



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; July / August - 2022

Analysis and Design of Algorithms

Time: 3 hrs

Max. Marks: 100

Course Outcome

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.

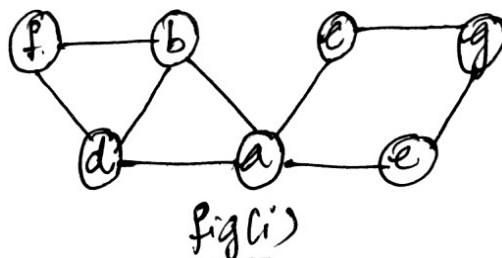
CO4: Develop the solution for given problems using Dynamic programming approach.

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

Note: i) **PART-A** is compulsory. One question from each unit for maximum of 2 marks.

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

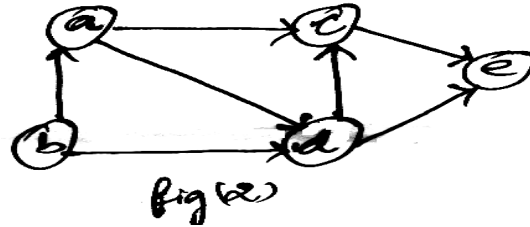
Q. No.	Questions	Marks	BLs	COs
I : PART - A		10		
I a.	Let A be the adjacency matrix of an undirected graph. Explain what property of the matrix indicates that	2	L2	CO1
	i) Graph is complete			
	ii) The graph has a loop i.e. an edge connecting a vertex itself			
b.	List the advantages and disadvantages of divide and conquer techniques.	2	L2	CO2
c.	Define a heap.	2	L1	CO3
d.	Mention the methods used to find the minimum spanning tree.	2	L2	CO4
e.	List any 2 problems that can be solved using backtracking method.	2	L2	CO5
II : PART - B		90		
UNIT - I		18		
1 a.	Explain the three different asymptotic notations with an example for each.	9	L2	CO1
b.	Discuss the steps to analyze the efficiency of recursive algorithm and apply the same to compute the factorial of a given numbers.	9	L2,4	CO1
c.	Write DFS algorithm and apply it to the graph in Fig. (i), to construct the corresponding DFS tree assuming 'a' as the starting vertex.	9	L2,4	CO1



UNIT - II

18

- 2 a. Write Quick sort algorithm and analyze its efficiency in Best case using Masters theorem. 9 L2,4 CO2
- b. Apply source removal method to find the topological ordering of the graph shown in Fig. (2). 9 L4 CO2



- c. Apply Strassen’s Matrix multiplication to multiply the following matrices. Discuss how this method is better than the direct matrix multiplication method. 9 L2,4 CO2

$$A = \begin{bmatrix} 1 & 2 \\ 5 & 6 \end{bmatrix} \times B \begin{bmatrix} 8 & 7 \\ 1 & 2 \end{bmatrix}$$

UNIT - III

18

- 3 a. Explain why rotations are necessary in AVL trees. Explain the various types of rotations in AVL trees. 9 L3 CO3
- b. Write Horspool algorithm for pattern matching. Analyze its time efficiency. 9 L2,4 CO3
- c. Apply memory function method to the instance of Knapsack problem given below.

Item	Weight	Value
1	2	3
2	3	4
3	4	5
4	5	6

Knapsack capacity $m = 5$.

UNIT - IV

18

- 4 a. Write Floyd’s algorithm for solving All pair shortest path problem and analyze its efficiency. 9 L2,4 CO4
- b. Construct a Huffman code for the following data:

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

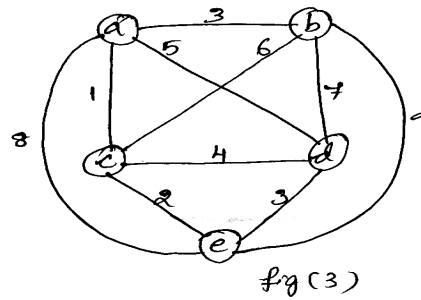
- i) Encode the text ABACABAD using generated code 9 L3 CO4
- ii) Decode the text whose encoding is 100010111001010
- c. List the various methods of establishing the lower bound and explain any one method. 9 L2 CO4

UNIT - V

18

- 5 a. Discuss NP-complete and NP-Hard problems with examples.
- b. What is Backtracking? Apply backtracking algorithm to solve the instance of the sum-of-subset problem $S = \{1, 3, 4, 5\}$ and $d = 11$.
- c. Explain the Branch and Bound method. Apply the Branch and Bound algorithm to solve the Travelling sales Person for the graph in Fig (3).

9 L6 CO5
9 L3 CO5



9 L3,4 CO5

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