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**316102**

**December, 2019**

**M.Tech. (CN/IT/CE/CSE) 1st Semester**

**Advanced Data Structures (MSC-18-102)**

**Time : 3 Hours]**

**[Max. Marks : 75**

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

**PART - A**

1. (a) What do you mean by Ordered Dictionaries? (1.5)
- (b) Derive the time complexity of Binary Search Trees. (1.5)
- (c) Discuss the significance of Hash Functions. (1.5)
- (d) What is Height-Balance property in AVL Tree? Discuss with example. (1.5)

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- (e) Is there any correspondence between (2, 4) Tree and Red-Black Tree? Justify with suitable example. (1.5)
- (f) What is the significance of using randomization in data structures? How randomization is used in Skip Lists? (1.5)
- (g) Derive the time complexity of Failure function in string matching? (1.5)
- (h) Why Compressed Tries are used for pattern matching? (1.5)
- (i) Discuss the role of Range Search. (1.5)
- (j) How k-d trees are used for Nearest Neighbor Search? (1.5)

## PART - B

2. (a) Draw the 11-item hash table resulting from hashing the keys 11, 23, 33, 55, 73, 85, 111, 49, 41, 26 and 35, using the hash function  $h(i) = (2i + 5) \bmod 11$  and assuming collisions are handled by linear probing. (10)
- (b) What is Rehashing? In which situations rehashing is done, explain with suitable example. (5)

3. (a) How removal is done in a Binary Search Tree?  
How different cases for removal in Binary Search Tree are handled? (8)

(b) How many Tri-node restructuring operations are needed to perform the zig-zig, zig-zag and zig updates in splay trees? (7)

4. Consider the following sequence of keys :

(5, 16, 22, 45, 2, 10, 18, 30, 50, 12, 1)

Consider the insertion of items with this set of keys, in the order given, into:

(a) An initially empty (2, 4) Tree T'.

(b) An initially empty red-black tree T". (15)

5. (a) Show that at most one tri-node restructure operation is needed to restore balance after any insertion in an AVL tree. (5)

(b) Write and discuss Boyer-Moore algorithm, with suitable example and derive its time complexity. (10)

6. (a) How Huffman Coding is used for text compression? Discuss with example. (7)

- (b) Show the Longest Common Subsequence table L for the two strings :

X = "skullandbones"

Y = "lullabybabies"

What is a Longest Common Subsequence between these strings? (8)

7. (a) Differentiate between One-Dimensional and Two-Dimensional Range Search. (7)
- (b) What is Priority Search Tree (PST)? How a PST is constructed? Write the algorithm for construction of a PST. (8)
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