REFNO057703

Roll No. 22 MCA 17 (M) 010

MASTER OF COMPUTER APPLICATION (TWO YEAR) SEMESTER I EXAMINATION 2022-23

CS - 108 : Data Structures and Algorithms

Time : Three hours **Max. Marks : 70**

(WRITE YOUR ROLL NO. AT THE TOP IMMEDIATELY ON THE RECEIPT OF THIS QUESTION PAPER)

Note: Question No. 1 is compulsory. Answer any four from the rest of the questions. Terms and abbreviations have their standard meanings.

1 (a) Write pseudo code for the best sorting algorithm if the number of swapping done is the only measure of efficiency. What is the time complexity and space complexity of your algorithm? Also, justify whether the algorithm is stable and in-place. (7)

(b) Explain hashing with an example. (3)

(c) A hash table of size 10 using open addressing with linear probing and the hash function is h(k)= (k)mod10, where k is the key value, initially, the table is empty. The following keys are inserted into the table in the given order: 44,87,43,68,30,20,67, 17, and 79. For each key, find the number of probes required to insert it. (4)

2 (a) What is backtracking? Explain the N-Queens Problem and the role of backtracking in its solution. (7)

(b) What do you mean by the space complexity and time complexity of an algorithm? (3)

(c) Write the recurrence formula for the following recursive function and find its running time complexity: (4)

```
function(int n){
    if (n<=1) return;
    for (int i =1; i<=3; i++)
        function(⌈n/3⌉));
}
```

3 (a) Define Array and Linked-list. Write their advantages and disadvantages. To implement a stack, which one you will prefer and why. (7)

(b) Define circular queue and its operations. Write pseudo code to implement circular queue using an array. (7)

4 (a) Explain a Binary Search Tree with an example. Discuss deletion operation in Binary Search Tree considering all possibilities. (7)

(b) What is graph? Explain the different ways of representing a graph (considering directed and undirected graphs) with suitable examples and compare them. (7)

5 (a) Explain Dijkstra's algorithm with an example (7)

(b) Explain Kruskal's algorithm with an example and compare it with Prim's algorithm. (7)

6 (a) What is asymptotic notation? Explain various asymptotic notations. (7)

(b) Write short notes on Dynamic Programming, Greedy Algorithm, Recursion, and Divide and Conquer (7)

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