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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Information Science and Engineering **Duration: 3 hrs.**
Course Code: 23IS5PEADS **Max Marks: 100**
Course: Advanced Data Structures and Algorithms
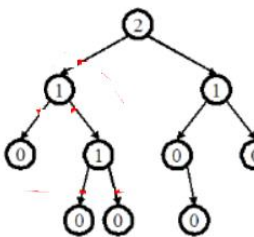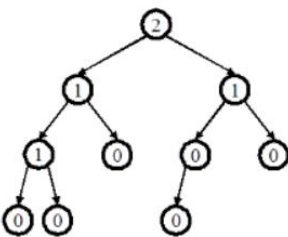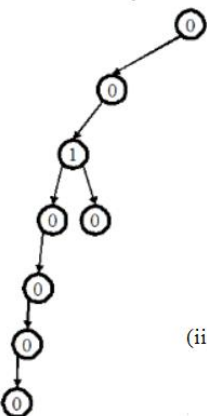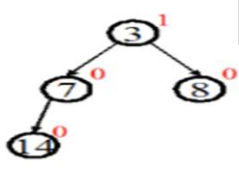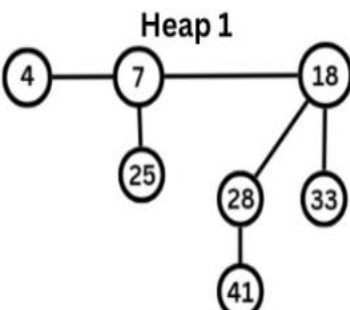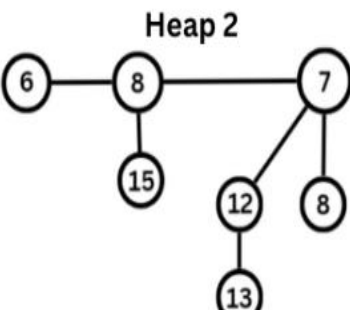
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

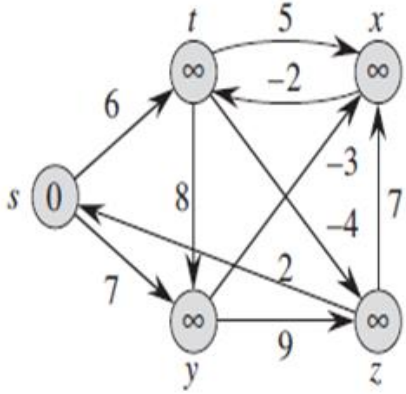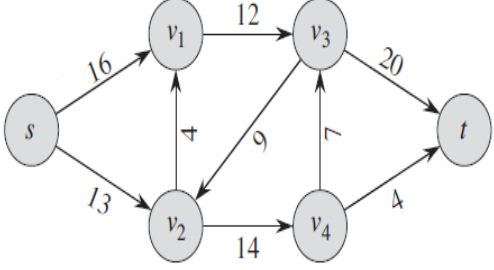|			UNIT - I	CO	PO	Marks
1	a)		List the properties of B-tree. With suitable illustrations, write the significance of B-trees usage in database management.	CO1	PO1	**10**
	b)		List the advantages and disadvantages of Skip List. Consider the following elements in a skip list L = {1, 5, 7, 12, 15, 19, 24}. Elements 5 and 24 are at level 2, while 15 is at level 1, and the remaining are at level 0. Construct the skip list to perform the following. i) Insert element 25 at level 1 ii) delete element 15 iii) Insert 9 at level 2	CO2	PO2	**10**
			OR			
2	a)		For a given interval tree, i) Identify the various attributes of a single node and write its essence of usage. ii) Write the various application of an interval tree iii) Given a composers list L ={A, B, C, D, E, F} with the birth and death years Y = {(1888,1971); (1874,1951); (1843, 1907); (1779,1828); (1756,1791); (1585,1672)} construct an interval tree.	CO2	PO2	**10**
	b)		Write a pseudocode for Segment trees i) Build a segment tree (SumQuery) ii) Perform a range query	CO1	PO2	**10**
			UNIT - II			
3	a)		Tries List = {"and", "ant", "dad", "do"} Insert "dog", "dot", "dock", "dumb", "dump". Write a pseudo code for the trie's node structure	CO2	PO1	**10**
	b)		Define Suffix trees. List the various applications. For the text T = "abaaba" construct a suffix tree.	CO2	PO2	**10**

			OR			
4	a)	i) Identify if the given trees are Leftist Heap. Justify your answers using Leftist Heap properties. (i) (ii) (iii) ii) For the given heaps, perform merge operation. H1 H2	*CO3*	*PO2*	**10**
	b)	List the properties of Binomial heaps. Perform merge operations for the following two heaps. Write an algorithm to find the min of the heap.	*CO3*	*PO2*	**10**
		UNIT - III			
5	a)	Given P = {5, 4, 6, 2,7}, perform Matrix-chain multiplication. Depict the DP table, the parenthesized tree and the expression.	*CO3*	*PO2*	**10**
	b)	Write the Longest common subsequence for the strings s1 = "BDCABA" and S2= "ABCBDAB". Write the algorithm to prepare the DP table and print the sequence.	*CO3*	*PO1*	**10**
		OR			

6	a)	Prepare an Optimal Binary Search Trees for the following details Keys K = {10, 13, 19, 20} Freq F = {5, 6, 4, 3} Depict the tree and the DP table.	CO3	PO2	**10**
	b)	Prepare Huffman codes for the given string H = "ACACBCDCCACAADD". Perform encoding and decoding for the string of length 5.	CO3	PO1	**10**
		UNIT - IV			
7	a)	Write Knuth-Morris-Pratt matcher and compute prefix algorithms.	CO4	PO2	**10**
	b)	Consider T ="aabacaababacaa" and pattern as P = "ababaca". Perform a String matching operation with finite automata.	CO4	PO2	**10**
		OR			
8	a)	Write the Rabin - Karp algorithm. Using a string, illustrate a spurious hit using modulo 13 as hash function.	CO4	PO1	**10**
	b)	i) Using suffixes and prefixes array, construct LPS arrays for the patterns p1 = "onions" and p2 = "abcdabd". ii) Perform KMP algorithm for the pattern p ="abcdabd" and search within the string s = " abcdabcdabde".	CO4	PO2	**10**
		UNIT - V			
9	a)	Write the Bellman - Ford Algorithm. Predict if the graph stabilizes, justify your answer. 	CO5	PO3	**10**
	b)	For the given graph, perform Ford-Fulkerson method. Predict the total flow at Sink T and the number of augmenting paths with suitable bottleneck capacities.	CO5	PO4	**10**

			OR			
10	a)	Compute Extended_GCD(33,20). Write the program to perform Extended Euclid's Algorithm.		*CO5*	*PO2*	**10**
	b)	For the given equations, predict the value of x, using The Chinese remainder theorem. $x \equiv 1 \pmod 5$ $x \equiv 1 \pmod 7$ $x \equiv 3 \pmod{11}$		*CO5*	*PO4*	**10**

******