

B.E. (Computer Engineering)
DESIGN AND ANALYSIS OF ALGORITHMS

Time: 2½ Hours Max. Marks: 70

Instructions to the candidates:

1. Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8
2. Neat diagrams must be drawn wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary

Q1) a) Write a detailed algorithm for Job Scheduling using Greedy Approach. Consider the following job set: [9]

Job	J1	J2	J3	J4	J5
Deadline	2	1	3	2	1
Profit	60	100	20	40	20

Find the optimal sequence of jobs and calculate the maximum profit.

b) Solve the following Knapsack problem using Dynamic Programming approach: [9]

Item	Weight	Profit
1	2	\$12
2	1	\$10
3	3	\$20
4	2	\$15

Capacity of Knapsack = 5

OR

Q2) a) Explain the Greedy Strategy with respect to: [12]

- Principle
- Control Abstraction
- Time Analysis
- Provide a suitable example demonstrating these aspects

b) Write detailed steps for Job Sequencing Algorithm using Greedy Approach. [6]

Q3) a) Apply Branch and Bound algorithmic strategy to solve the Traveling Salesman Problem for the following distance matrix: [9]

City	A	B	C	D
A	0	10	15	20
B	10	0	35	25
C	15	35	0	30
D	20	25	30	0

b) Explain Backtracking with: [8]

- Principle
- Control Abstraction
- Time Analysis
- Provide a detailed example

OR

Q4) a) Write a Branch and Bound algorithm for solving the 0/1 Knapsack Problem. Solve the following instance: [9]

Item	A	B	C	D
Profit (Rs.)	18	10	12	10
Weight (kg)	9	4	6	2

Knapsack Capacity = 15 kg

b) Solve the Sum of Subset Problem using Backtracking: [8] Input: set[] = {2, 3, 5, 6, 8, 10}, sum = 10

Q5) a) What is Amortized Analysis? Explain the Aggregate Method with a comprehensive example. [9]

b) Illustrate the Potential Function Method by finding the Amortized Cost of: [9]

- PUSH Operation
- POP Operation
- MULTIPOP Operation

OR

Q6) a) Explain Randomized and Approximation Algorithms with suitable examples. [10]

b) Discuss the special needs of Embedded Algorithms and identify the best sorting algorithm for embedded systems. [7]

Q7) a) i) Explain an algorithm for Distributed Minimum Spanning Tree [5]

ii) Write and explain the Rabin-Karp algorithm for string matching [5]

b) Analyze Multithreaded Algorithms with respect to: [7]

- Parallel Loops
- Race Conditions
- Performance Analysis

OR

Q8) a) Write a detailed pseudo-code for Multi-threaded Merge Sort Algorithm. Explain how parallel merging provides a significant parallelism advantage. [9]

b) For the Rabin-Karp string matching algorithm: [8]

- Working module $q = 11$
- Text $T = 31415926535$
- Pattern $P = 26$
- Calculate the number of spurious hits
- Analyze the matching process

Note: Choose ONE question from each pair of alternative questions.