Code No: F-13884/N/BL/AICTE

FACULTY OF ENGINEERING

B.E. (CSE) VI - Semester (AICTE) (Main & Backlog) (New) Examination,
August / September 2024

Subject: Design and Analysis of Algorithms

Time: 3 Hours Max. Marks: 70

Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.
(iii) Missing data, if any, may be suitably assumed.

1. a) Define space and time complexity of an algorithm.
   b) Define convex hull. Give example.
   c) Write the control abstraction for greedy method.
   d) Define LC search used in branch and bound.
   e) Differentiate between deterministic and non-deterministic polynomial time algorithms.
   f) State the difference between greedy and dynamic programming strategies.
   g) What is the concept of Satisfiability problem?

2. a) Solve the given recurrence relation using substitution method.

$$T(n) = \begin{cases} a & n=1 \quad a \text{ is a constant} \\ 2\,T(n/2) + c * n & n>1 \quad c \text{ is a constant.} \end{cases}$$

   b) Write the weighted union and collapsing find algorithms for disjoint sets.

3. a) Determine the maximum and minimum elements using the divide and conquer MaxMin algorithm for the given elements. Draw the tree for recursive calls to MaxMin algorithm.
   Elements: 5, 22, 13, 15, 60 -8
   b) Write the Quick sort algorithm to sort a list in ascending order.

4. a) Write the greedy algorithm for single source shortest paths problem.
   b) Using dynamic programming strategy, find the minimum cost tour for the travel salesperson problem given the cost adjacency matrix between the vertices representing cities. The tour starts at vertex 1.

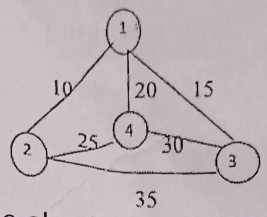
∞	10	15	20
5	∞	9	10
6	13	∞	12
8	8	9	∞

5. a) Explain backtracking solution for hamiltonian cycle problem with a suitable example.
   b) Solve the given 0-1 knapsack problem instance using LC branch and bound strategy.
   M=15, N=4, (p1,p2,p3,p4) = (10,10,12,18), (w1,w2,w3,w4) = (2,4,6,9)

..2..

6. a) Define NP-Complete, NP-Hard. Show that the Clique Decision Problem is NP-Complete.
   b) Explain the different models in parallel computing based on how read and write conflicts are resolved.

7. a) Apply Prim's algorithm to find the minimum cost spanning tree and its minimum cost for the given graph.



   b) Write the iterative binary search tree algorithm. State its best, average and best case time complexity for both successful and unsuccessful searches.

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