NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA

THEORY EXAMINATION

Date: 19 / 12 / 2022	**Semester:** 5
Programme: B. Tech.	**Number of Pages:** 1
Course Name: Advanced Data Structures and Algorithms	**Time Allowed:** 3 hours
Course Code: CSPC31	**Maximum Marks:** 50

Q1.	a.	Construct an AVL tree for the days of a week on their lexicographical order. Initial order of the days is as they occur in a week from Sunday to Saturday.	4
	b.	Write down the algorithm for extracting the minimum node from a Fibonacci heap. Calculate the amortised cost of it.	4,2
Q2.	a.	What are splay trees? Discuss splay operation. Consider the following splay tree and perform a delete for the key 3 under the assumption that this is a bottom-up splay tree. Show each step.	4,3
	b.	Comment on the efficiency of search operations on a 2-3 tree.	3
Q3.	a.	Start with an empty red-black tree and insert the keys in the given order: 2, 1, 4, 5, 9, 3, 6, 7. Draw the figures depicting the tree immediately after each insertion and following the re-balancing. Further, delete the key 5 from the same.	4,3
	b.	2000 elements are inserted one at a time into an initially empty binary search tree and red-black tree. What is the maximum possible height of the resulting trees?	3
Q4.	a.	What is a binary trie? Construct a binary trie with the elements: 0001, 0011, 1000, 1001, 1100, 0010, 1101, 1010.	5
	b.	Explain about the KMP pattern matching algorithm. Illustrate the operationso f the KMP pattern matching algorithm for the following:	5

		T = "abacaabaccabacabaabb" P = "abacab" Further, explain the complexity of finding the prefix function.	
Q5.	a.	For the undirected graph `G = (V,E)`, prove that the clique problem is NP-Complete.	5
	b.	Give a randomised approximation algorithm to find the maximum 3-CNF satisfiability. Further, prove its approximation ratio.	5