B.Tech. III-Sem UD Main/Back/Reback Exam DEC- 2023
Computer Science Engineering & IT
Subject code: Data Structure and Algorithms
Branch:CS & IT

Time: 3 Hours

Maximum Marks: 100

Instructions to candidates:

PART A :Short answer questions (up to 25 words) 10 x 2 marks = 20 marks. All ten questions are compulsory.

PART B : Analytical/Problem Solving questions (up to 100 words) 6 x 5 marks = 30 marks. Candidates have to answer six questions out of eight.

PART C : Descriptive/ Analytical/Problem solving questions 5 x 10 marks = 50 marks. Candidates have to answer five questions out of seven.

The following code(s) are required:

1. _____ 2. _____

PART (A)

Q.1) Explain the purpose of Big-O notation and compute the time complexity of the following loop:

for (int i = 0; i < n; i ++) cout << "Current Count = " << i << ".\n";

Q.2) Explain two operations in Doubly Linked List.

Q.3) Compute time complexity of the following recurrence relation

$$T(n) = T(n/3) + 1; \ T(1) = 1.$$

Q.4) A node of a B-Tree has *t* key values. How many children for this node possible?

Q.5) What is the time complexity of Merge Sort? Sort the following data using Merge Sort:

1072. 451, 567, 442, 34, 723, 98, 7.

Q.6) Explain the logic that checks whether a Queue is empty or not for a Queue implemented using Array.

Q.7) What is Skewed Binary Search Tree?

Q.8) Find the hash value of the following keys using function mod 8 and count the number of collisions:

18, 71, 42, 47, 61, 41, 90, 53.

Q.9) Using Separate Chaining Technique, Resolve Collision in the following Keys using function mod 9 and show the data structure:

14, 11, 38, 50, 41, 7, 92, 182, 4.

Q.10) Represent any graph containing 5 Vertices and 7 Edges in Adjacency List Format.

PART (B)

Q.1) Describe the procedure of adding two polynomials through example using Linked List.

Q.2) Explain pre-order traversal algorithm of a binary tree through example.

Q.3) Describe the structure of a threaded binary tree through example.

Q.4) A singly linked list was formed from a given set of data values by a programmer, for which a pointer to starting node was given. Write pseudo-code/ algorithmic steps to find whether loop exists in the list or not in the list using hashing technique.

Q.5) For searching a number in Sorted List, Describe Binary Search method through example. Show that it is faster than Linear Search.

Q6) Write algorithm to convert an adjacency matrix representation of a sparse matrix to array storage representation of sparse matrix.

write output after each pass of the Bubble Sort on the following data:

72, 98, 61, 12, 6, 103, 71, 97

Also write the number of exchanges required to complete in each pass and quality of last element after first pass.

Q8) Distinguish between tree structure of a Binary Search Tree (BST) and Heap Tree in terms of the value at the root through example.

PART (C)

Q:1) Write the algorithmic steps to obtain Max Heap data structure from a given set of numbers. Explain the construction of Heap using array structure from starting from address 0 for the following set of numbers:

531, 1025, 76, 347, 2371, 4351, 68, 457, 986, 756, 66, 78, 645, 555, 349

Also explain the procedure to obtain third largest value from the Heap without sorting and using only one comparison.

Q.2) What is negative cycle issue in single source shortest path algorithm? Explain through example.

Q.3) Write algorithm to obtain Minimum Cost Spanning tree for a given graph. Explain through example of a graph containing 7 vertices and compute cost of the tree.

Q.4) Obtain postfix notation of the expression $A-X/B*C+D*A$ using Shunting Yard algorithm mentioning each step.

Q.5) Explain stack operations. Write pseudo-code for parenthesis checking using Stack.

Q.6) Explain L-Rotation and RL-Rotation for balancing height in Binary Search Tree to obtain AVL Tree.

Q.7) Write short notes on

(a) Circular Queue

(b) Breadth First Search

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