MAR-21-210176

B. Tech. EXAMINATION, March 2021

Semester V (NS)

ANALYSIS AND DESIGN OF ALGORITHM

(CSE, IT)

CS-313

Time : 3 Hours Maximum Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. (a) What is meant by time complexity and space complexity ? Discuss its importance.

(b) Discuss the step in mathematical analysis for recursive algorithm. Do the same for finding the factorial of a number ? **20**

2. (a) What are the rules of manipulate Big-Oh expression ? Write about the typical growth rates of algorithms.

(b) Find the complexity of the following recurrences :

   (i) $T(n) = T(n/2) + n$

   (ii) $T(n) = 2T(n - 1) + cn$. **20**

Section B

3. Discuss the running time of HEAPSORT on an array A of length n that is already sorted in increasing order. Also discuss about decreasing order ?

4. Determine the cost and structure of an optimal binary search tree for a set of $n = 4$ keys with the following probabilities :

| i	0	1	2	3	4
Keys		10	20	30	40
p_i		0.1875	0.1875	0.0625	0.0625
q_i	0.125	0.1875	0.0625	0.0625	0.0625

Section C

5. Given a complete undirected graph G(V. E). where V = {0, 1, 2, 3, 4} and the corresponding weight matrix W_{ij} as follows :

$$W = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

Calculate the minimum weight for the spanning tree T of G. Consider vertex 0 as leaf node in tree T.

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6. Find out the minimum spanning tree using Prime and Kruskal's algorithm.

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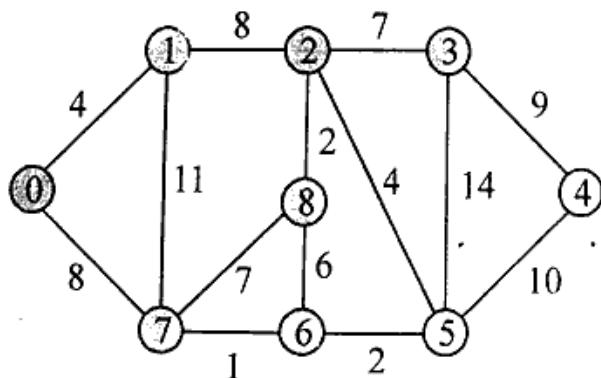
Section D

7. Two problems are given below. Identify the class of problem (P, NP, NPC, NP-Hard) and justify the answer :

    (a) Travelling Salesman Problem

    (b) ·0/1 Knapsack Problem.

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8. Write pseudocode for Bellmen Ford Algorithm. Compare and differentiate between Dijkstra's algorithm and Bellmen Ford algorithm for single source shortest path algorithm.

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(Compulsory Question)

9. Write short notes on the following :   **2×10=20**

    (i) Master method

    (ii) DFS

    (iii) Selection sort algorithm

    (iv) Merge-sort algorithm

    (v) Activity selection problem

    (vi) Minimum spanning tree

    (vii) Randomized Quicksort

    (viii) Sorting in linear time

    (ix) Knapsack problem

    (x) Backtracking.