

Question Paper consists of FIVE units, each carrying 14 marks  
 Each unit has TWO questions; either of them should be answered  
 All parts of a question must be answered at one place

- 1.a) Draw the hash table for each insertion of the below elements which are inserted into an empty hash table with hash function  $f(x) = x \% 13$  and linear probing  
 112, 44, 52, 45, 37, 278, 89, 28, 61, 249  
 How will you handle overflow and collision detection in a hash table? Discuss methods. (7M)
- (OR)
- 1.c) Discuss how collision can be resolved using quadratic probing while inserting following keys in Hash table of size 10.  
 97, 40, 15, 22, 17, 89, 67  
 Explain how data is inserted and deleted from dictionaries while it is implemented using list data structure? (7M)
- 2.a) What are the different types of imbalances that occur while deleting a node from AVL trees?  
 Explain three possible cases for inserting a node in the 2-3 Trees? Construct 2-3 Tree with the following data 50, 20, 60, 90, 40, 100, 10 (7M)
- (OR)
- 2.c) What is an AVL tree? Explain the need for rotation of AVL trees. Construct an AVL Tree for the list 8, 9, 11, 6, 5, 7, 10 by using successive insertion.  
 Write Algorithm for 2-3 Tree deletion and discuss its analysis. (7M)
- 3.a) Construct the Binary Heap for the following data  
 11, 45, 23, 9, 4, 16, 8, 29, 1, 12, 21, 15.  
 Write a routine for delete min from Binary Heap  
 Explain about lazy binomial queue? (7M)
- (OR)
- 3.c) Explain reheap up, reheap down operations and show the heap implementation steps using arrays.  
 Explain about binomial queue along with its operations? (7M)
- 4.a) Explain about the kruskal's algorithm with example.  
 How to find shortest path between vertices using all pairs shortest path Floyd's algorithm. (7M)
- (OR)
- 4.c) Write Prim's algorithm? Discuss the analysis of prim's algorithm.  
 Explain Warshall's algorithm with example. (7M)
- 5.a) Discuss about Average Case Complexity of quick Sort?  
 Sort the following elements using radix sorting? Discuss its time complexity (7M)
- 20, 10, 5, 30, 40, 57, 3, 2, 4, 35, 25, 18, 22, 21.
- (OR)
- 5.c) Write heap sort algorithm and analyze the time complexity.  
 Perform heap sort with the following elements (7M)
- 84, 62, 50, 42, 30, 52, 70  
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