

**B.E. COMPUTER SCIENCE AND ENGINEERING SECOND YEAR FIRST SEMESTER EXAM 2024****Subject: Digital Logic and Circuits****Time: Three hours****Full marks:100**

**Answer the questions Group wise**  
**Answer all parts of the same questions contiguously**

**Group1 (CO1): Answer the question (15)**

1. a. Convert  $(1011010.101)_2$  to decimal, octal and hexadecimal. 3
- b. Represent the decimal number 564 (i) in BCD, (ii) in excess-3 code. 3
- c. Determine the even parity bits generated for the messages consisting of binary equivalents of 349 and 464. 3
- d. Perform binary addition of the number  $(250.5)_{10}$  with  $(403.5)_8$  3
- e. Perform subtraction with the following binary numbers using 1's complement and 2's complement:  $10110 - 11100$  3

**Group2(CO2): Answer any two questions (20)**

2. Let,  $f(A, B, C, D) = \sum(5, 6, 13)$  and  $f_1(A, B, C, D) = \sum(0, 1, 2, 3, 5, 6, 8, 9, 10, 11, 13)$  5+
  - i) Find  $f_2$  such that  $f = f_1 \cdot \overline{f_2}$  (Show in K-map). 3+
  - ii) Is  $f_2$  unique? If not, indicate the total number of possibilities. 2
  - iii) Give the minimal value of  $f_2$ .
3. Simplify the following function using Quine Mccluskey Procedure 10
 
$$F(A, B, C, D) = \sum(0, 2, 3, 5, 8, 10, 11, 13)$$
4. a. Find out the prime implicants, essential prime implicants, and minimal expression of the following function 8
 
$$F(W, X, Y, Z) = \sum m(4, 5, 7, 8, 9, 10, 11, 13, 14)$$
- b. What is Shanons Expansion theorem? 2

**Group 3 (CO3): Answer Any 2 questions (40 marks)**

5. a. Design a sequence detector to detect a sequence 1 1 0 1. Assume overlapping sequence and use D flip-flops to implement the sequence detector. 10
- b. Design a circuit using appropriate combinational blocks to compute the maximum of two 4-bit numbers A and B 10

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|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 6 | a. | What are the differences between a Moore machine and a Mealy machine?                                                                                                                                                                                                                                                                                        | 4  |
|   | b. | Design a 7 bit comparator using one 7485 Chip and any extra gate if necessary.                                                                                                                                                                                                                                                                               | 6  |
|   | c. | What is race around condition and How do you address it? Explain with appropriate diagram.                                                                                                                                                                                                                                                                   | 5  |
|   | d. | Design a 2 level NAND-NAND circuit for the function<br>$F = \sum m(1,3,9,11,13,15)$                                                                                                                                                                                                                                                                          | 5  |
| 7 | a. | Design a four input priority encoder such that when two inputs $I_i$ and $I_j$ are high simultaneously, and $I_i$ has the priority over $I_j$ , when $i > j$ . The encoder should produces the following 2-bit code for the four input $I_0, I_1, I_2$ , and $I_3$ : $I_0 \rightarrow 00, I_1 \rightarrow 01, I_2 \rightarrow 10$ , and $I_3 \rightarrow 11$ | 8  |
|   | b. | Draw the circuit diagram of Mod 5 Asynchronous (ripple) Down counter with the corresponding timing diagram.                                                                                                                                                                                                                                                  | 12 |

**Group 4 (CO4):** Answer any one question (15 marks)

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|----|----|--------------------------------------------------------------------------------------------------------------|---------|
| 8. | a. | Draw the circuit diagram of NAND gate using TTL Logic circuits and discuss its advantages and disadvantages. | 10      |
|    | b. | What is Noise margin? Describe the utility of the Fan in and Fan Out.                                        | 2+<br>3 |
| 9. | a. | What are the advantages of CMOS logic family over other logic families?                                      | 5       |
|    | b. | How does 555 timer act as an Astable Multivibrator, explain briefly with the diagram of 555 timer.           | 10      |

**Group 5 (CO5):** Answer any one question. (10 marks)

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|-----|----|---------------------------------------------------------------------------------------------|----|
| 10. | a. | Draw the circuit of Pseudo Random number generator using Registers and explain the details. | 6  |
|     | b. | Draw the block diagram of the memory having six 8 bit registers and 4 read ports            | 4  |
| 11. | a. | Draw a memory cell of RAM using multiple Emitter transistor Logic                           | 10 |