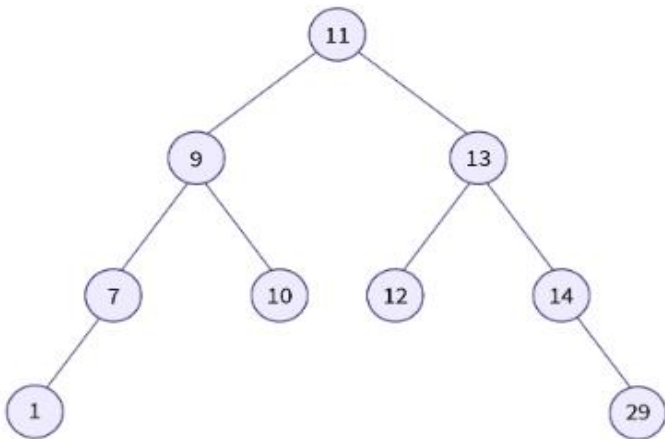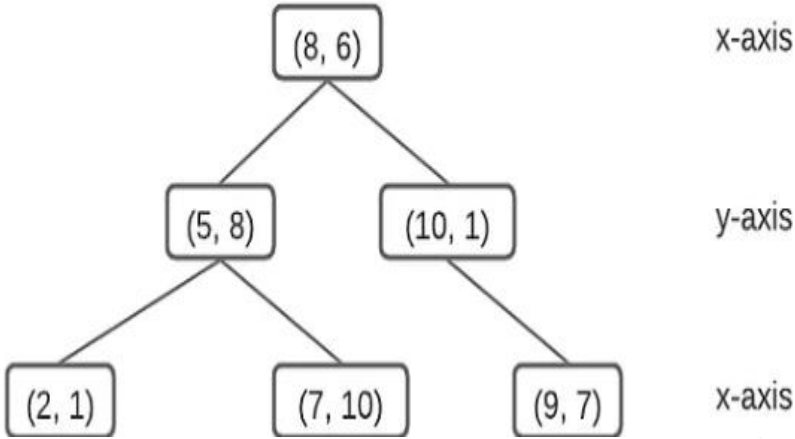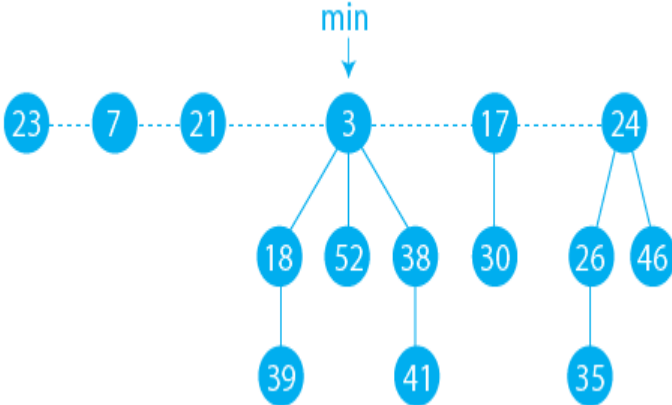# B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Computer Science and Engineering **Duration: 3 hrs.**

Course Code: 23CS6PEADS / 22CS6PEADS **Max Marks: 100**

Course: Advanced Data Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	CO	PO	Marks
1	a)		Demonstrate the representation of disjoint set using array and graph with an example.	CO3	PO1	**8**
	b)		Differentiate among the following self organizing list with an example. ➢ Move to Front Method ➢ Transpose Method ➢ Count Method	CO4	PO2	**6**
	c)		Justify how Skip list is better in searching an element in the list compared to linked list with an example.	CO4	PO2	**6**
			OR			
2	a)		Demonstrate the concept of union by rank and path compression technique with an example.	CO3	PO1	**6**
	b)		Construct Skip list for the following sequence of elements: ➢ 1 with level 3 ➢ 7 with level 0 ➢ 10 with level 1 ➢ 12 with level 0 ➢ 15 with level 2 ➢ 18 with level 0 ➢ 21 with level 1 ➢ 25 with level 0 ➢ 29 with level 3 After the skip list is constructed, perform the following operations. Show steps clearly. **1)** Search 21	CO3	PO1	**8**

