PAPER ID-311808

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

**MTECH**
**(SEM I) THEORY EXAMINATION 2023-24**
**FOUNDATION OF COMPUTER SCIENCE**

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

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

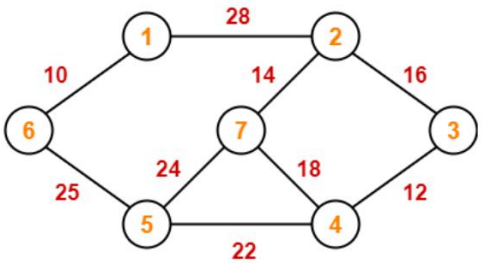
## SECTION A

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

| | |
|---|---|
| a. | Compare and contrast the operations of enqueue and dequeue in a queue data structure. |
| b. | Explain the concept of a doubly linked list. |
| c. | Define the term PDA. |
| d. | Explain the concept of Distributed Databases. |
| e. | Define Paging. |
| f. | What do you mean by DDL and DML? |
| g. | What is Critical Section? |

## SECTION B

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

| | |
|---|---|
| a. | Explain the concept of a binary search tree (BST). How does a BST differ from a regular binary tree? |
| b. | Consider the set of 6 processes whose arrival time and burst time are given below-<br>Process Id / Arrival time / Burst time<br>P1 / 0 / 7<br>P2 / 1 / 5<br>P3 / 2 / 3<br>P4 / 3 / 1<br>P5 / 4 / 2<br>P6 / 5 / 1<br>If the CPU scheduling policy is shortest remaining time first, calculate the average waiting time and average turn around time. |
| c. | Explain the closure properties of regular languages. |
| d. | Explain the concept of deadlock. Also Discuss the concepts of deadlock detection and avoidance in the context of database management systems (DBMS). |
| e. | Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm-<br>  |

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## SECTION C

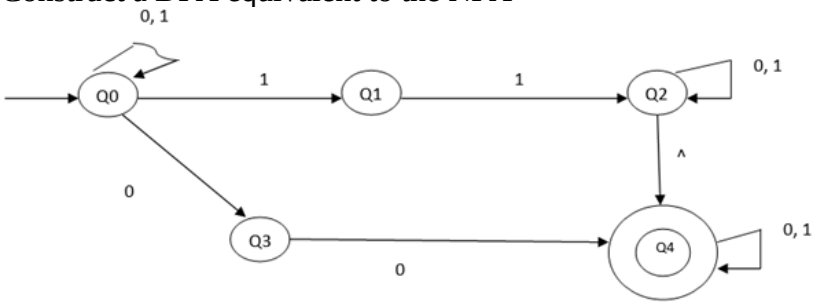
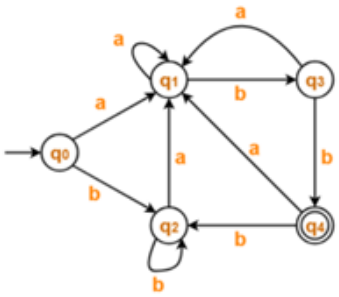
**3. Attempt any *one* part of the following: 7 x 1 = 7**

| | |
|---|---|
| (a) | Discuss step by step procedure for sorting the following elements using MERGE SORT<br>30,12,38,8,5,15,1,40,42. |
| (b) | Explain the concept of depth-first search (DFS) and breadth-first search (BFS) algorithms. Provide pseudocode for each algorithm and discuss their applications in solving different problems. |

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

| | |
|---|---|
| (a) | Explain the concept of virtual Memory. Also discuss how it is implemented? |
| (b) | Explain the producer-consumer problem in concurrent programming. What are the roles of producers and consumers? |

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

| | |
|---|---|
| (a) | Construct a DFA equivalent to the NFA<br>  |
| (b) | Construct a minimum state automata equivalent to a DFA<br>  |

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

| | |
|---|---|
| (a) | Define Serializability? Explain conflict and view serializability. |
| (b) | Explain Time Stamp Based Protocol with the help of an example. |

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

| | |
|---|---|
| (a) | Explain the concept of log-based recovery in database systems. How does it ensure data consistency and recoverability? |
| (b) | Explain the concept of normalization in database design. Why is it important, and what are the different normal forms? |