October, 2020

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) Write the recurrence relation for ternary search and also solve it.   (1.5)

   (b) Differentiate big 'O' and small 'o' asymptotic notations.   (1.5)

   (c) If an array is sorted in decreasing order then which sorting runs in minimal complexity? Justify.   (1.5)

   (d) Explain Transitive Closure in graph.   (1.5)

   (e) Differentiate Binary tree, Binary Search Tree and Optimal Binary Search Tree.   (1.5)

[P.T.O.

(f) Merge the following files optimally :

(1, 3, 2, 5, 3, 4, 6, and 8)

(g) Describe principle of optimality. (1.5)

(h) Explain explicit and implicit constraints for Hamiltonian cycle. (1.5)

(i) Describe Least Cost Search function in brief. (1.5)

(j) Differentiate NP-Hard and NP-Complete problems. (1.5)

(1.5)

PART - B

2. (a) Solve the following recurrence relations:-

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

(ii) $T(n) = T(\sqrt{n}) + 1$

(iii) $T(n) = 3T(n/9) + n^3$

(iv) $T(n) = T(n/3) + T(2n/3) + n$ (10)

(b) Solve the knapsack problem (0/1 and Fractional) using Greedy Method: $m = 30$, $(w1, w2, w3, w4) = (10, 15, 6, 9)$, $(p1, p2, p3, p4) = (2, 5, 8, 1)$. (5)

3. (a) Define Merge-Purge rule with an appropriate example. (5)

(b) Write the algorithm for Quick-sort and compute its time complexity. Also sort the following array using Quick-sort:-

$A = \{10, 23, 6, 34, 21, 76\}$ (10)

4. Solve the following travelling salesman problem using branch and bound:

0	7	3	12	8
3	0	6	14	9
5	8	0	6	18
9	3	5	0	11
18	14	9	8	0

(15)

5. (a) Write the backtracking algorithm for n-queen problem. Find a solution to place 4 queens on a 4*4 chess-board. (5)

   (b) Write Network Flow algorithm and explain with appropriate example. (10)

6. (a) Explain Approximation algorithms in detail. (10)

   (b) Define Strassen's Matrix Multiplication in brief. (5)

7. Define Cook's theorem and explain reduction of NP-Hard problems into NP-Complete problem with suitable example. (15)

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