LS/2022

Reg. No. _____
(To be filled by the candidate)

21CS21
(2021 Batch only)

COIMBATORE INSTITUTE OF TECHNOLOGY
(Government Aided Autonomous Institution)
COIMBATORE 641 014

B.Tech. DEGREE EXAMINATIONS, SEPTEMBER 2022
(Second Semester)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE BRANCH

21CS21 DIGITAL DESIGN

Time : 3 Hours

Max: 75 marks

INSTRUCTIONS

1. Answer all questions in PART A and as per choice in PART B.
2. Part A and Part B questions should be answered separately in the same answer sheet.

PART:A

(10 X 2 = 20)

1 Identify the value for the following equivalence: $(37.25)_{10} = (?)_6$

2 Consider $(123)_5 = (X8)_Y$. The number of possible solution(s) for X and Y is / are?

3 Let $f(x_1, x_2, \ldots, x_n)$ be equal to 1 if and only if k or more of the variables are equal to 1 ($k <= n$). How many prime implicants does this function have?

4 Express the following function F(x, y, z) = xy + x'z to its canonical product-of-sum expression.

5 Find the max terms for the following : $F(P, Q, R) = (P + Q)(\sim P + \sim R)$ where $\sim X$ represents the complement of X.

6 Design a full Adder using only the universal NAND gates.

7 Outline the salient differences between latches and flip-flops.

8 Give the excitation table for S-R flip-flop. Outline the timing diagram for an S-R flip-flop with S and R values as '0110' and '1001' respectively.

9 Give a brief overview about EDO(Extended Data Out) RAM.

10 Illustrate the block diagram that shows L1 and L2 cache memories in a computer.

PART:B

(5 X 11 = 55)

11. Design a 4-bit Binary-to-Gray code converter. Assume $B_4B_3B_2B_1$ represents 4-bit Binary number and $G_4G_3G_2G_1$ represents its 4-bit Gray code. (6 + 5)
    a) Draw the truth table. Show K-map and derive the expression for G_i's in terms of B_i's.
    b) Using the minimized expression, realize the logic circuit for the same.

(OR)

12 a.) Construct a Truth Table for a Headlight Warning System application which abides with the following constraints: (6 + 5)

- Day driving does not require a head light.
- Night driving requires a head light.

The system accepts three parameters as inputs viz., H, I and D representing Headlight, Engine Ignition and Daytime respectively and yields an output W that represents a warning signal.

b.) Given $(135)_X+(144)_X = (323)_X$. Find the base 'x' so that the preposition holds. Once the base 'x' is found, find the decimal equivalent of individual numbers given in the preposition.

Contd..

13 a) Draw the logic circuit of the parallel Adder, by realizing each full Adder using two half Adder circuits. (6 + 5)

b) Minimize the following Boolean function by applying suitable algebraic laws.

$F(A,B,C,D) = ABC'D' + ABC'D + AB'C'D + ABCD + AB'CD + ABCD' + AB'CD'$

(OR)

14 Using Quine McClusky's method(QM method), simplify the below Boolean expression that possess don't care condition: (11)

$$F(A,B,C,D) = \sum_m (1,5,6,12,13,14) + d(2,4)$$

15 a) Outline the principles of a 2^n to n Encoder. Construct a Truth table for a 8:3 Encoder.Realize the logical circuit for the same. (6 + 5)

b) With suitable illustration, brief about priority encoders.

(OR)

16 a) Devise a logical circuit such that it performs 4-Bit binary addition-cum-subtraction. (6 + 5)

b) With a suitable illustration, explain about the philosophy behind Look-Ahead Carry Adder?

17 Give the block diagram for a primitive J-K Flip-flop along with its excitation table. Give the timing diagram for a positive edge-triggered J-K flip-flop for the following sequence: J = '00110011' and K='11001001' (6 + 5)

(OR)

18 a) Design an asynchronous Mod-6 up counter using J-K flip-flop. (6 + 5)

b) What are bidirectional shift registers? Show how bidirectional shifts are achieved by considering a 4-bit bidirectional shift register.

19 a) Describe about the various types of read-only memories. (6 + 5)

b) Give short notes on Flash memories. Give a comparative study between flash memory and ROM.

(OR)

20 Show a basic 16X8-bit ROM array programmed for a 4-bit Binary –to-Gray conversion (6 + 5)

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