

Hall Ticket Number:

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Code No. : 21913

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
M.Tech. (CSE: CBCS) I-Semester Main Examinations, January-2019

Advanced Data Structures

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Q.No.	Stem of the question	M	L	CO	PO
Part-A (10 × 2 = 20 Marks)					
1.	What are the characteristics of a good Hash Function? Give two examples.	2	2	1	1
2.	Given the hash table of size 11, use Division hash function to find the indices for the keys 11, 77, 58, 46, 37, 92, 21.	2	3	1	1,2
3.	Randomizing a data structure improves the performance of operations. Justify the statement with an example.	2	2	2	1
4.	Give reasons for bounding the height of a Skip list to $O(\log n)$.	2	2	2	1,2
5.	Draw the binary search tree (BST) after the insertion of the keys 50, 25, 29, 62, 22, 56, 16, 32 into an initially empty tree. Also, draw the final BST after deletion of the keys 29, 50 from the above constructed BST.	2	2	3	1,2
6.	Perform the operation deletion(7) on the following splay tree and draw the resultant splay tree.	2	3	3	1,2
7.	What is the longest prefix that is also the suffix of the string "cgtacgttcgtacg"?	2	3	4	1,2,3
8.	Write the looking glass heuristic and character jump heuristic. Implement them on the following text and pattern. T: course on ADS P: ADS	2	3	4	1,2,3
9.	Differentiate between 1-dimensional range tree and 2-dimensional range tree.	2	2	5	1,2
10.	What is the significance of a k-d tree? What is the worst case depth of a k-d tree defined on 'n' points in the plane?	2	2	5	1,2,3
Part-B (5 × 8 = 40 Marks)					
11. a)	Give reason for maintaining constant load factor for a Hash Table. Explain how Rehashing helps in improving the performance of hashing.	4	2	1	1,2
b)	Rishi is excited to participate in an "online coding" game conducted during a technical fest. This game will provide the participant to randomly choose 'n' balls and place them in the baskets numbered from 0 to n-1. The number of balls 'n' cannot be more than 10. Each ball is referred with a unique ball-id number which is between 1 to 100. If the balls are uniquely placed in different baskets he will win a gift worth of 500 rupees. Given the number of balls 'n' and the ball-id numbers of 'n' balls as input, your task is to help Rishi in designing a solution to win the game. Use hashing technique to propose a solution to the problem.	4	5	1	1,2,3

12. a)	Write an Algorithm for searching an element in a Skip list. Compare the worst case time complexity of a search function in a Skip list to a single Linked List with example.	4	2	2	1, 2
b)	How can we augment sorted linked lists to make the search faster? Draw a skip list resulting from performing the following sequence of operations removeElement(25), insertElement(44), removeElement(70), insertElement(75) into a Skip list Containing the keys 12, 25, 36, 50, 67, 70, 78, 96, 110.	4	5	2	1,2,3
13. a)	What are the properties of a Red black tree? Explain the double red and double black problem caused while inserting and deleting a node with the help of an example.	4	2	3	1, 2
b)	Construct an AVL tree with the keys 45,78, 35, 10, 22, 58, 96, 112, 89, 34, 66, 12. Also specify the necessary rotations performed.	4	3	3	1, 2
14. a)	Explain Huffman coding algorithm. Draw the frequency array and Huffman tree for the following string: "dogs do not spot hot pots or cats"	4	2	4	1,2,3
b)	Compute the failure function and show the result of implementing KMP algorithm in finding the pattern P in the text T T: a a b a a c a c a c c b a b a b a b a c a a b b a c P: b a b a b	4	3	4	1,2,3
15. a)	Write an algorithm for 1-dimensional range search and analyze its time complexity.	4	2	5	1, 2
b)	Draw a Quad tree for the following set of points assuming a 16X16 bounding box {(1,2), (4,10), (14,3), (6,6), (3,15), (2,2), (3,12), (9,4), (12,14)}	4	3	5	1,2,3
16. a)	Illustrate extendible hashing technique with the help of an example.	4	2	1	1, 2
b)	What is a deterministic skip list? Explain the procedure for deletion of a key from a skip list with example.	4	2	2	1, 2
17.	Answer any <i>two</i> of the following:				
a)	What are the properties of B-Tree? Explain the insertion operation on a B-tree of order 5.	4	2	3	1, 2
b)	Draw the compact representation of suffix trie for the string "minimize minime"	4	3	4	1,2,3
c)	Design an algorithm to construct a priority search tree.	4	2	5	1, 2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	60
2	Knowledge on application and analysis (Level-3 & 4)	30
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	10