U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

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

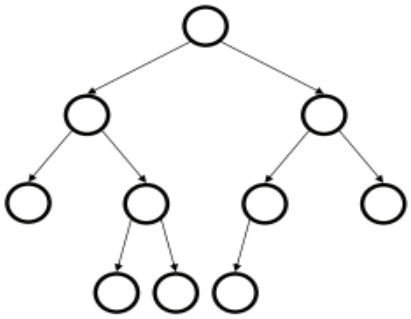
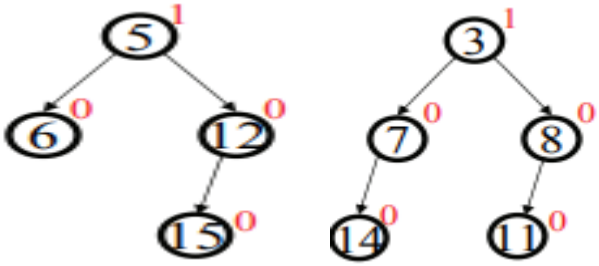
Course Code: 23IS5PEADS / 22IS5PEADS **Max Marks: 100**

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.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Describe the properties of B-Trees	CO2	PO1	5
	b)	Construct a B-Tree of order 5 for the elements 8,14,2,15,3,1,16,6,5,27,37,18,25,7,13,20,22,23,24	CO2	PO1	10
	c)	Skip List is called as a probabilistic data structure. Justify this statement with suitable illustrations.	CO5	PO2	5
		OR			
2	a)	Differentiate between Interval trees and segment trees	CO3	PO1	6
	b)	Construct a sum segment tree and min segment tree over the array [1, 3, -2, 8, -7, 5, 6, 8, 10, 11]	CO3	PO1	8
	c)	Write a pseudocode for Segment trees to perform a range query.	CO3	PO2	6
		UNIT - II			
3	a)	Draw a Binomial heap of order 4 to write the properties.	CO2	PO1	7
	b)	Construct the suffix tree for the string acgacgct	CO2	PO1	8
	c)	Construct a compressed trie for the words apple, apricot, banana, band, bandage, cat, carrot	CO2	PO2	5
		OR			
4	a)	i) Write the properties of Leftist heap and what are the operations performed on it. ii) write the rank of each node for the following tree	CO1	PO1	7

						
		b)	Merge the following leftist heaps. 	CO1	PO2	8
		c)	List the applications of Tries and Suffix Trees.	CO1	PO1	5
			UNIT - III			
	5	a)	State the principle of optimality in dynamic programming technique with the help of an example	CO5	PO1	5
		b)	Apply the dynamic programming technique to find the optimal order of multiplication for the matrix chain $A1_{5*4}$ $A2_{4*6}$ $A3_{6*2}$ $A4_{2*3}$ to get the minimum number of scalar multiplications.	CO3	PO2	12
		c)	Write the significance of an Optimal Binary Search Tree?	CO3	PO1	3
			OR			
	6	a)	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.	CO4	PO3	10
		c)	Construct Huffman code tree for the following the following frequency data a:2, b:3, c:5, d:7, e:9, f:13 and write the binary code of each character. Write the pseudocode to generate Huffman Codes.	CO4	PO3	10
			UNIT - IV			
	7	a)	Write the Rabin - Karp algorithm. Using a string, illustrate a spurious hit using modulo 21 as hash function.	CO3	PO1	10
		b)	Construct finite automaton to find a match for the following strings	CO3	PO1	10

			i) abab over the alphabet {a, b} ii) aabc over the alphabet {a,b,c}			
			OR			
	8	a)	i) Construct the LPS table for the string ACABAC using KMP algorithm. ii) Explain how is the above used in finding a match for text ACABACACDACABAC.	*CO1*	*PO1*	**10**
		b)	Write any 4 applications of pattern matching with explanation.	*CO1*	*PO1*	**4**
		c)	Working modulo q = 13, how many spurious hits does the Rabin-Karp matcher encounter in the text T = 2359023141526739921 when looking for the pattern P = 31415?	*CO1*	*PO1*	**6**
			UNIT - V			
	9	a)	Write the Pseudocode of Bellman-Ford algorithm.	*CO4*	*PO2*	**5**
		b)	• Edge 1: A -> B, weight = 2 • Edge 2: A -> C, weight = 4 • Edge 3: B -> C, weight = 1 • Edge 4: B -> D, weight = 7 • Edge 5: C -> D, weight = 3 • Edge 6: D -> A, weight = 5 Find the shortest paths from the source vertex A to all other vertices in the above graph.	*CO4*	*PO2*	**10**
		c)	Describe the maximum flow problem in a flow network	*CO4*	*PO1*	**5**
			OR			
	10	a)	Design a flow network with 4 nodes. Nodes: S, A, B, T (Source S and sink T) Edges and capacities: S-> A with capacity 10, S-> B with capacity 5, A-> T with capacity 10, B-> T with capacity 5. Define and demonstrate augmenting path, bottleneck capacity, and total flow at each iteration using the Ford-Fulkerson method.	*CO5*	*PO2*	**10**
		b)	A bus arrives at stops every 5, 7 and 9 minutes. If the buses arrive together at 10:00 AM, when will they next arrive together? Solve using Chinese Remainder Theorem.	*CO5*	*PO2*	**10**

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