				CO4	PO2	
			2) Delete 15 **3)** Insert 35			
		c)	Justify how XOR linked list is better with respect to memory. Describe how forward traversal and backward traversal takes place with an example. Show the steps for address calculations appropriately.	CO4	PO2	**6**
			UNIT - II			
3		a)	Construct a B-tree of order 5 for the following sequence of characters. After creating the tree, perform Delete E and Delete F. Show the steps clearly. **C,N,G,A,H,E,K,Q,M,F,W,L,T,Z,D,P,R,X,Y,S**	CO3	PO1	**8**
		b)	Analyze the below Splay tree and identify what type of rotation needs to be taken to splay at 9. Also, show the updated tree contents after splay at 9. 	CO4	PO2	**6**
		c)	Differentiate between AVL tree and Red Black tree with an example.	CO4	PO2	**6**
			OR			
4		a)	Construct Red Black tree for the following set of numbers and show the tree content after inserting each element: **2, 1, 4, 5, 9, 3, 6, 7**	CO3	PO1	**8**
		b)	Scapegoat tree is a self balancing binary tree? Justify your answer with an example.	CO4	PO2	**6**
		c)	Demonstrate the various rotations used in Splay tree with an example for each.	CO3	PO1	**6**
			UNIT - III			
5		a)	Construct a Fenwick Tree for the following array. Also show how the sum from 0 to 6 is computed and searching happens in the tree. Clearly show how the parent is computed for each node and how the tree structure is formed. **{3,2,-1,6,5,4,-3,3,7,2,3}**	CO3	PO1	**10**

		b)	Analyze the below given K Dimensional tree and show the tree after inserting the following set of points where k=2: **{ (1,7), (3,5), (2,9), (6,2) }**	*CO4*	*PO2*	**6**

		c)	Justify how Suffix tree is beneficial with respect to time and space in storing and searching for a pattern.	*CO4*	*PO2*	**4**
			OR			
6	a)		Create a Trie data structure for the following strings: **"their", "there", "this", "that", "does", "did".** Also, demonstrate how it searches for the strings: **"that", "they"**	*CO3*	*PO1*	**8**
	b)		Analyze the time complexity of Trie data structure to create, delete, search for a string.	*CO4*	*PO2*	**6**
	c)		Justify how Segment tree is beneficial in finding the sum value of a given range within an array compared to Bruteforce method with an example.	*CO4*	*PO2*	**6**
			UNIT - IV			
7	a)		Apply Extract Minimum operation on the following Fibonacci Heap. Show all the steps clearly.	*CO3*	*PO1*	**8**

	b)		List the properties of Binomial Tree and Binomial Heap with example.	*CO3*	*PO1*	**8**
	c)		Demonstrate the merge operation in pairing heap with an example.	*CO3*	*PO1*	**4**

			OR			
	8	a)	Construct a Binomial Heap for the following set of elements and demonstrate how minimum node is extracted with all the steps clearly. **{ 5,-1,3,5,7,8,9 }**	*CO3*	*PO1*	**8**
		b)	Write an algorithm for decrease a key operation on Fibonacci heap.	*CO3*	*PO1*	**6**
		c)	List the properties of Fibonacci heap with example.	*CO3*	*PO1*	**6**
			UNIT - V			
	9	a)	Describe the following two properties of Binary Heaps with an example: ➤ Structure Property ➤ Heap Order Property	*CO3*	*PO1*	**6**
		b)	Differentiate between d-heaps, Leftlist heap with an example.	*CO4*	*PO2*	**6**
		c)	Describe Perfect Hashing and Universal Hashing along with advantages and disadvantages.	*CO3*	*PO1*	**8**
			OR			
	10	a)	Demonstrate the usage of Hopscotch hashing with an example.	*CO3*	*PO1*	**10**
		b)	Construct a Cuckoo Hash table for the following list of elements: **{20, 50, 53, 75, 100, 67, 105, 3, 36, 39}** **h1(key) = key%11 and h2(key) = (key/11)%11**	*CO3*	*PO1*	**10**

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