SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT
An Autonomous Institution
MANGALURU

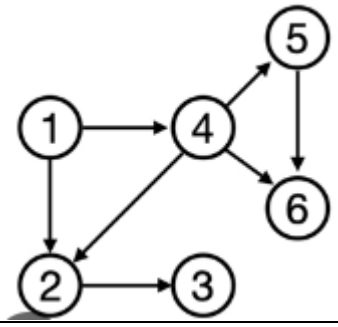
USN | | | | | | | | | | |

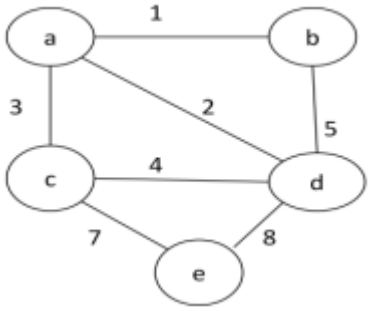
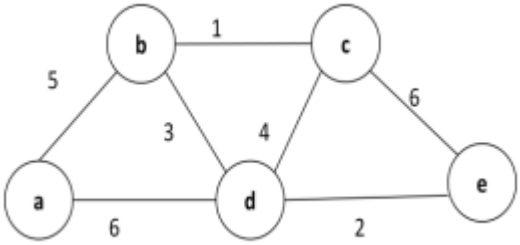
21CS44

Third Semester B.E. Degree Examination, Apr/May 2023
DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hrs.Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Q. No.		Questions	Marks	BL/CO
		Module I		
1	a.	Write an algorithm to search a pattern in a given text using brute force technique. Solve the following using the above algorithm. Text: BAABABABCCA Pattern: ABABC	07	CL3/CO1
	b.	Write an algorithm to find the maximum element in an array of n elements. Give the mathematical analysis of this non recursive algorithm.	07	CL3/CO1
	c.	Explain the algorithms design and analysis process with a neat diagram.	06	CL2/CO1
		OR		
2	a.	Write an algorithm for checking whether all elements in a given array are distinct or not. Derive its time complexity.	07	CL3/CO1
	b.	Write an algorithm to sort the elements using selection sort. Solve the following elements using the same: 23, 45, 12, 34, 22, 56, 21, 51.	07	CL3/CO1
	c.	Define algorithm. Discuss the criteria that an algorithm must satisfy?	06	CL2/CO1
		Module II		
3	a.	Illustrate the tracing of quick sort algorithm for the following set of numbers: 25, 10, 72, 18, 40, 11, 64, 58, 32, 9.	08	CL3/CO2
	b.	Apply and analyze source removal method and DFS to obtain topological sort for the given graph. 	08	CL3/CO2
	c.	Write a function to derive a binary search using recursive analysis.	04	CL2/CO2
		OR		
4	a.	Illustrate the tracing of merge sort algorithm for the following set of numbers: 35, 20, 22, 81, 45, 16, 74, 85, 42, 19.	08	CL3/CO2
	b.	Apply and analyze insertion sort algorithm for the given data 89, 45,	08	CL3/CO2

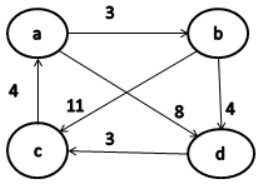
<table>
<tr><td></td><td></td><td>68,90,29,34, 17</td><td></td><td></td></tr>
<tr><td></td><td>c.</td><td>Explain the three major variations of decrease and conquer technique with example for each.</td><td>04</td><td>CL2/CO2</td></tr>
<tr><td colspan="5">Module III</td></tr>
<tr><td>5</td><td>a.</td><td>Solve the following instance of greedy knapsack problem where n=4, m=10, p = (40, 42, 25, 12) and w = (4, 7, 5, 3)</td><td>07</td><td>CL3/CO3</td></tr>
<tr><td></td><td>b.</td><td>Apply Prim's algorithm to find minimum cost spanning tree.
 
