Paper id: 252518

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

MCA

(SEM II) THEORY EXAMINATION 2024-25

DATA STRUCTURES & ANALYSIS OF ALGORITHMS

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

Note: Attempt all Sections. In case of any missing data; choose suitably.

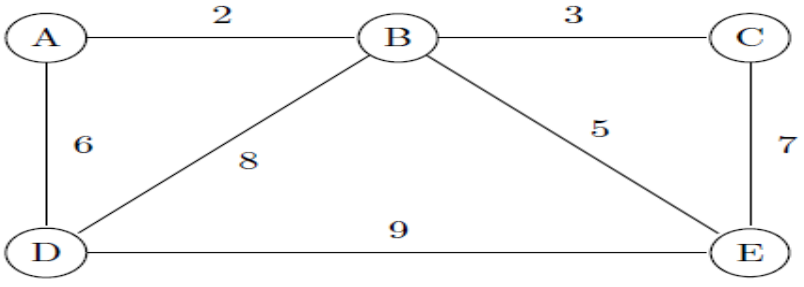
SECTION A

1. Attempt *all* questions in brief. **02 x 7 = 14**

Q no.	Question	CO	Level
a.	Define abstract data type (ADT).	1	K1
b.	Mention one key difference between an algorithm and a program.	1	K1
c.	What is tail recursion?	2	K1
d.	What is the worst-case time complexity of sequential search?	2	K1
e.	What is the basic idea behind counting sort?	3	K1
f.	Define complete binary tree. Give example.	4	K1
g.	What is the basic idea behind divide and conquer strategy?	5	K1

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 21**

Q no.	Question	CO	Level
a.	Define data structure. Describe about its need and types.	1	K2
b.	What is a Stack? Describe the array and linked list implementation of a stack in C. Compare both in terms of memory usage and flexibility.	2	K3
c.	Explain the working of Insertion Sort with an example. What is its time complexity in the best, average, and worst cases?	3	K3
d.	Draw a binary tree with following traversal : Inorder : D B H E A I F J C G Preorder : A B D E H C F I J G	4	K3
e.	Define spanning tree. Find the minimal spanning tree for the following graph using Prim's algorithm. 	5	K3

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SECTION C

3. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Define array. Explain Row Major Order and Column Major Order representations of a 2-D array with suitable examples.	1	K2
b.	Explain the concept of asymptotic notations. Compare and contrast Big O, Theta (Θ), and Omega (Ω) notations with appropriate examples for each.	1	K3

4. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain circular queue. What is the condition if circular queue is full?	2	K2
b.	What is hashing? How is it used in search operations? Explain the importance of a good hash function.	2	K3

5. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain Depth First Search (DFS) and Breadth First Search (BFS) algorithms with examples. How are they used to identify connected components in a graph?	3	K3
b.	Describe the Heap Sort algorithm. How is a max-heap constructed, and how does it help in sorting an array?	3	K3

6. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Define binary search tree. Create BST for the following data, show all steps: 20, 10, 25, 5, 15, 22, 30, 3, 14, 13	4	K3
b.	What is a B-Tree? Construct a B-tree on following sequence of inputs. Assume that the order of the B-tree is 3. 10, 20, 30, 40, 50, 60, 70, 80, 90	4	K3

7. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain the Divide and Conquer strategy with examples. How do Merge Sort and Quick Sort apply this technique, and how do they differ in terms of time complexity and space usage?	5	K3
b.	Explain Dijkstra's algorithm with suitable example.	5	K3