

1129
B. E. (Information Technology)
Fifth Semester
ITE-504: Design of 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

Qn. 1. Attempt the following:-

- a) Define and explain the significance of O-notation?
- b) Differentiate between performance analysis and performance measurement.
- c) Which is a better strategy for problem solving: Greedy Strategy, Dynamic Programming or both? Justify.
- d) What are overlapping sub-problems? Give example
- e) Explain with example: Matrix multiplication using divide and conquer? (5x2=10)

PART-A

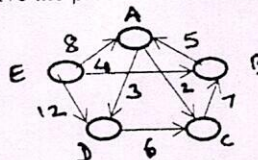
- Qn 2 a) Write an algorithm to find the sum of first and second minimum number from an array of integers. Also find its time and space complexity.
b) What are Asymptotic notations? Why they are used for machine independent analysis of algorithms. Arrange the following complexities from low to high:
 $O(n^3), O(2^n), O(n \log n), O(n^4 + n \log n), O(n^4 + n^2 + n), O(n^2 + \log n)$. (5,5)
- Qn 3. a) What is the greedy choice property? Find the feasible and optimal solutions for the following knapsack instance. (Given $n=3, M=60$):
 $I=\{I1, I2, I3\}$; $W= \{10, 20, 30\}$; $P=\{100, 120, 140\}$
b) Discuss the characteristics of problems solved using Divide and conquer. Discuss the best, average and worst case time complexity of Quick sort algorithm. (5,5)
- Qn 4 a) What is a minimum cost spanning tree? Illustrate the working of Kruskal's algorithm to find minimum cost spanning tree. Discuss the time complexity for its execution.
b) Discuss the role of recurrence relations in algorithm analysis. Solve by Master Method: $T(n) = 3T(n/2) + n^2$. Also draw the recursion tree for the given recurrence relation. (5,5)

PART-B

- Qn 5 a) What do you mean by optimal substructures? Illustrate it by using forward approach used to solve the multistage graph problem.
b) Explain the Travelling salesman problem. Find the minimum cost of the tour by using travelling salesman problem if starting from city A. (5,5)

	A	B	C	D
A	-	6	10	11
B	10	-	14	20
C	15	11	-	15
D	9	7	5	-

- Qn 6 a) What is a N-Queens problem? Explain the bounding function used to solve 8-queens problem and provide a solution using the backtracking approach.
b) Find the shortest path between all pairs of vertices in the following graph? Discuss the strategy applied to solve the problem and its complexity. (5,5)



- Qn 7 a) Solve the following sum of subset problem. Draw portion of state space tree till first feasible solution is obtained and provide relevant explanation:
 $n=7, (w1, w2, w3, w4, w5, w6, w7) = (10, 7, 5, 18, 12, 20, 15), m=35$
b) Write short notes on: NP Completeness, Reducibility (5,5)