Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject Code: 710208N **Date: 24-06-2014**

Subject Name: Advanced Data Structure

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What is difference between AVL tree and Red-black tree (In terms of height and complexity). Insert the following sequence in AVL tree and Red-black tree: **07**

12, 4, 19, 16, 21, 1, 4, 7, 9

What is the time complexity for following operations in Red-black tree in best and worst case?

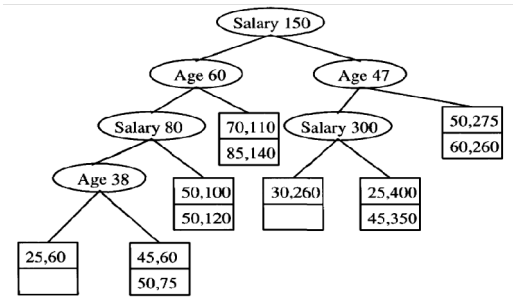
(i) insertion

(ii) deletion

(b) Define a k-d tree. List k-d tree operations. In the given below K-d tree, what new points would be directed to: **07**

a) The block with point (30, 260)?

b) The block with points (50,100) and (50,120)?



Q.2 **(a)** Perform multi-way external sort on given data. Assume that we have three tapes (k=3) and memory can hold three records. **07**

17, 3, 29, 56, 24, 18, 4, 9, 10, 6, 45, 36, 11, 43.

Mention how many passes are required to get sorted data?

(b) Insert the keys F, S, Q, K ,C, L, H, T, V, W, M, R, N, P, A, B, X, Y in order into an empty B-tree of order 5. **07**

OR

(b) Write an algorithm to delete a key from B-tree. Trace your algorithm on suitable example. **07**

Q.3 **(a)** What is the time complexity in skip list for following operations in best and worst case? Explain with suitable example. **07**

(i) insert new node

(ii) delete a node

(b) Compare heap tree, binary search tree and treap. What are the applications of treap? **07**

OR

Q.3 **(a)** What is the time complexity in AA tree for following operations in best and worst case? Explain with suitable example. **07**

(i) insertion

(ii) deletion

(b) Suppose we have a grid file with three lines (i.e., four stripes) in each dimension. However, the points (x, y) happen to have a special property. Tell the largest possible number of nonempty buckets if: **07**

a) The points are on a line; i.e., there are constants a and b such that y = ax + b for every point (x, y).

b) The points are related quadratically; i.e., there are constants a, b, and c such that $y = ax^2 + bx + c$ for every point (x, y).

Q.4 **(a)** What is time complexity for following operations on min heap in best and worst case? **07**

(i) create
(ii) insert
(iii) delete
(iv) search

(b) What is difference between leftist heaps and skew heaps? Explain with suitable example. What is merging time complexity in both? **07**

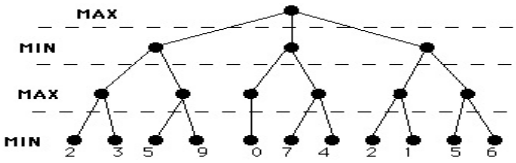
OR

Q.4 **(a)** Explain given terms. **07**

Hash table, Hash function, Hash value, Key value, Collision, Open addressing, Chaining

(b) Explain union by height and simple disjoint set find algorithm. **07**

Q.5 **(a)** A two player game tree is shown below. Apply minmax algorithm to find the suitable path from root to leaf. **07**



(b) Suppose Pattern P= a a b a c a a b and **07**

Text T = a a c c a a b c a a b a c c a b a c c

How many comparisons are required to find first occurrence and all occurrences of pattern P into text T using naïve method?

OR

Q.5 **(a)** Define R-tree and explain any two operations in detail with suitable example. **07**

(b) Using KMP algorithm find whether the pattern P = (0 0 1 0) is in the text T = (1 1 0 0 0 1 1 0 1 0 0 0 1 0 1 0) or not. **07**

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