BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION MO/2022)

CLASS: M.Tech **SEMESTER : I**
BRANCH: CS **SESSION : MO/2022**

SUBJECT: CS502 ADVANCED DATA STRUCTURES

TIME: 03 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Can a hash table with collisions handled using open addressing having a load factor greater than 1?	[2]	1	2
Q.1(b)	How are insertions and deletions handled in a chained hash table?	[3]	1	1
Q.1(c)	Given input {71, 23, 73, 99, 44, 79, 89} and a hash function h(x) = (x mod 5), show the result using a. hash table using linear probing b. hash table using quadratic probing	[5]	1	3
Q.2(a)	How can we determine the number of levels in a Skip List?	[2]	5	2
Q.2(b)	Skip Lists support randomization is a data structure and supports both searching and insertion in O(logN) expected time. Comment.	[3]	5	3
Q.2(c)	Create a skip list with the elements: 23, 45, 37, 12, 7, 89, 44, 56, 12, 67. Draw the skip list resulting from performing the following sequence of operations: delete(37), insert(10), insert(34), delete(56). Assume the coin flips for the first insertion yield two heads followed by tails, and those for the second insertion yield three heads followed by tails.	[5]	5	4
Q.3(a)	Show that the maximum number of nodes in a binary tree of height h is 2^h-1, h ≥ 1.	[2]	2	3
Q.3(b)	What are the merits of a 2-3 tree over an AVL tree?	[3]	2	1
Q.3(c)	Construct a red-black tree inserting the following keys into an empty tree, in the sequence given: 40, 16, 36, 54, 18, 7, 48, 5. Then perform delete(40) and delete(36).	[5]	2	5
Q.4(a)	Illustrate the heap creation process using the list (MAX Heap): (2, 5, 16, 4, 10, 23, 39, 18, 26, 15).	[2]	4	3
Q.4(b)	List the properties of a Binomial Heap.	[3]	4	1
Q.4(c)	Illustrate the processing of insertion and deletion in a Leftist Heap.	[5]	4	3
Q.5(a)	Compare the performance of the Brute Force pattern matching and the Boyer Moore pattern matching technique.	[2]	3	4
Q.5(b)	State the Boyer-Moore Algorithm	[3]	3	1
Q.5(c)	Illustrating the comparisons done by the brute-force pattern matching algorithm for the case when the text is "aaabaadaabaaa" and the pattern is "aabaaa". (Use figures)	[5]	3	6

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