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**Code: 17F00402**

MCA IV Semester Regular Examinations May 2019

**DESIGN & ANALYSIS OF ALGORITHMS**

(For 2017 admitted batches only)

Time: 3 hours Max. Marks: 60

Answer all the questions

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1 (a) Apply Strassen's algorithm to compute matrix multiplication, using 2 X 2 matrices, exiting the recursion when n = 2.

$$\begin{bmatrix} 1 & 0 & 2 & 1 \\ 4 & 1 & 1 & 0 \\ 0 & 1 & 3 & 0 \\ 5 & 0 & 2 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 1 & 0 & 1 \\ 2 & 1 & 0 & 4 \\ 2 & 0 & 1 & 1 \\ 1 & 3 & 5 & 0 \end{bmatrix}$$

(b) Explain the concept of divide and conquer.

**OR**

2 (a) Illustrate the tracing of Quick Sort algorithm for the following set of numbers:
18, 25, 18, 40, 11, 37, 32, 9

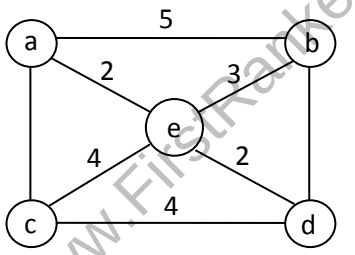
(b) Explain best case, average case and worst case efficiencies for quick sort with specific examples.

3 (a) Write an algorithm to find single source shortest paths.

(b) Obtain the optimal solution for the job sequencing problem with deadline where n = 4 Profit (P1, P2, P3, P4) = {100, 10, 15, 17} and deadlines = {2, 1, 2, 1}.

**OR**

4 (a) Write an algorithm, to find the minimum cost spanning tree using Kruskal's method. Apply the algorithm on the graph shown below.




(b) Write a note on travelling sales person problem.

5 (a) What is graph traversal? Explain depth first traversal and breadth first traversals, with an example.

(b) What is a Hamilton cycle? Give an example.

**OR**

6 (a) Explain back tracking concept and apply it to solve subset sum problem for S = {6, 5, 3, 7} and d = 15.

(b) Explain Bi-connected components of a graph with a suitable example.

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7 Explain how branch and bound is different from backtracking. Solve the following instance of the 0/1 knapsack problem by Branch and bound algorithm (W = 16).

| Item | Weight | Value |
|---|---|---|
| 1 | 10 | $100 |
| 2 | 7 | $63 |
| 3 | 8 | $56 |
| 4 | 4 | $12 |

**OR**

8 (a) What is a comparison tree? Draw the comparison tree for sorting three elements.

(b) Show how to invert a lower triangular matrix using lower bound theory.

9 Give and explain the relationship between P, NP, NP-complete and NP hard problems.

**OR**

10 Write short notes on the following NP-complete problems:

(a) Node cover.

(b) Hamilton circuit problem.

(c) Graph coloring problem.

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