Total No. of Questions : 10]

SEAT No. :

PF12282

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S.E. (Computer Engineering/AI & DS/CS & Eng./AI/CSE)

PCC-201-COM/AID/CAI/CSE : DATA STRUCTURES

(2024 Pattern) (Semester - III)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Numeric figures in square brackets [ ] indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Consider two algorithms with their time complexities as $T(A) = 0 (\log_2 (n))$ and $T(B) = 0(n)$. Identify which algorithms is linear and non-linear. Discuss what do you understand by the performance of algorithm A and B. List Applications having similar performance to A and B. **[6]**

b) Define ADT and Explain Types of Data structures. Discuss the significance of Persistent and Ephemeral Data Structures. **[8]**

OR

Q2) a) Explain significance of Data Structure and its types. Compare Static and Dynamic Data Structures. **[6]**

b) What are Algorithm Strategies? Explain any two of them with suitable examples. **[8]**

Q3) a) Write short note on the following: **[6]**

i) Fast Transpose of 2D Matrix

ii) Storage representation of Various types of Array

iii) Binary Search

b) Compare Merge Sort and Quick Sort. Show steps to sort the array in ascending order using Merge Sort [25, 32, 15, 27, 54, 28, 30, 12]. List its time complexity. **[8]**

OR

Q4) a) Write short note on the following: **[6]**

i) Sparse Matrix

ii) Index Sequential Search

iii) Selection Sort

b) Explain insertion sort algorithm and sort the given list 7, 4, 10, 6, 3, 12, 1, 8, 2, 15. Also mention the time complexity of the algorithm. **[8]**

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Q5) a) List and Explain Applications of Linked List and compare array with linked list data structure **[6]**

b) Convert the given expressions into postfix representation and show stack operation status after every step in tabular form [A+(B-C)] * [(D-E)/(F-G+H)] **[8]**

OR

Q6) a) What is circular queue? Explain the advantages of circular queue over the linear queue and List the Applications of Circular queue. **[6]**

b) Enlist the real time applications of Stack data structure and evaluate the expression and show stack operation after every step in tabular form (5, 6, 2, + * 12, 4, / -) **[8]**

Q7) a) Define the Following terms with respect to Hashing **[6]**

i) Hash Function
ii) Collision
iii) Probe
iv) Synonyms
v) Overflow
vi) Load Density

b) Given the Inputs: {4371, 1323, 6173, 4199, 4344, 9679, 1989} Hash table size =10 and Hash function = key mod 10. show the results for the following: **[8]**

i) Open addressing hash table using Linear Probing.
ii) Open addressing hash table using Quadratic Probing.

OR

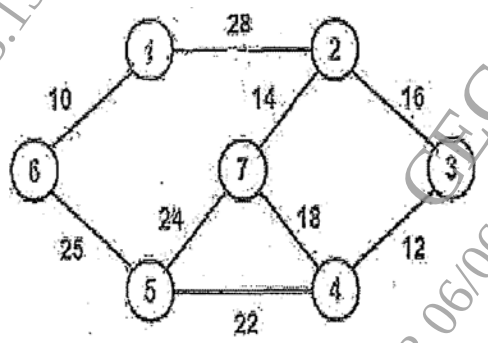
Q8) a) Write a short note with suitable example on Extensible and Rehashing. **[6]**

b) Represent the following key in memory using Linear probing with and without replacement. Use modulo 10 as your hashing function. **[8]**
24, 13, 16, 15, 19, 20, 22, 14, 17, 26

Q9) a) i) Write steps to convert general tree to binary tree with example. **[6]**

ii) Define Skewed and Complete Tree

b) Write Prim's algorithm and apply it on given graph to find Minimum Spanning Tree. Estimate the cost of MST **[8]**



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Q10)a) Draw and explain the following. **[6]**

i) Complete Graph

ii) Connected Graph

iii) Directed Graph

iv) Weighted Graph

v) Adjacency Matrix

vi) Adjacency List

b) Construct the graph represented by the following adjacency matrix: And find minimum spanning tree of this graph using Kruskal's Algorithm. Estimate the cost of MST. **[8]**

	1	2	3	4	5	6
1	0	6	1	5	0	0
2	6	0	5	0	3	0
3	1	5	0	5	6	4
4	5	0	5	0	0	2
5	0	3	6	0	0	6
6	0	0	4	2	6	0

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