

B.Tech. Degree VI Semester Special Supplementary Examination November 2022

CS 19-202-0603 ANALYSIS AND DESIGN OF ALGORITHMS
(2019 Scheme)

Time: 3 Hours

Maximum Marks: 60

Course Outcome

On successful completion of the course, the students will be able to:

- CO1: Analyse a given algorithm and express its worst, best and average time and space complexities in asymptotic notations.
- CO2: Solve recurrence equations using Substitution Method, Changing Variables, Recursion Tree and Masters Theorem.
- CO3: Understand the dynamic programming paradigm and its algorithmic design solutions.
- CO4: Familiarise optimization problems using Greedy Method.
- CO5: Design efficient algorithms using Backtracking and Branch and Bound Techniques for solving problems.
- CO6: Familiarize some approximation algorithms and the benefit of using them.
- CO7: Classify computational problems into P, NP, NP-Hard and NP-Complete complexity classes.

Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6 – Create

PO – Programme Outcome

PART A

(Answer *ALL* questions)

| | (8 × 3 = 24) | Marks | BL | CO | PO |
|--|--------------|-------|----|----|------|
| I. (a) State Masters theorem. | | 3 | L1 | 2 | 1,3 |
| (b) Estimate worst case, best case and average case complexity of linear search. | | 3 | L2 | 1 | 1,3 |
| (c) Give the time complexity analysis of bubble sort. | | 3 | L1 | 2 | 1,3 |
| (d) Differentiate between AVL tree and Red Black Tree. | | 3 | L2 | 1 | 1,3 |
| (e) Discuss the properties of RBT. | | 3 | L1 | 1 | 1,3 |
| (f) Discuss about different graph algorithms. | | 3 | L1 | 4 | 3 |
| (g) Write short notes on the P, NP, NP hard and NP complete complexity classes. | | 3 | L1 | 7 | 4,5 |
| (h) What are approximation algorithms? Give an example. | | 3 | L1 | 6 | 3,10 |

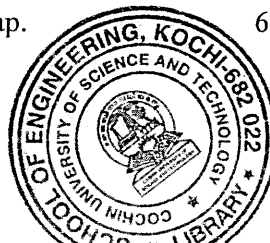
PART B

(4 × 12 = 48)

- II. (a) Solve the following equation by Masters theorem: $T(n) = 4T(n/2) + n$. Solve the given equations using iterative method: $T(n) = 3T(n/2) + n$. 6 L3 2 1,3
- (b) Explain Masters Theorem for divide and conquer and decrease and conquer with example. 6 L4 2 1,3

OR

- III. (a) Solve the given equations using recursive tree method 6 L3 3 1,3
- (i) $T(n) = 4T(n/2) + n^2$
- (ii) $T(n) = T(n/2) + T(n/4) + T(n/8) + n$.
- (b) Differentiate between Binomial heap and Fibonacci heap. 6 L2 1 1,3



(P.T.O.)

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| | | Marks | BL | CO | PO |
|-----------|--|-------|----|----|------|
| IV. | Explain the analysis of Merge sort algorithm with an example and analyze its best case and worst case complexity. | 12 | L4 | 3 | 3 |
| OR | | | | | |
| V. | Explain the analysis of Heap sort algorithm with an example analyze its best case and worst case complexity. | 12 | L4 | 3 | 3 |
| VI. | Explain N queens problem with its analysis. | 12 | L1 | 5 | 3 |
| OR | | | | | |
| VII. | Given a chain of four matrices. The matrices have size 5×4 , 4×6 , 6×2 , 2×7 . Evaluate M [1,4] using dynamic programming approach of Matrix chain multiplication. | 12 | L3 | 3 | 3 |
| VIII. | Discuss the approximation algorithm for TSP in detail with an example. | 12 | L1 | 6 | 3,10 |
| OR | | | | | |
| IX. | Discuss PRAM models with suitable examples. | 12 | L1 | 6 | 3,10 |

Blooms's Taxonomy Levels

L1 - 45%, L2 - 10%, L3 - 20%, L4 - 25%.