</td><td>07</td><td>CL3/CO3</td></tr>
<tr><td></td><td>c.</td><td>Discuss the problem statement for job sequencing with deadline? Let n=5, profits (10, 3, 33, 11, 40) and deadlines (3, 1, 1, 2, 2). Find the optimal sequence of execution of job solution using greedy algorithm.</td><td>06</td><td>CL2/CO3</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>6</td><td>a.</td><td>Construct heap for the list 1, 8, 6, 5, 3, 7, 4 using bottom up algorithm and successive key insertion method.</td><td>07</td><td>CL3/CO3</td></tr>
<tr><td></td><td>b.</td><td>Apply Kruskal's algorithm to find minimum spanning tree for the following and also define minimum cost spanning tree.
 
</td><td>07</td><td>CL3/CO3</td></tr>
<tr><td></td><td>c.</td><td>Discuss Huffman tree for the following data and obtain its Huffman code
<table>
<tr><td>Character
A B C D _</td><td>A</td><td>B</td><td>C</td><td>D</td><td>_</td></tr>
<tr><td>Probability</td><td>0.35</td><td>0.1</td><td>0.2</td><td>0.2</td><td>0.15</td></tr>
</table>
i)Encode the text DAD and ADD
ii)Decode the text whose encoding is 10011011011101</td><td>06</td><td>CL2/CO3</td></tr>
</table>

Module IV

7 a. Solve the optimal solution for the following instance of knapsack problem by applying the dynamic programming. (Knapsack Capacity = 6). — 08 — CL3/CO4

ITEM	1	2	3	4
WEIGHT	2	3	2	1
VALUE	20	15	18	12

b. Apply all pair shortest path for the following graph using Floyd's algorithm. — 08 — CL3/CO4



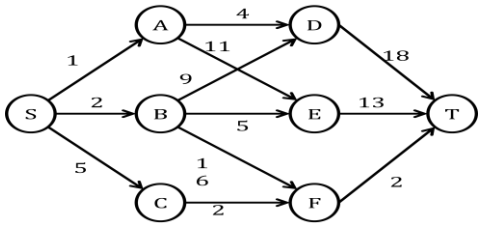
c. Write the psuedocode to find the Optimal Binary Search Tree using Dynamic Programming. — 04 — CL2/CO4

OR

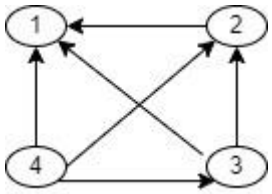
8 a. Solve the below instance of Travelling Sales Person using dynamic programming — 08 — CL3/CO4

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

b. Determine the minimum cost path from source (S) to sink(T) for the graph using forward approach. — 08 — CL3/CO4

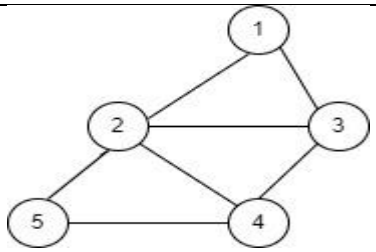


c. Trace the following graph using Warshalls algorithm to find transitive closure. — 04 — CL3/CO4



Module V

9 a. Apply backtracking based graph coloring algorithm for the graph given below with m=4. Give state space tree showing first 3 valid assignments. — 10 — CL3/CO5

				
	b.	Discuss the backtracking to solve the following instance of the subset-sum problem S= {8, 10, 11, 13, 16, 28} and d=30. Give all possible solutions.	10	CL2/CO5
		OR		
10	a.	Give the problem statement of n-queens problem. Solve 4-queens problem using state space tree.	10	CL3/CO5
	b.	Discuss the following: i i. NP-hard problem ii ii. NP-Complete problem	10	CL/CO5

Cognitive Levels of Bloom's Taxonomy

No.	CL1	CL2	CL3	CL4	CL5	CL6
Level	Remember	Understand	Apply	Analyze	Evaluate	Create

Course Outcomes

CO1	Solve the time complexity of recursive, non-recursive and brute force algorithm using asymptotic notations.	CL3
CO2	Solve the recurrence relation to obtain the performance of divide-and-conquer, decrease-and conquer approach.	CL3
CO3	Apply greedy technique, transform and conquer strategy to solve the problem for optimal solution.	CL3
CO4	Determine the time complexity for Dynamic-Programming paradigm and String-matching techniques.	CL3
CO5	Apply backtracking and branch-and-bound approach on combinatorial problems and categorize algorithms as P, NP, NP-complete and NP-hard classes.	CL3