



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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; May / June - 2019

Analysis and Design of Algorithms

Time: 3 hrs

Max. Marks: 100

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

UNIT - I

- 1 a. What is an Algorithm? Design Euclid’s algorithm and consecutive integer checking algorithm for computing $GCD(m, n)$. 8
- b. List the steps in algorithm design and analysis process. Explain any two steps in the process. 6
- c. How is algorithm’s efficiency measured in terms of input’s size and its running time? 6
- 2 a. Explain the following asymptotic notations : 6
 - i) O (Big Oh) ii) Ω (Big Omega)
- b. Compare the order of growth of $\frac{1}{2}n(n-1)$ and n^2 . 4
- c. Write the general plan for analyzing time efficiency of non-recursive algorithm. Design a non-recursive algorithm for matrix multiplication. Derive its efficiency. 10

UNIT - II

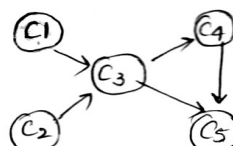
- 3 a. Design an algorithm for selection sort. Trace the algorithm to sort the following number : 8
89, 45, 68, 90, 29, 34, 17.
- b. What is string matching problem? Design an algorithm to solve the same using brute force approach. Illustrate the brute force string matching with an example. 8
- c. Derive the time complexity of bubble sort algorithm. 4
- 4 a. Explain Divide and Conquer approach. Write an algorithm for Merge sort. Illustrate the operation of the algorithm with an example. 10
- b. Compute the product of the given matrices using Strassen’s matrix multiplication, 10

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

UNIT - III

- 5 a. Explain the Breadth-First Search algorithm. Differentiate between DFS and BFS. 10
- b. What is Topological sorting? Explain the two approaches used for topological sort. Apply the source Removal and DFS based algorithm for sorting the below digraph 10

(Fig Q5(b))



- 6 a. What is an AVL tree? Explain the four types of rotations used to construct the AVL tree. Construct an AVL tree for the list 5, 6, 8, 3, 2, 4, 7 by successive insertions. 10

- b. What is Heap? List the important properties of Heap. Illustrate the two stages of heap sort algorithm with an example. 10

UNIT - IV

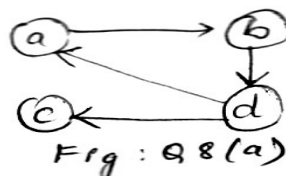
- 7 a. Design an algorithm to sort by distribution counting method. Apply the algorithm to sort the following array,

13	11	12	13	12	12
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8

Array values	11	12	13
Frequencies	1	3	2
Distribution values	1	4	6

- b. Explain Open and Closed Hashing. 8
- c. Explain the procedure for Horspool string matching algorithm. 4
- 8 a. Write Warshall's algorithm for computing the transitive closure. Apply Warshall's algorithm to the diagraph given below Fig. Q 8(a).

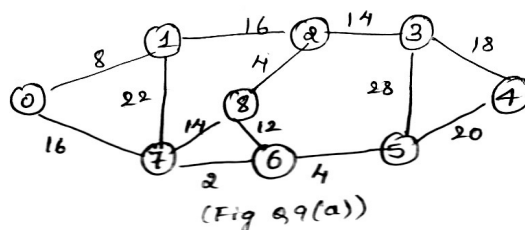


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- b. Write the pseudo code for constructing a table for solving the Knapsack problem by dynamic programming. Apply the same to the following instance of Knapsack problem. 10
- $N = 4$, Weights $(W_1, W_2, W_3, W_4) = (3, 1, 2, 1)$, Profit $(P_1, P_2, P_3, P_4) = (10, 29, 30, 20)$, and capacity $W = 5$.

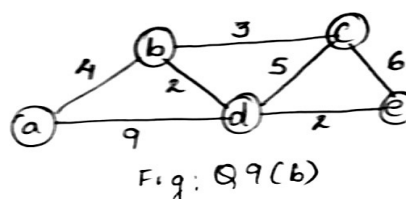
UNIT - V

- 9 a. Design Kruskal's Algorithm for finding a minimum spanning tree, Apply the same to find MST for the following graph,



10

- b. Write Dijkstra's single source shortest path algorithm and apply the same on the given graph. Taking the source as 'a'.



10

- 10 a. What is n-Queens Problem? Solve the FOUR Queen's problem by backtracking, illustrating state space tree. 10
- b. What are P, NP, NP-complete problems? Give examples for the same. 10