

Roll No.

Total No. of Questions : 09

Total No. of Pages : 02

MCA (Sem.-1)
ADVANCED DATA STRUCTURES

Subject Code : PGCA-1952

M.Code : 79037

Date of Examination : 21-12-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

I) Write short notes on :

- a. What do you mean by amortized analysis?
- b. What is the worst case time complexity of merge sort?
- c. What are the characteristics of a good hash function?
- d. What is the worst case time complexity of counting sort algorithm?
- e. What are the four rotations of AVL tree?
- f. What is minimum spanning tree?
- g. What is maximum flow?
- h. What is string copy?
- i. How to concatenate two strings? Explain.
- j. What is the time complexity of Rabin Karp algorithm?

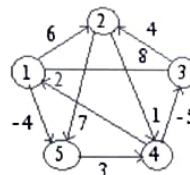
SECTION-B

2) Answer the following :

- a. Consider a hash table with 10 slots and the collisions are resolved by linear probing. The following keys are inserted in the order: 15, 2, 1, 5, 20, 31, 12, 21, 17 and 34. The hash function is $h(k) = k \bmod 10$. What is the resultant hash table?
- b. What is perfect hashing? Explain.
- a. Show the red-black trees that result after successively inserting the keys 41, 38, 31, 12, 19, 8 into an initially empty red-black tree.
- b. Explain disjoint-set data structures using an example.
- What is the difference between counting sort and bucket sort? Explain with the help of an example.
- What are the methods of amortized analysis? Explain in detail.

SECTION-C

- 6) How graphs are represented in memory? Explain in detail.
- 7) Apply all pairs shortest algorithm for constructing the shortest path for the following graph.



- 8) What is the good suffix rule in Boyer-Moore algorithm? Explain in detail with the help of an example.
- 9) What is prefix function in Knuth-Morris-Pratt algorithm? Explain in detail.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.

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SECTION-A

I. Write short notes on :

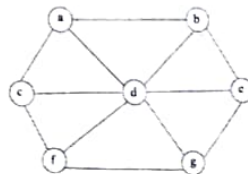
- a) Show that left and right rotations are inverses of each other. What can you say about double rotations?
- b) Which algorithm works with negative edges and Why?
- c) What is Pivot element? What is its importance?
- d) What is bucket sorting?
- e) What is string matching? Give example
- f) What is the difference between shortest path and minimal spanning tree?
- g) What are B-trees?
- h) What do you mean by an adjacency matrix? Give example.
- i) How is the growth rate of an algorithm determined?
- j) What is maximum flow problem?

SECTION-B

2. Insert the following keys in the height balanced trees, showing all the intermediate steps
342, 206, 444, 523, 607, 301, 142, 183, 102, 157 and 149
3. Write an algorithm for quick sort and apply the same on the following sequence
8 5 7 3 2 1 6 4 9
4. Compare chaining and open addressing techniques of collision resolving
5. What are Red-black trees? Construct a red black tree for the following list with proper rotations and coloring 7, 5, 6, 3, 9, 14, 15

SECTION-C

6. Explain the Rabin-Karp algorithm in detail
7. Write an algorithm to solve APSP problem
8. What do you mean by a spanning tree? Explain the Kruskal's algorithm used to find out the minimum spanning tree of a graph with the help of a suitable example
9. Draw five spanning trees from the following graph



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