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## B.Tech. Degree VI Semester Regular Examination April 2022

### CS 19-202-0603 ANALYSIS AND DESIGN OF ALGORITHMS

(2019 Scheme)

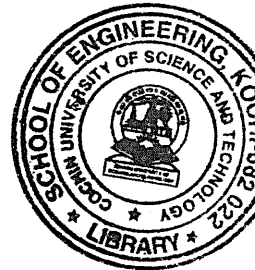
Time: 3 Hours

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)

I.	(8 × 3 = 24)	Marks	BL	CO	PO
(a) What are the different asymptotic notations?		3	L1	1	1,2,3
(b) Estimate worst case, best case and average case complexity of linear search.		3	L2	1	1,2,3
(c) Give the analysis of Insertion sort.		3	L1	2	1,2,3
(d) Differentiate between Binomial heap and Fibonacci heap.		3	L2	1	1,2,3
(e) Discuss the properties of RBT.		3	L1	1	1,2,3
(f) What are Minimum Spanning Tree? Differentiate between Prim's and Kruskal's 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 PRAM models? Give an example.		3	L1	6	3,10

#### PART B

(4 × 12 = 48)

II. (a) Solve the following equations by Masters theorem.	6	L3	2	1,2,3
(i) $T(n) = 2T\left(\frac{n}{2}\right) + n$				
(ii) $T(n) = T\left(\frac{n}{2}\right) + n^3$				
(b) Solve the given equations using iterative method.	6	L3	2	1,2,3
$T(n) = 3T\left(\frac{n}{4}\right) + n$				

OR

(P.T.O.)

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III. (a)	Solve the given equations using recursive tree method.	6	L3	2	1,2,3
	(i) $T(n) = 2T\left(\frac{n}{2}\right) + n^2$				
	(ii) $T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{4}\right) + T\left(\frac{n}{8}\right) + n$				
(b)	Differentiate between greedy and dynamic programming.	6	L2	4	3
IV.	Explain the analysis of Quick sort algorithm with an example and analyze its best case and worst case complexity.	12	L4	3	3
<b>OR</b>					
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 backtracking with an example.	12	L1	5	3
<b>OR</b>					
VII.	Given a chain of four matrices. The matrices have size $5 \times 4$ , $4 \times 6$ , $6 \times 2$ , $2 \times 7$ . Evaluate M [1, 4] using dynamic programming approach of Matrix chain multiplication.	12	L3	3	3
VIII.	Discuss the approximation algorithm for Graph coloring.	12	L1	6	3,10
<b>OR</b>					
IX.	Discuss the approximation algorithm for TSP in detail with an example.	12	L1	6	3,10

Bloom's Taxonomy Levels

L1 = 50%, L2 = 17%, L3 = 22%, L4 = 11%

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