L general-purpose register? (CO3,K1) 1

(a) Opcode

(b) Address of memory

(c) Address of next instruction

(d) Temporary data

1-f. After XRA A instruction is executed, what will be the status of Zero Flag? (CO3,K1) 1

(a) 1

(b) 0

(c) No change

(d) none of these

1-g. Which register holds the next instruction to be executed in ATmega 328P? (CO4,K1) 1

(a) SP

(b) PC

(c) SREG

(d) X register

1-h. Which of the following addressing modes is NOT used by the AVR core in ATmega 328P? (CO4,K1) 1

(a) Immediate

(b) Direct

(c) Indirect

(d) Absolute

1-i. How many timers does the ATmega328P microcontroller have? (CO5,K1) 1

(a) 2

(b) 3

(c) 4

(d) 5

1-j. In ATmega328P, what does an 8-bit timer mean? (CO5,K1) 1

(a) The timer counts up to 8

(b) The timer can count from 0 to 255

(c) The timer has 8 modes

(d) The timer uses 8 pins

2. Attempt all parts:-

2.a. Define Prime, Essential Prime and Selective Prime implicants. (CO1,K2) 2

2.b.	State the difference between Synchronous and Asynchronous counters. (CO2, K2)	2
2.c.	What is Non-Maskable interrupt? (CO3,K2)	2
2.d.	Explain the role of the SRAM in ATmega 328P. (CO4,K2)	2
2.e.	How is the Input Capture Unit used in ATmega328P timers? (CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Convert $(116)_{10}$ to Octal, binary and, hexadecimal numbers. (CO1,K2)	6
3-b.	What is Full adder? Explain with truth table and circuit diagram. (CO1,K3)	6
3-c.	What is need of shift register? Draw & explain bidirectional shift register. (CO2,K3)	6
3-d.	Convert T flip-flop into D flip-flop. (CO2,K3)	6
3.e.	Explain the function of following pins of microprocessor 8085. a) SOD/SID b) ALE c) HOLD. (CO3,K3)	6
3.f.	Describe the role of the Flash memory in the ATmega328P microcontroller. How is it divided, and what is its total capacity? (CO4,K3)	6
3.g.	Describe the use of the OCR0A and OCR0B registers. (CO5,K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Implement a 4-bit Binary to Gray code converter. Also write the advantages of Gray code. (CO1,K3)	10
4-b.	F(A,B,C,D) = ∑m(4,5,7,8,10,11,15) + ∑d (0,1,2) minimize the given function using K-MAP in POS form and implement the circuit using logic gates. (CO1,K4)	10

5. Answer any one of the following:-

5-a.	Differentiate (i) Ring and Twisted Ring counters (ii) state table, characteristics table and excitation table. (CO2,K3)	10
5-b.	Design a binary counter using T flip flops to count in the following sequences: (i) 000, 001, 010, 011, 100, 101, 111, 000 (ii) 000, 100, 111, 010, 011, 000 (CO2,K4)	10

6. Answer any one of the following:-

6-a.	Explain the direct addressing modes and indirect addressing modes of 8085 with examples. (CO3,K3)	10
6-b.	Write a program for sum of series of 100 bytes. (CO3,K3)	10

7. Answer any one of the following:-

7-a.	Draw the block diagram of the ATmega328P microcontroller and explain each component in detail. (CO4,K3)	10
7-b.	Draw and explain the function of the Status register in detail in ATmega328P. (CO4,K3)	10

8. Answer any <u>one</u> of the following:-

8-a.	Describe the structure and purpose of the UCSRA (USART Control and Status Register A) in ATmega328P. Discuss the functions of important bits like RXC (Receive Complete), TXC (Transmit Complete), and UDRE (USART Data Register Empty). (CO5,K3)	10
8-b.	Discuss about the ASSR and GTCCR register in detail. (CO5,K3)	10