Roll No. ...2.44.19.MCA.017........

M.C.A. Semester I Examination 2024-25
Master of Computer Application
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) What is an analysis of the algorithm? Explain the Asymptotic Notations used while analyzing an algorithm. **(7)**

   (b) What is the meaning of collision in hashing? Explain collision resolution techniques in context of hashing. **(3)**

   (c) Using modulo-division and linear probing method, store the keys given below in an array of 13 elements. How many collisions occurred after the keys are inserted. **(4)**
   28, 7, 846, 786, 431, 870, 612, 675, 876, 546, 34, 12

2. (a) What is Stack? Explain Stack operations: push and pop. **(4)**
   Convert the following expression from infix to postfix: **(3)**
   (i) (A+B)*C-D^E
   (ii) A+B/(D+E)*F^G

   (b) Write an algorithm to evaluate the above postfix expression using stack. Explain the algorithm with an example. **(7)**

3. (a) What is a linked list? Explain the advantages of linked lists over arrays. **(4)**

   (b) Give the data structure and write algorithms to delete an element from the beginning, after the given node and before the given node. **(5)**

   (c) Explain binary search and linear search. Explain scenarios where one will be preferred over the other. **(5)**

4. (a) Explain the circular queue and its need. Write algorithm code for the operations in a circular queue. **(7)**

   (b) 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) Construct the Binary Search Tree and Binary Tree for the data 27,5,36,47,19,250,21,44,6. Perform preorder, inorder and postorder traversal for the constructed trees. **(7)**

   (b) What is the minimum cost spanning tree? Discuss Prim's algorithm with an example. **(4)**

   (c) Draw all possible minimum spanning trees for the following graph: **(3)**
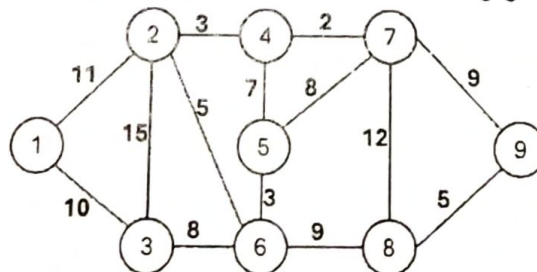
6. (a) What is the 0-1 Knapsack Problem? Design a Dynamic Programming approach for the 0-1 Knapsack Problem and explain it using one example. **(7)**

   (b) Write an algorithm for the quick sort. What is the time complexity of the algorithm? Also, justify whether the algorithm is stable and in-place. **(7)**

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