

2063
B.E. (Information Technology)
Fifth Semester
PCIT-502: Design and Analysis of Algorithms

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

Q 1	a) What is space complexity? How is it computed? b) Explain 'principle of optimality'. c) What is a state space tree? Explain E-node, live node and dead node. d) Write an algorithm for finding second minimum element from an array. Find its complexity. e) Differentiate: P and NP class of problems.	2x5= (10)
PART - A		
Q 2	a) What is asymptotic analysis of algorithms? Justify its need and explain the various notations used for the analysis. b) How do we determine the time complexity of Recursive algorithms? Solve by Master's Theorem and draw there recursion tree: (i) $T(n) = 4T(n/2) + n^2$ (ii) $T(n) = 2T(n/2) + n$	(5,5)
Q 3	a) What attributes of a problem facilitates in deciding that Divide and Conquer strategy is most appropriate approach to solve the problem. Explain with suitable example how application of DAC approach improves computational complexity. b) Explain Partitioning with respect to Quick sort algorithms. Explain the best-case and worst-case partitioning in quick sort.	(5,5)
Q 4	a) Explain the <i>single source shortest path</i> problem and find its solution by applying Greedy strategy. Also illustrate how it satisfies the Optimal substructure property. b) Explain the Kruskals algorithm and its time complexity for finding minimum cost spanning tree. Which specific data structures are most suitable for its implementation? For the following weighted graph, apply Kruskals algorithm to determine the minimum cost spanning tree:	(5,5)
PART - B		
Q 5	a) Explain the two key properties of Dynamic Programming (DP) approach with suitable example. The 0/1 knapsack problem can be solved by DP whereas fractional knapsack cannot be solved by applying DP strategy. Justify. b) For the following weighted directed graph, apply Floyd- Warshall algorithm for constructing shortest path and show the matrix A^k that is generated after every iteration.	(5,5)

(2)

Q 6	a) Solve the 8-queens problem using Backtracking strategy for algorithm design and explain the following terms with respect to the 8-queens problem: implicit constraints, explicit constraints, bounding function, permutation tree. b) What is sum of subset problem? Let $S = \{3, 4, 5, 6, 7\}$ and $M = 13$; Find all possible subsets of S that sum to M using recursive backtracking algorithm. Draw the portion of state space tree that is generated.	(5,5)
Q 7	Explain the following terms: a) Non-deterministic and deterministic problems b) NP-hard and NP= complete class of problems c) Principle of Optimality taking Travelling Salesman Problem as an example.	(3,3,4)

x-x-x