

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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 System 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

20

1. Attempt all parts:-

- 1-a. Two-input XNOR gate gives HIGH output (CO1,K1) 1
- (a) when one input is HIGH and the other is LOW
- (b) only when both the inputs are LOW
- (c) when both the inputs are the same
- (d) only when both the inputs are HIGH
- 1-b. Sum-of-product logic is equivalent to _____ (CO1,K1) 1
- (a) OR-AND logic
- (b) NOR-NOR Logic
- (c) NAND-NAND Logic
- (d) None of these
- 1-c. Which of the following are building blocks of encoders? (CO2,K1) 1
- (a) NOT gate
- (b) OR gate
- (c) AND gate
- (d) NAND gate
- 1-d. Logic circuit of code converter _____ (CO2,K1) 1
- (a) Inverts the given input
- (b) Converts into decimal number
- (c) Converts data of one type into another type

- (d) Converts to octal
- 1-e. The shift registers are categorized into _____types. (CO3,K1) 1
- (a) one
- (b) two
- (c) three
- (d) four
- 1-f. Race around condition is related to (CO3,K1) 1
- (a) SR flip-flop
- (b) JK flip-flop
- (c) D flip-flop
- (d) None of these
- 1-g. A Moore machine differs from a Mealy machine in that: (CO4,K1) 1
- (a) Moore machines have outputs that depend only on the current state.
- (b) Moore machines have outputs that depend on both the current state and the inputs.
- (c) Moore machines are always faster than Mealy machines.
- (d) Moore machines are simpler to design than Mealy machines.
- 1-h. A 4-bit synchronous up-counter can count from 0 to: (CO4,K1) 1
- (a) 7
- (b) 15
- (c) 31
- (d) 63
- 1-i. A combinational PLD with a programmable AND array and a fixed OR array is called as-- (CO5,K1) 1
- (a) PLD
- (b) PROM
- (c) PLA
- (d) PAL
- 1-j. Which of the following memory is non-volatile? (CO5,K1) 1
- (a) RAM
- (b) ROM
- (c) Cache
- (d) ROM and Cache
2. Attempt all parts:-
- 2.a. Explain the Demorgan's Theorem. (CO1,K2) 2
- 2.b. Design 1 bit magnitude comparator circuit. (CO2,K2) 2
- 2.c. Write the Characteristic equation of JK and T F/Fs. (CO3,K2) 2
- 2.d. Draw a 4- bit ripple up counter. (CO4,K2) 2

2.e. Compare RAM with ROM. (CO5,K2) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Implement basic gates using only NAND gates. (CO1, K3) 6

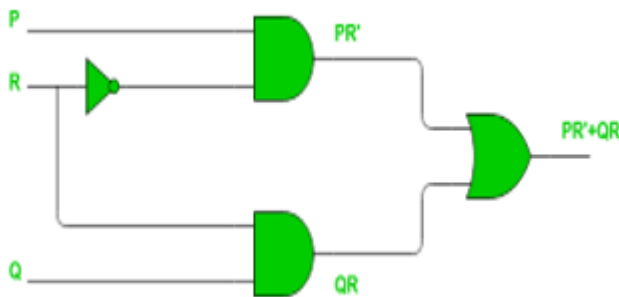
3-b. Perform the subtraction (A-B) and (B-A) using 2's complement for A= 1101 and B = 1001 (CO1,K3) 6

3-c. Implement $F(A_1, A_2, A_3) = \sum (3, 5, 6, 7)$ Using (a) 8x1 multiplexer (b) 4x1 multiplexer (CO2,K3) 6

3-d. Design and explain full adder using two half-adders. (CO2,K3) 6

3.e. Convert J K flip flop into D flip flop. (CO3,K3) 6

3.f. Modify the logic circuit to eliminate the static-1 hazard having output $Y = PR' + QR$. (CO4,K3) 6



3.g. Compare PROM, PAL, and PLA in details. CO5,K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. What is Hamming Code? Generate Hamming code for data 1011 assuming even parity. (CO1,K4) 10

4-b. Implement the Boolean function $F(A,B,C,D) = \sum m(0,1,2,8, 10, 11,14,15) + d(5,7)$ after minimizing using K-Map. (CO2,K4) 10

5. Answer any one of the following:-

5-a. Design a combinational circuit that will convert 4-bit binary code to Gray code. (CO2,K4) 10

5-b. Implement a full subtractor combinational circuit using two half subtractors. (CO2,K4) 10

6. Answer any one of the following:-

6-a. What is Flip-Flop? Convert D F/F into T F/F. (CO3,K4) 10

6-b. Design and explain 4- bit ring counter & 4- bit Johnson counter. (CO3,K4) 10

7. Answer any one of the following:-

7-a. Design MOD-5 Synchronous and Asynchronous Counters. (CO4,K4) 10

7-b. Define Hazards in combinational circuits and design hazard-free circuit for the following Boolean function, (CO4,K4) 10

$$F(A, B, C, D) = \sum m(0, 2, 6, 7, 8, 9, 10, 11)$$

8. Answer any one of the following:-

- 8-a. Draw the block diagram of PLA and explain the function of each blocks. (CO5,K3) 10
- 8-b. A combinational logic is defined by functions (CO5,K4) 10
 $F_1(A,B,C) = \sum m(3,5,6,7)$ and $F_2(A,B,C) = \sum m(0,2,4,7)$
Implement the circuit with PLA having 3 inputs, 4 product terms and 2 outputs.

COP:JULY_DEC-2024