

Code: 9A05403

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II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

DESIGN & ANALYSIS OF ALGORITHMS

(Common to CSS, IT & CSE)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Define an algorithm. What are the different criteria that satisfy the algorithm?
(b) Explain the different areas of research where the algorithms can be applied.
- 2 (a) Present an algorithm for union with weighting rule.
(b) What is collapsing rule? Explain with example.
- 3 (a) Give a control abstraction for divide and conquer.
(b) Write the Iterative algorithm for searching an element by using binary search.
- 4 (a) Find an optimal solution to the knapsack instance $n = 7$, $m = 15$, $P[1 : 7] = 10, 5, 15, 7, 6, 18, 3$ and $W[1 : 7] = (2, 3, 5, 7, 1, 4, 1)$
(b) Write an algorithm for Knapsack problem by using greedy technique.
- 5 (a) Device an algorithm m to find the optimal order of multiplying n matrices using dynamic programming technique.
(b) Explain the time efficiency of an algorithm OBST is cubic.
- 6 (a) Write an algorithm to estimate the efficiency of backtracking.
(b) Explain the 4-queen problem using backtracking.
- 7 (a) What do you mean by bounding? Explain how these bounds are useful in branch and bound method.
(b) Explain FIFO branch and bound.
- 8 Given an integer $m \times n$ matrix A and an integer m -vector b , the 0-1 integer programming problem asks whether there is an integer n -vector x with elements in the set $\{0, 1\}$ such that $Ax \leq b$. Prove that 0-1 integer programming is Np-complete.

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- 1 (a) What are the different techniques to represent an algorithm? Explain.
(b) Give an algorithm to solve the towers of Hanoi problem.
- 2 (a) Write a pseudo code for UNION algorithm with weighted rule.
(b) Present an algorithm for FIND using collapsing rule.
- 3 (a) Search for an element -2 from the below set by using binary search:
 $A = \{-15, -6, 0, 7, 9, 23, 54, 82, 101, 112\}$.
(b) Draw the binary decision tree for the above.
- 4 (a) Give brief description about the single source shortest path by using greedy technique.
(b) Write a high – level description for job sequencing algorithm.
- 5 (a) Using divide and conquer approach coupled with the set generation approach. Show how to obtain an $O(2^{n/2})$ algorithm for 0/1 knapsack problem.
(b) Develop an algorithm that uses the approach to solve the 0/1 knapsack problem.
- 6 Generalize Hamiltonian so that it processes a graph whose edge have costs associated with then and finds a Hamiltonian cycle with minimum cost. You can assume that all edge costs are positive.
- 7 (a) Write an algorithm of LC branch and bound to find minimum cost answer node algorithm.
(b) Explain the solution to the traveling sales person problem by using LC branch and bound.
- 8 Show that partition α the minimum finish time non-preemptive three processor flow shop schedule use only one job. That has three non-zero tasks. All other jobs have only one non-zero task.

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- 1 (a) Present an algorithm that searches an unsorted array $a[1...n]$ for the element x . If x occurs, return the position in the array else return zero.
(b) If S is a set of n elements, the power of set S is the set of all possible subsets of S . Write a recursive algorithm to compute power set (S).
- 2 Explain in detail the set representation with suitable example.
- 3 (a) Explain the sorting of elements by using merge sort technique.
(b) Present an Iterative algorithm for binary search.
- 4 (a) Prove that the greedy method produces an optimal solution to the job sequencing problem.
(b) Present greedy algorithm for sequencing unit time jobs with deadlines and profits.
- 5 (a) Find the solution for the knapsack problem. When $n=3$, $(W_1, W_2, W_3) = (18, 15, 10)$.
 $(P_1, P_2, P_3) = (25, 24, 15)$ and $m=20$.
(b) Explain the general concept of dynamic programming.
- 6 How many solutions are there to the eight queens problem? How many distinct solutions are there if we do not distinguish solutions that can be transformed into one another by rotations and reflections?
- 7 (a) Compare FIFO branch and bound and LC branch and bound.
(b) Explain the method of reduction to solve TSP problem using branch and bound.
- 8 (a) Mention the classes of complexity in algorithms.
(b) Give out the relation between NP-hard and NP-complete problems.

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- 1 (a) Write an algorithm for transpose of a matrix by using step count method.
 (b) What are the advantages and disadvantages of randomized algorithms?
- 2 (a) Explain the different set operations with suitable examples.
 (b) Give brief description about the array representation of sets.
- 3 Explain in detail about the Strassen's matrix multiplication.
- 4 (a) Define minimum cost spanning trees. Explain them with suitable example.
 (b) Present faster algorithm for job sequencing.
- 5 Solve the all- pair's shortest path problem for the digraph with the weight n-matrix.

$$\begin{bmatrix}
 0 & 2 & \alpha & 1 & 8 \\
 6 & 0 & 3 & 2 & \alpha \\
 \alpha & \alpha & 0 & 4 & \alpha \\
 \alpha & \alpha & 2 & 0 & 3 \\
 3 & \alpha & \alpha & \alpha & 0
 \end{bmatrix}$$

- 6 (a) Derive the bounding functions of sum of subsets problem and write the algorithm for the same.
 (b) Define the following terms: live node, E-node, dead node.
- 7 Write and explain an algorithm for a LIFO branch and bound algorithm to find the minimum cost answer node.
- 8 (a) Explain about non deterministic algorithm.
 (b) Discuss NP-hard and NP-complete problems.
