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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; 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. Define Graph. Explain the methods of graph representation with an example each. 6

b. Write an algorithm to find GCD of two numbers. 4

c. With a neat flow diagram, explain the various stages of algorithm design and analysis process. 10

2 a. Write the general plan for analysis of non-recursive algorithms. 5

b. Design a recursive algorithm to find factorial of a given number and analyze its time efficiency. 7

c. Write an algorithm for bubble sort. Analyze its best case and worst case time efficiency. 8

## UNIT - II

3 a. Design a recursive algorithm to search for an element in the given array using binary search method. Analyze its time efficiency. 8

b. Apply Merge sort algorithm on the data set 45, 50, 25, 10, 35, 25, 75, 30. 5

c. Write an algorithm for Quick sort to sort the given elements. 7

4 a. Differentiate between DFS and BFS. 5

b. Consider the graph Fig. Q4(b)

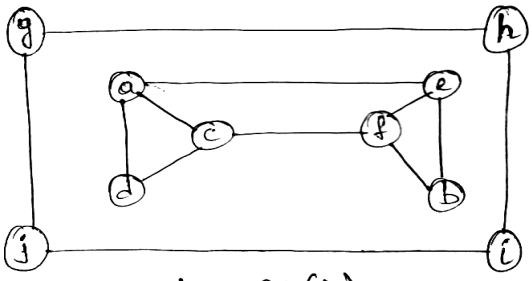


Fig. Q4(b) 10

i) Write the adjacency matrix.

ii) Starting at vertex '*a*' and resolving ties by the vertex alphabetical order traverse the graph by DFS and construct the corresponding DFS tree. Give the order in which the vertices were reached for the first time and the order in which the vertices became dead ends.

c. Explain presorting with an example. 5

## UNIT - III

5 a. Write an algorithm for comparison counting sort. Apply the algorithm to sort the elements 62, 31, 84, 96, 19, 47. 10

b. Write Horspool algorithm for pattern matching. Analyze its time efficiency. 10

6 a. Compute ${}^{6}C_{4}$ using dynamic programming. 8

Contd…2

b. Solve the All Pairs Shortest Path problem for the cost adjacency matrix given below; 12

| | a | b | c | d | E |
|---|---|---|---|---|---|
| a | 0 | ∞ | 3 | ∞ | ∞ |
| b | 2 | 0 | ∞ | ∞ | 4 |
| c | ∞ | 7 | 0 | 1 | ∞ |
| d | 6 | ∞ | ∞ | 0 | ∞ |
| e | ∞ | ∞ | ∞ | 2 | 0 |

## UNIT - IV

7 a. Apply dynamic programming approach to solve 0/1 Knapsack problem. Where, 12

Capacity m = 8, No. of objects n = 4, Profits $P_i$ = {1, 2, 5, 6}, Weights $W_i$ = {2, 3, 4, 5}

b. Solve the graph Fig. Q7(b) for its minimum spanning tree using Prim's algorithm and Kruskal's algorithm. 8

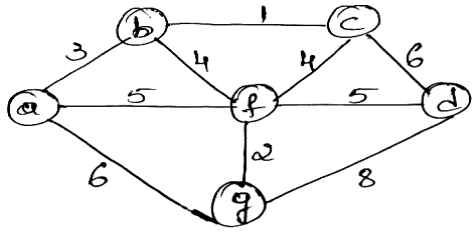


Fig. Q7(b)

8 a. Write Dijkstra's algorithm to find single source shortest paths. 6

b. Explain NP-Complete problems. 4

c. Explain an algorithm to construct the Huffman tree. Construct the Huffman tree for the following data and obtain its Huffman code. 10

| Character | A | B | C | D | E | - |
|---|---|---|---|---|---|---|
| Frequency | 0.5 | 0.35 | 0.5 | 0.1 | 0.4 | 0.2 |

## UNIT - V

9 a. Write a C program to implement n-Queens problem using Backtracking method. 10

b. Apply the Branch and Bound algorithm to solve the Travelling Salesman problem for the graph Fig. Q9(b). 10

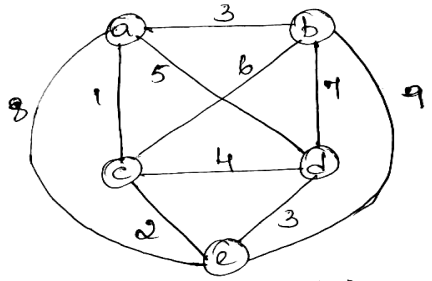


Fig. Q9(b)

10 a. Define the terms: speedup, asymptotic speedup, total work done by algorithm, efficiency of the algorithm and work optimal. 10

b. Let the input to the prefix computation problem be 5, 12, 8, 6, 3, 9, 11, 12, 1, 5, 6, 7, 10, 4, 3, 5 and let ⊕ stand for addition. Solve the problem using work optimal method. 10

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