Roll No: | | | | | | | | | | | | | |

# BTECH
## (SEM III) THEORY EXAMINATION 2023-24
## DIGITAL ELECTRONICS

**TIME: 3HRS** **M.MARKS: 70**

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

**1. Attempt all questions in brief.** 2 x 7 = 14

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | What is the difference between binary, decimal, and hexadecimal number systems? | 2 | 1 |
| b. | What is a don't-care condition in Karnaugh maps? | 2 | 1 |
| c. | Explain the function of a magnitude comparator. | 2 | 2 |
| d. | Differentiate between synchronous and asynchronous counters. | 2 | 3 |
| e. | Explain the concept of a ring counter. | 2 | 3 |
| f. | What are the advantages of synchronous counters over asynchronous counters? | 2 | 4 |
| g. | Differentiate between RAM and ROM. | 2 | 5 |

## SECTION B

**2. Attempt any three of the following:** 7 x 3 = 21

| | | | |
|---|---|---|---|
| a. | Explain the SOP and POS forms in Boolean algebra. How are they derived? | 7 | 1 |
| b. | Describe the operation of half and full adders. Provide truth tables and circuit diagrams. | 7 | 2 |
| c. | Define storage elements and discuss the characteristics of latches and flip-flops. | 7 | 3 |
| d. | Explain the concept of hazards in digital circuits and methods to eliminate them. | 7 | 4 |
| e. | Compare and contrast different digital logic families such as DTL, DCTL, TTL, ECL, and CMOS in terms of their characteristics. | 7 | 5 |

## SECTION C

**3. Attempt any one part of the following:** 7 x 1 = 7

| | | | |
|---|---|---|---|
| a. | Minimize the Boolean function F(A, B, C, D) = Σ(0, 1, 2, 4, 6, 7, 9, 12, 14) using the Karnaugh map method. | 7 | 1 |
| b. | Implement the Boolean function F = AB + AC + BC using only NAND gates. | 7 | 1 |

**4. Attempt any one part of the following:** 7 x 1 = 7

| | | | |
|---|---|---|---|
| a. | Discuss the operation of BCD adders and their significance. | 7 | 2 |
| b. | Implement a 4-to-1 multiplexer using basic logic gates. | 7 | 2 |

**5. Attempt any one part of the following:** 7 x 1 = 7

| | | | |
|---|---|---|---|
| a. | Explain the concept of ripple counters and synchronous counters. | 7 | 3 |
| b. | Convert a JK flip-flop to a T flip-flop and demonstrate its operation with characteristic equations. | 7 | 3 |

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**6. Attempt any one part of the following:** **7 x 1 = 7**

| | | | |
|---|---|---|---|
| a. | Describe the process of state reduction and assignments in sequential circuit design. | 7 | 4 |
| b. | Discuss the concept of race-free state assignment and how it is achieved. | 7 | 4 |

**7. Attempt any one part of the following:** **7 x 1 = 7**

| | | | |
|---|---|---|---|
| a. | Describe the working principles of PLA and PAL and their applications. | 7 | 5 |
| b. | Explain the concepts of fan-out, fan-in, and noise margin in digital circuits. | 7 | 5 |