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# TCS–301

## B. TECH. (CSE) (THIRD SEMESTER)

## MID SEMESTER EXAMINATION, 2022

### LOGIC DESIGN

**Time : 1½ Hours**

**Maximum Marks : 50**

**Note :** (i) Answer all the questions by choosing any ***one*** of the sub-questions.

(ii) Each question carries 10 marks.

1. (a) (i) Find the $(r-1)$'s of $(6652312)_7$. (___) 2

(ii) What is binary equivalent of $(0.125)_{10}$ ? (___) 2

(iii) Find the $(111111101)_2 = (\_\_\_)_{10}$ 2

(iv) $(11011.110)_2 = (\_\_\_)_8$ 2

(v) Find the r's complement of $(544663)_7$. (___) 2 (CO1)

*P. T. O.*

OR

(b) (i) Represent the decimal number 2545 in (I) BCD, (II) Excess-3 code. 3

(ii) Express the Boolean function F (A, B, C) = A + BC using sum of minterm. 3

(iii) Simplify the Boolean function using k-map : 4 (CO1)

$$f(a,b,c,d,e) = \sum (0,1,2,3,5,6,10) + \sum_{d} (8,12)$$

2. (a) (i) The Hamming code 1111110 is received as even parity. Correct error if any. 3

(ii) Given $\sqrt{(222)_r} = (13)_r$, find the value of radix $r$. 3

(iii) Perform the following arithmetic operation using 1's complement : 4 (CO3)

(I) Add $(11)_{10}$ and $(12)_{10}$

(II) Add $(-39)_{10}$ and $(49)_{10}$

OR

(b) (i) Design a 3-bit combinational circuit which produces logic 1 output when more than input is greater than 011. 5

(ii) With the use of K-map, find the simplest SOP form of the function F = *f.g.*, where $f(a, b, c, d) = abc' + ac'd'$ and $g(a, b, c, d) = (a + b + c' + d)(b' + c' + d)$. 5 (CO1)

3. (a) (i) Given the two numbers X = 84 and Y = 67, perform the subtraction : 5

(I) X – Y

(II) Y –X

using 2's complements.

(ii) Simplify the Boolean function an implement using NOR gate only :

5 (CO1)

$$f(a, b, c, d) = \sum(1,3,10,14,15) + \sum_{d}(0,2)$$

*P. T. O.*

OR

(b) (i) Write the Boolean equation for function T1 and draw the logic diagram of the circuit containing minimum gates whose outputs are defined by the following truth table : 5

| A | B | C | T1 |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

(ii) $Y = \Sigma\, m\ (3, 5, 7, 8, 10, 11, 13)$ minimize the expression using Quine Mc-Cluskey method. 5 (CO1)

4. (a) Design four-bit magnitude comparator and draw its logic gate implementation.

10 Marks (CO2)

OR

(b) Simplify the following functions using Boolean algebra : 10 Marks (CO2)

(i) $F = B \cdot (A + B)$

(ii) $F = \overline{A} + \overline{B} + A.B$

(iii) $F = [AB'(C + BD) + A'B']C$

5. (a) Simplify the following function using SOP and POS forms : 10 Marks (CO3)

$F(A, B, C, D, E) = \Sigma m (0, 5, 6, 8, 9, 10, 11, 16, 20, 24, 25, 26, 27)$

OR

(b) Implement the following Boolean function using 4 × 1 multiplexer and external logic gates : 10 Marks (CO3)

$F(A, B, C, D) = \Sigma (1, 3, 4, 11, 12, 13, 14, 15)$

$F(A, B, C, D) = \Sigma (1, 2, 5, 7, 8, 11, 12, 13, 15)$