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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Computer Science and Engineering

Semester End Examination; August - 2023

Analysis and Design of Algorithms

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Analyse the computational complexity of different algorithms.

CO2: Develop the solution for given problems using divide and conquer and decrease and conquer methods.

CO3: Develop an algorithm using Greedy method and transform and conquer methods.

CO4: Develop the solution for given problems using Dynamic programming approach.

CO5: Develop the solution for given problems using Backtracking and Branch-and-Bound technique.

Note: ***I) PART - A*** *is compulsory.* ***Two*** *marks for each question.*

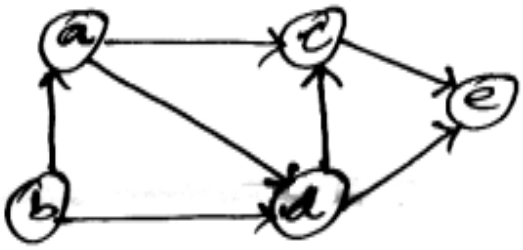
II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for a Maximum of* ***18 marks*** *from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Let A be the adjacency matrix of an undirected graph. Defining the following, explain what property of the matrix indicates that (i) The graph has an isolated vertex, i.e., a vertex with no edges incident to it.	2	L1	CO2	PO1,2,3,4
b.	List the advantages and disadvantages of divide and conquer techniques.	2	L2	CO2	PO1,2,3,4
c.	Define Balance factor with reference to AVL Trees.	2	L1	CO3	PO1,2,3,4
d.	Define; (i) Spanning Tree (ii) Minimum Spanning Tree	2	L1	CO3	PO1,2,3,4
e.	List any two problems that can be solved using backtracking method.	2	L1	CO5	PO1,2,3,4
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Explain the three different asymptotic notations with an example for each.	9	1	CO1	PO1,2,3,4
b.	Discuss the steps to analyze the efficiency of non-recursive algorithm and apply the same to find value of the largest element in a list of *n* numbers.	9	3	CO1	PO1,2,3,4
c.	Write Bubble sort algorithm and analyze its efficiency.	9	3	CO1	PO1,2,3,4

Contd... 2

UNIT - II **18**

3 a. Explain the steps to find the topological ordering using source removal method and apply the same to find the topological ordering of the graph given below.



9 3 CO2 PO1,2,3,4

b. Write a Merge sort algorithm and analyze its efficiency using Master's theorem. 9 3 CO2 PO1,2,3,4

c. Write Strassen's matrix multiplication algorithm and evaluate the asymptotic efficiency of this algorithm. 9 3 CO2 PO1,2,3,4

UNIT - III **18**

4 a. Explain why rotations are necessary in AVL trees? Explain the various types of rotations in AVL trees. 9 2 CO3 PO1,2,3,4

b. Write Horspool's algorithm for pattern matching. Apply Horspool's algorithm to search for the pattern **BARBER** in the text 9 3 CO3 PO1,2,3,4

J I M _ S A W _ M E _ I N _ A _ B A R B E R S H O P

c. Apply memory function method to the instance of Knapsack problem given below.

item	weight	value
1	2	$12
2	1	$10
3	3	$20
4	2	$15

capacity W = 5.

9 3 CO4 PO1,2,3,4

UNIT - IV **18**

5 a. Write Warshall's algorithm for finding the transitive closure of a given graph. Analyze its time efficiency. 9 3 CO4 PO1,2,3,4

Contd... 3

b. Write Huffman's algorithm to construct Huffman Tree. Consider the five-symbol alphabet {A, B, C, D, _} with the following occurrence frequencies in a text made up of these symbols:

9	3	CO4	PO1,2,3,4

symbol	A	B	C	D	_
frequency	0.35	0.1	0.2	0.2	0.15

Construct the Huffman tree for the given input.

c. What are Decision trees? Write an algorithm to find the minimum of three numbers and Write the Decision tree for the same.

9	2	CO5	PO1,2,3,4

UNIT - V **18**

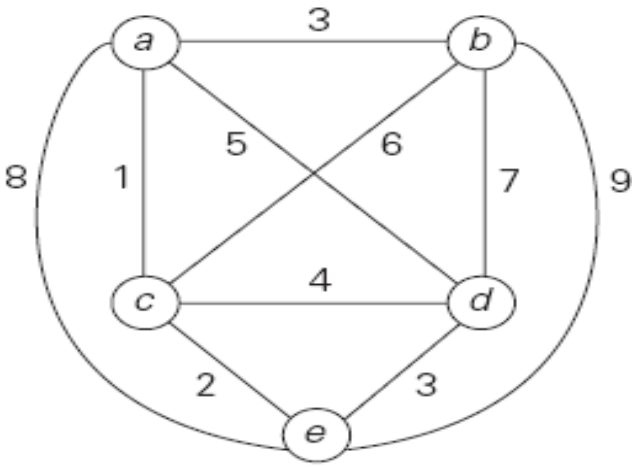
6 a. What is Backtracking? Apply the Backtracking to solve 4-Queens problem.

9	3	CO5	PO1,2,3,4

b. Apply backtracking algorithm to solve the instance of the sum-of-subset problem A = {3, 5, 6, 7} and d = 15.

9	3	CO5	PO1,2,3,4

c. Explain the Branch and Bound method. Apply the Branch and Bound algorithm to solve the Travelling sales Person for the graph given below.



9	3	CO5	PO1,2,3,4

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