

**MASTER OF COMPUTER APPLICATION (TWO YEAR) I SEMESTER
EXAMINATION 2023-24**

CS - 108 : Data Structures and Algorithm

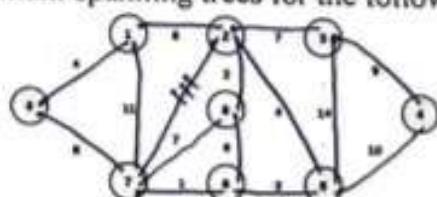
Time : Three hours

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) Define an algorithm and write the characteristics of an algorithm. (4)
 (b) What do you mean by the space complexity and time complexity of an algorithm? (3)
 (c) Explain hashing with an example. (3)
 (d) A hash table of size 10 using open addressing with linear probing and the hash function is $h(k) = (k) \bmod 10$, where k is the key value. Initially, the table is empty. The following keys are inserted into the table in the given order: 12, 18, 13, 2, 3, 23, 5 and 15. For each key, find the number of probes required to insert it and draw the resultant hash table. (4)
- 2 (a) Show with an example that the performance of Quick Sort is worst when elements are already sorted. (7)
 (b) Explain Depth First Search and Breadth First Search with suitable example. (7)
- 3 (a) Define Array and Linked-list. Write their advantages and disadvantages. To implement a circular queue, which one would you prefer and why? (7)
 (b) Write an algorithm to convert an infix expression into a postfix expression. (7)
 Elaborate the algorithm using an example. (7)
- 4 (a) Discuss deletion operation in Binary Search Tree considering all possibilities. (4)
 (b) Explain the usage of the stack in recursive algorithm implementation. (3)
 (c) What is a graph? Explain the different ways of representing a graph (considering directed and undirected graphs) with suitable examples and compare them. (7)
- 5 (a) Write an algorithm for binary search with a suitable example. Also explain when linear search will be preferred over binary search. (7)
 (b) Compare Kruskal's algorithm and Prim's algorithm. (4)
 (c) Draw all possible minimum spanning trees for the following graph: (3)



- 6 (a) What is asymptotic notation? Why do we need it? Explain various asymptotic notations. (7)
 (b) What is the 0-1 Knapsack Problem? Design a greedy approach for the 0-1 Knapsack Problem. (4)
 (c) Write your arguments on the statement 'Greedy approach always gives optimal solution for 0-1 Knapsack Problem' with proper justification. (3)