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Total Pages : 3

301404

May, 2019

B.TECH. (CE/CSE/IT) - IV SEMESTER

Design & Analysis of Algorithms (PCC-CS-404)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Solve the following recurrence relation:

$$T(n) = T(n^{1/2}) + c.$$ (1.5)

(b) Differentiate between O-notation and Omega-notation with the help of appropriate example. (1.5)

(c) How arrays can be used to store a tree? Discuss with example. (1.5)

(d) For which type of problems Divide & Conquer approach is generally used, discuss. (1.5)

(e) Differentiate between Depth First Search and Breadth First Search. (1.5)

(f) What is Transitive Closure of a graph? (1.5)

(g) What do you mean by reducibility? (1.5)

(h) Which approach among Backtracking and Branch & Bound is better and why? (1.5)

(i) Discuss the time complexity of Kruskal's algorithm. (1.5)

(j) Why Randomized algorithms are used? Discuss with example. (1.5)

PART–B

2. Design a divide and conquer algorithm to find the maximum and minimum of an array A of n elements, and prove that the algorithm makes at most 3n/2 element-to-element comparisons. (15)

3. (a) Differentiate between Deterministic and Non-Deterministic algorithms. Write a Deterministic algorithm to search an element in the array and convert the same into a Non-Deterministic algorithm. (7)

(b) Differentiate between Greedy and Dynamic method to solve the problems. Write and explain All Pair Shortest Path algorithm to find the Shortest Paths in a graph with example and derive its time complexity. (8)

4. Find all the feasible solutions to the Knapsack instance $n = 7$, $m = 15$,

$(P_i) = (10, 5, 15, 7, 6, 18, 3)$

$(W_i) = (2, 3, 5, 7, 1, 4, 1)$.

Find the optimal solution for the same by using Greedy method. (15)

5. (a) What do you mean by Network Flow? Write Ford-Fulkerson algorithm with suitable example. (5)

(b) Differentiate between Backtracking and Branch & Bound with the help of suitable examples. Discuss the Hamiltonian Cycle problem and write its algorithm. (10)

6. (a) Why Topological sorting is used for Directed Acyclic Graph (DAG), justify with suitable example. (7)

(b) What are approximation algorithm and why they are used? Solve Travelling Salesman Problem by using approximation algorithm. (5)

7. (a) Discuss P, NP, NP-Complete and NP-Hard Problems with suitable examples. (10)

(b) What is Satisfibility? Discuss CNF-Satisfibility. (5)