

Exam.Code:0916

Sub. Code: 6396 ✓

2054

B.E. (Computer Science and Engineering)

Fourth Semester

CS-401: Analysis and Design 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 Unit.

x-x-x

I. Attempt the following:-

(a) Describe substitution method with the help of an example.

(b) Explain the time complexity of selection sort algorithm.

(c) What are various elements of greedy strategy?

(d) Explain general method of Backtracking.

(e) What is Cook's Theorem?

(5x2)

UNIT - I

II. (a) Solve the following recurrences and justify your answers. Assume that $T(n)$ is constant for $n \leq 2$.

i) $T(n) = 16T(n/4) + n^2$

ii) $T(n) = T(n-1) + n$

(b) Use divide and conquer strategy to illustrate the operation of merge sort on array $A = (3, 41, 52, 26, 38, 57, 9, 49)$.

(2x5)

III. (a) Explain Strassen's matrix multiplication solution. Also perform its time and complexity analysis.

(b) Suppose that the graph $G = (V, E)$ is represented as an adjacency matrix. Give a simple implementation of Prim's algorithm for this case that runs in $O(V^2)$ time.

(2x5)

IV. Write a short note on the following:

[5 X 2 = 10]

(a) Binary search

(b) Single source shortest path

(2x5)

P.T.O.

(2)

UNIT - II

- V. (a) What is LCS problem? Write an algorithm to compute length of an LCS. Use the same to determine the LCS of (1,0,0,1,0,1,0,1) and (0,1,0,1,1,0,1,1,0). (4)
- (b) Let $w = [5, 7, 10, 12, 15, 18, 20]$ and $m = 35$. Write an algorithm for sum of subsets problem and use the same to find all possible subsets of w that sum to m . Draw the portion of the state space tree that is generated. (4,1,1)
- VI. (a) What is 0/1 knapsack problem? Explain its solution using dynamic programming. (4)
- (b) Explain N-Queen's problem using an example and solve the same using backtracking. Also perform the time and space complexity analysis of your solution. (4,1,1)
- VII. (a) Explain Graph coloring problem. Using an example solve the same using backtracking. Also perform the time and space complexity analysis of your solution. (1,4, 1,1)
- (b) Write a note on NP-Completeness and reducibility. (3)

x-x-x