

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)

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: $m = 30$, $(w_1, w_2, w_3, w_4) = (10, 15, 6, 9)$, $(p_1, p_2, p_3, p_4) = (2, 5, 8, 1)$. (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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