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BTECH
(SEM V) THEORY EXAMINATION 2023-24
DESIGN & ANALYSIS OF ALGORITHMS

TIME: 3 HRS

M.MARKS: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 7 = 14

a)	How do you compare the performance of various algorithms?
b)	Define feasible and optimal solution.
c)	Difference between Complete Binary Tree and Binary Tree?
d)	Difference between Greedy Technique and Dynamic programming.
e)	Differentiate between Backtracking and Branch and Bound Techniques.
f)	Explain application of graph coloring problem.
g)	Solve the following By Recursion Tree Method $T(n) = n + T(n/5) + T(4n/5)$

SECTION B

2. Attempt any three of the following:

7 x 3 = 21

a)	What do you mean by stability of a sorting algorithm? Explain its application.
b)	Provide an overview of Red-Black trees, explaining their properties and how they are used in data structures.
c)	Define spanning tree. Write Kruskal's algorithm for finding minimum cost spanning tree.
d)	What is dynamic programming? How is this approach different from recursion? Explain with example.
e)	What is the application of Fast Fourier Transform (FFT)? Also write the recursive algorithm for FFT.

SECTION C

3. Attempt any one part of the following:

7 x 1 = 7

(a)	Explain the Shell sort algorithm. Discuss its key features, advantages, and limitations.
(b)	Discuss the Quick sort algorithm. Explain its partitioning and recursive sorting steps.

4. Attempt any one part of the following:

7 x 1 = 7

(a)	Explain properties of Binomial Heap in Write and algorithm to perform uniting two Binomial Heaps. And also to find Minimum Key.
(b)	Explain the characteristics of B-trees and discuss their applications in database systems.

5. Attempt any one part of the following:

7 x 1 = 7

(a)	Explain the application of Divide and Conquer in solving the Convex Hull problem.
(b)	Discuss how Divide and Conquer is employed in matrix multiplication algorithms.

6. Attempt any one part of the following:

7 x 1 = 7

(a)	Give Floyd warshall algorithm to find the shortest path for all pairs of vertices in a graph. Give the complexity of the algorithm. Explain with example.
(b)	Explain how the Branch and Bound algorithm is applied to solve the Travelling Salesman Problem.

7. Attempt any one part of the following:

7 x 1 = 7

(a)	Describe in detail Knuth-Morris-Pratt string matching algorithm. Compute the prefix function π for the pattern ababbabbabbabbabb when the alphabet is $\Sigma = \{a, b\}$.
(b)	Explain the Theory of NP-Completeness. Discuss the classes P and NP, the concept of polynomial time, and the implications of NP-completeness in algorithmic complexity theory.