U.S.N

# 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; June - 2017**
**Analysis and Design of Algorithm**

Time: 3 hrs                                                                    Max. Marks: 100

*Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

## UNIT - I

1 a. Define an algorithm. Explain the various stages of algorithm, design and analysis process with a flow chart. 10

   b. Define a graph. List different ways of representing a graph, and explain each with an example. 10

2 a. Explain the general plan for analyzing the efficiency of Non-Recursive algorithms. Write an algorithm to determine the value of largest element in an array and analyze its efficiency. 10

   b. Write bubble sort algorithm and analyze its efficiency. 10

## UNIT - II

3 a. Write quick sort algorithm. Apply it on the data set 5, 3, 1, 9, 8, 2, 4, 7 and also draw the tree of recursive calls made. 10

   b. Define Topological sorting. Apply the DFS based method to solve the topological sorting problems for the graph in fig. 3(b). 10



fig 3(b)
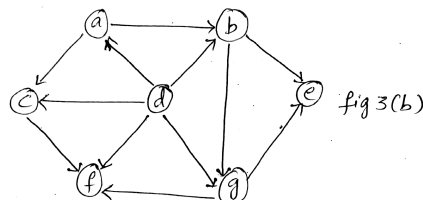
4 a. Write the presorting based algorithm for checking element uniqueness in an array and analyze its efficiency. 8

   b. Define an AVL Tree. Why rotations are necessary in an AVL tree? List and explain the various types of rotations in AVL tree. 12

## UNIT - III

5.a. (i) Write distribution counting algorithm for sorting a list of items.

   (ii) Assuming that the set of possible list values is {a, b, c, d}sort the following list in alphabetical order by distribution counting algorithm: b, c, d, c, b, a, a, b. 10

   b. Write Horspool's algorithm and apply the same for finding the pattern BAOBAB in the text BESS_KNEW_ ABOUT_ BAOBABS. 10

6. a What does Dynamic programming have in common with divide and conquer? Write an algorithm to find the Binomial co-efficient and apply the same to find C(6, 3). 10

   b. Define Transitive closure. Write the Warshall's algorithm to find the Transitive closure and apply it to the given adjacency matrix, 10

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$
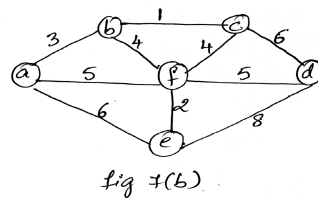
## UNIT - IV

7 a. Solve the following instance of Knapsack problem using memory functions.

| Item | Weights | profits |
|------|---------|---------|
| 1 | 2 | 20 |
| 2 | 1 | 10 |
| 3 | 3 | 20 |
| 4 | 2 | 15 |

Capacity W = 5.

10

b. Write Prim's algorithm for finding the Minimum spanning tree and find the Minimum spanning tree of the graph in fig. 7(b) using Prim's algorithm.



fig 7(b)

10

8 a. What is Huffman tree? Construct the 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 the code above

(ii) Decode the text whose encoding is 1000101110011010 in the above code.

10

b. What is a decision tree? Write the decision tree for 3 element Insertion sort and Find the average number of comparisons using the same.
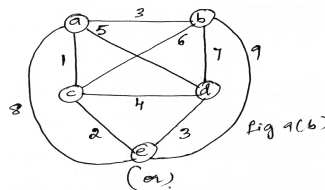
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## UNIT - V

9 a. What is backtracking Technique? Explain how 4-Queens problems can be solved by using Backtracking technique and also write the state-space tree for the same.

10

b. Explain the Branch and Bound method. Apply the Branch and bound algorithm to solve the travelling Salesperson problem for the graph in fig. 9(b) along with the state-space diagram.



fig 9(b)

(or)

10

10 a. List the two Approximation algorithms for the Travelling Sales person problem. Write any one approximation algorithm for the Travelling salesperson problem and explain with an example.

10

b. List the two types of computational models. Explain the important features of parallel computing. List and explain the categories of parallel models.

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