***U.S.N*** | | | | | | | | | | |

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

***(An Autonomous Institution affiliated to VTU, Belagavi)***

**Fourth Semester, Master of Computer Applications (MCA)**

**Semester End Examination; May/June - 2018**

**Design and Analysis of Algorithms**

*Time: 3 hrs* *Max. Marks: 100*

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

**UNIT - I**

1 a. Explain the typical sequence of steps in designing and analyzing an algorithm. 10

b. Explain the concept of asymptotic notations, indicating the commonly used notations. 6

c. Define space and time complexity of an algorithm. 4

2 a. Explain the important problem types in analysis and design of algorithm. 10

b. Suggest a general plan for analyzing the efficiency of non-recursive algorithms. Apply these steps to analyze the time efficiency of a definition based algorithm to compute the product (mxn) matrices. 10

**UNIT - II**

3 a. Suggest a Brute force string matching algorithm. Determine the number of character comparison that will be made by Brute force algorithm in searching for the pattern EXPERIENCE in the text LEARN_NEW_SKILLS_TO_EXPERTISE. What is the worst case performance? 10

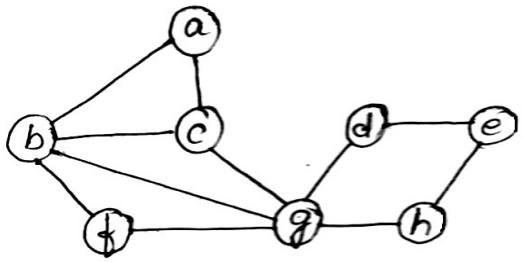
b. Write a selection sort algorithm. Demonstrate with an example. Show that the worst case efficiency is Quadratic. 10

4 a. Write Quick sort algorithm and apply the same to sort the list EXAMPLE in alphabetical order. Draw the tree of recursive calls made. 10

b. Explain about the applicability of divide and conquer on binary tree. Design an algorithm for finding the height of a binary tree. Analyse its time efficiency. 10

**UNIT - III**

5 a. Write an algorithm for Depth First Search traversal and apply that to the graph shown below:




10

b. Explain Johnson Trotter algorithm for generating permutations. Use the algorithm to generate all the permutations of the sequence 1, 2, 3, 4. 10

Contd…2

6 a. What are the advantages of presorting? Write an algorithm to check element uniqueness in an array and find the efficiency of the algorithm. 10

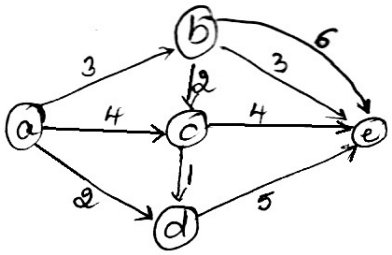
b. Write an algorithm to construct a heap from the element of a given array by the bottom-up-approach. What is its complexity? 10

**UNIT - IV**

7 a. Write an algorithm to sort a given list using comparison counting. Trace the algorithm for the following list 18, 35, 15, 50, 25. 10

b. Explain how the input enhancement technique can be applied to string matching? Give a pseudo-code for Horspool's algorithm for string matching. 10

8 a. Explain Floyd's algorithm to find distance between every pair of vertices and hence find the same in the following graph:

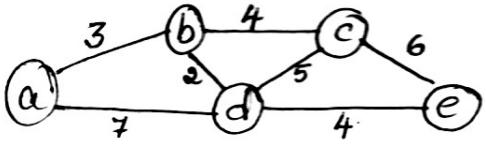



10

b. Suggest and explain an algorithm to solve the knapsack problem by the dynamic programming concept. 10

**UNIT - V**

9 a. Explain Dijkstra's algorithm to solve single source shortest path. Apply this algorithm for the following graph with starting vertex '*a*'

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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 |

10

Encode the text ABACABAD and decode 101010111001010

10 a. Explain branch and bound technique and solve the following assignment problem:

$$\begin{array}{c} \\ A \\ B \\ C \\ D \end{array}\begin{array}{c} \begin{array}{cccc} J_1 & J_2 & J_3 & J_4 \end{array} \\ \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \end{array}$$

10

b. Write short notes on : i) Decision trees ii) P-NP Problems 10

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