YMCA UNIVERSITY OF SCIENCE& TECHNOLOGY, FARIDABAD

M.TECH 1st SEMESTER (UNDER CBS)

ANALYSIS & DESIGN OF ALGORITHM (MTCE-17-122)

Time: 3 Hours Max. Marks:75

Note: 1. *It is compulsory to answer the questions of Part -1. Limit your answers within 20-40 word in this part.*
2. *Answer any four questions from Part -2 in detail.*
3. *Different parts of the same question are to be attempted adjacent to each other.*
4. *Assume suitable standard data wherever required, if not given.*

PART -1

Q1 (a) Solve the following recurrence relation: (1.5)

$$T(n)= T(n/2) + c \text{ for } n>1$$

(b) Explain Union and Find with example. (1.5)

(c) Discuss the disadvantages of using greedy approach. (1.5)

(d) Compare the time complexity of ternary search with binary search. (1.5)

(e) What is a stable sorting method? Is merge sort a stable sorting method? (1.5)

(f) Explain the terms feasible solution, optimal solution and objective function. (1.5)

(g) Explain the applications of Backtracking. (1.5)

(h) Discuss the time complexitiy of Kruskal's algorithm. (1.5)

(i) Differentiate between dynamic knapsack and branch and bound knapsack problem. (1.5)

(j) Discuss P, NP and NP-complete problems.

PART -2

Q2 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)

Q3 Develop a counterexample to show that the greedy algorithm developed for the fractional knapsack problem does not work for the 0/1 knapsack problem. (15)

Q4 Differentiate between Backtracking and Branch & Bound with the help of suitable examples. Define Hamiltonian cycle. Apply backtracking to find the Hamiltonian cycle by taking a graph. Write algorithm for the same. (15)

Q5 Consider five items along with their respective weights and profits : (15)

$W_i = (8, 12, 24, 18, 40)$

$P_i = (35, 42, 110, 75, 123)$

The Knapsack has capacity, m = 60, Find out the solution to the fractional and 0/1 Knapsack problem using Branch and Bound method.

Q6 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. (15)

Q7 There are n+1 stones labeled 0, 1, 2.....n. you start on stone 0, and you take a sequence of steps from stone to stone – always increasing the number of the stone – and ending in stone n. The cost to go from stone i to stone j (i<j) is $S_{i,j}$.

(a) Let m_k denote the minimum cost to get to stone k. Find the recurrence relation for m_k. (15)

(b) What is the running time to compute m_n using your recurrence?

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