Printed Page:- 04   Subject Code:- BEC0301

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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 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. Bubble input AND gate is Equivalent to (CO1,K1)   1

  (a) NAND

  (b) NOR

  (c) XOR

  (d) AND

1-b. In four-variable K-map simplification, a group of eight adjacent ones leads to a term with (CO1,K1)   1

  (a) one literal

  (b) two literal

  (c) three literal

  (d) four literal

1-c. Which One is not the outcome of magnitude comparator? (CO2,K1) 1

  (a) a > b

  (b) a – b

  (c) a < b

  (d) a = b

1-d. The 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. In which flip flop the present input will be the next output? (CO3,K1)   1

(a) J-K

(b) D

(c) T

(d) S-R

1-f. The basic latch consists of _____. (CO3,K1)   1

(a) Two inverters

(b) Two comparators

(c) Two amplifiers

(d) Two adders

1-g. The primary advantage of asynchronous circuits is: (CO4,K1)   1

(a) Speed

(b) Simplicity

(c) Power consumption

(d) All of the above

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. Which is the volatile memory? (CO5,K1)   1

(a) ROM

(b) RAM

(c) PROM

(d) EPROM

1-j. Which is not the PLD? (CO5,K1)   1

(a) MUX

(b) PROM

(c) PAL

(d) PLA

2. Attempt all parts:-

2.a. Explain the Demorgan's Theorem. (CO1,K2)   2

2.b. Implement 4*1 MUX using 2*1 Mux. (CO2,K2)   2

2.c. Discuss the all types of triggering method used for F/Fs. (CO3,K2)   2

2.d. Define static and dynamic hazards in combinational circuits. (CO4,K2)   2

2.e.   Compare EPROM with EEPROM. (CO5,K2)   2

SECTION-B   30

3. Answer any <u>five</u> of the following:-

3-a.   Find the canonical SOP and POS form expressions of F= AB'+CD   (CO1,K3)   6

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

3-c.   Design a 4 bit binary to gray code converter. (CO2,K3)   6

3-d.   Design a 1-digit BCD Adder using 7483 ICs. (CO2,K3)   6

3-e.   Convert a T F/F into D F/F. (CO3,K3)   6

3-f.   Design MOD-5 Asynchronous counter. (CO4,K3)   6

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

SECTION-C   50

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

4-a.   What is Hamming code? Construct the Hamming code for the data 1010 with   10
          (CO1,K4)
          a. even parity   b. odd parity

4-b.   Minimize the following function by K-Map and also perform the NAND   10
          implementation of the simplified function.
          $F(w,x,y,z) = \sum m (1,4,8,9,13,14,15) + d (2,3,11,12)$ (CO1,K4)

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

5-a.   What is multiplexer? Implement the function using 8:1 multiplexer. F(A,B,C,D)   10
          $= \sum m(0, 2, 3, 6, 8, 9, 11, 12, 14)$ (CO2,K4)

5-b.   Design and implement a 2-bit magnitude comparator. (CO2,K4)   10

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

6-a.   Differentiate between: 10
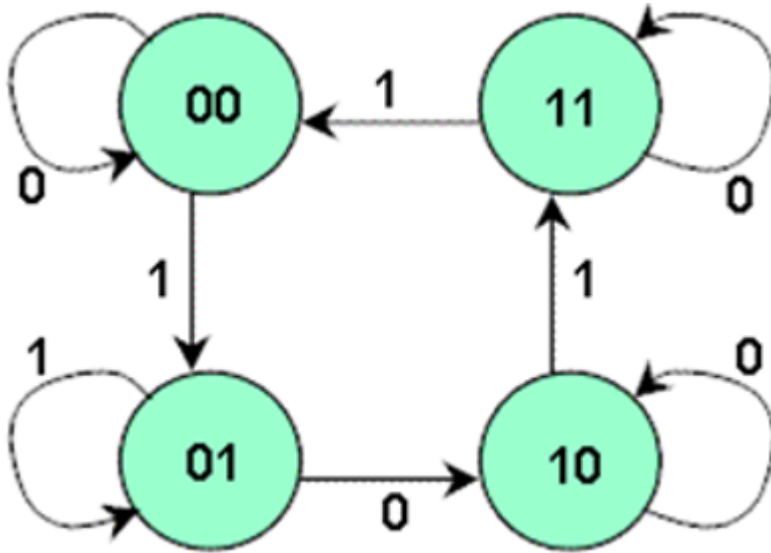   (a) Combinational and sequential circuits.
          (b) Latches and flip flops (c) Ring and Twisted ring counters.   (CO3,K4)

6-b.   Derived the characteristic equation of JK and T F/Fs. (CO3,K4)   10

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

7-a.   Design a synchronous sequential circuit using JK filp-flops for the given state   10
          diagram. (CO4, K4)

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

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

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

8-a.   Implement the following Boolean functions using PROM and PLA. (CO5,K4)   10
        $A(X,Y,Z)=\sum m(2,4,7)$, $B(X,Y,Z)=\sum m(3,4,6)$.

8-b.   Draw the block diagram of PLA and explain the function of each blocks.   10
        (CO5,K3)