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10CS43

Fourth Semester B.E. Degree Examination, June/July 2018
Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART - A

- 1 a. Write an algorithm to find GCD (m, n) using EUCLID's method and solve for GCD(60, 24). (05 Marks)
- b. Sort the list E, X, A, M, P, L, E in alphabetical order by using selection sort. (05 Marks)
- c. Write a general plan for analyzing efficiency of recursive algorithm. Analyze Tower of Hanoi problem for efficiency. (10 Marks)
- 2 a. Solve the Recurrence relations below and find upper bound:
 - (i) $T(n) = T\left(\frac{n}{2}\right) + 1$
 - (ii) $T(n) = 2T\left(\frac{n}{2}\right) + n$
 (05 Marks)
- b. Sort the list E, X, A, M, P, L, E in alphabetical order by using merge sort. (05 Marks)
- c. Write an algorithm for Quick Sort. Solve for 5, 5, 8, 3, 4, 3, 2 in ascending order. Is quick sort a stable algorithm? Give reasons. (10 Marks)
- 3 a. Using Greedy method, find an optimal solution to knapsack instance $n = 7, M = 15$
Profits = (10, 5, 15, 7, 6, 18, 3)
Weights = (2, 3, 5, 7, 1, 4, 1) (05 Marks)
- b. Write an algorithm for Dijkstra's single source shortest path. (05 Marks)
- c. Write Kruskal's algorithm for finding minimum cost spanning tree. Solve on Fig.Q3(c). (10 Marks)

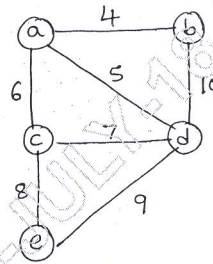


Fig.Q3(c)

- 4 a. Explain 0/1 knapsack problem and solve for the instance $N = 3, M = 4$ using Dynamic programming weights = [1, 2, 2], profits = [18, 16, 6]. (05 Marks)
- b. Apply Warshall's algorithm to find transitive closure of the digraph defined by the following adjacency matrix. (05 Marks)

	a	b	c	d
a	0	1	0	0
b	0	0	1	0
c	0	0	0	1
d	1	0	0	0

- c. What is Traveling salesperson problem? Using dynamic programming strategy obtain optimal tour for the following matrix: (10 Marks)

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

PART - B

- 5 a. What is DFS? How can we use DFS for identifying connected components of a graph? Explain with suitable graph. (05 Marks)
 b. Apply Boyer - Moore algorithm to search for the pattern BAOBAB in the text BESS_KNEW_ABOUT_BAOBAB. (05 Marks)
 c. Obtain topological order for the digraph Fig.Q5(c) using source removal method and DFS based algorithm. (10 Marks)

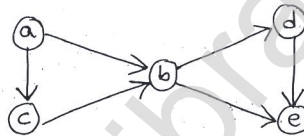


Fig.Q5(c)

- 6 a. Define Decision Trees. Construct decision tree for three-element insertion sort. (05 Marks)
 b. Explain NP and NP-complete problems. Give examples. (05 Marks)
 c. What is Numerical analysis? Explain the following with examples: (10 Marks)
 (i) Truncation error (ii) Round off error (iii) Subtraction cancellation.
- 7 a. Explain N-Queens problem. Obtain states space tree for solving 4-Queens problem. (05 Marks)
 b. Write Twice-around-the-tree approximation algorithm for traveling salesperson problem. (05 Marks)
 c. Using Branch and Bound technique solve for TSP refer Fig.Q7(c). (10 Marks)

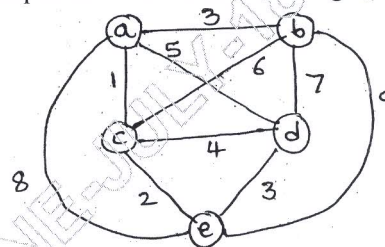


Fig.Q7(c)

- 8 a. What are the different ways of resolving Read and Write conflicts? (05 Marks)
 b. Explain steps involved in computation of matrix \tilde{M} using parallel algorithm. (05 Marks)
 c. What is prefix computation problem? Let input to the prefix computation be 5, 12, 8, 6, 3, 9, 11, 12, 1, 5, 6, 7, 10, 4, 3, 5 and there are 4 processors and \oplus stands for addition. With a diagram explain how prefix computation is done by parallel algorithm. (10 Marks)
