Krantiguru Shyamji Krishna Verma Kachchh University, Bhuj
Master of Science (Computer Applications & Information Technology)
Semester: IV

Paper Code: CECS408	Total Credit :04
Title of Paper: Advanced Data Structures and Algorithms	**Total Marks :** 70
	Time : 3 Hrs

Unit	Description	Weighting
I	**Priority Queues and Heaps** What is a Priority Queue? Priority Queue ADT, Priority Queue, Applications, Priority Queue Implementations, Heaps and Binary Heaps, Binary Heaps, Heapsort, Priority Queues [Heaps]: Problems & Solutions **Disjoint Sets ADT** Introduction, Equivalence Relations and Equivalence Classes, Disjoint Sets ADT, Applications, Tradeoffs in Implementing Disjoint Sets ADT, Fast UNION Implementation (Slow FIND), Fast UNION Implementations (Quick FIND), Summary, Disjoint Sets: Problems & Solutions	20%
II	**Sorting** What is Sorting? Why is Sorting Necessary? Classification of Sorting Algorithms, Other Classifications, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merge Sort, Heap Sort, Quick Sort, Tree Sort Comparison of Sorting Algorithms, Linear Sorting Algorithms, Counting Sort, Bucket Sort (or Bin Sort), Radix Sort, Topological Sort, External Sorting, Sorting: Problems & Solutions **Searching** What is Searching? Why do we need Searching? Types of Searching Unordered Linear Search, Sorted/Ordered Linear Search, Binary Search, Comparing Basic Searching Algorithms, Symbol Tables and Hashing, String Searching Algorithms, Searching: Problems & Solutions	20%
III	**Graph Algorithms** Introduction, Glossary, Applications of Graphs, Graph Representation Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree, Graph Algorithms: Problems & Solutions **Selection Algorithms [Medians]** What are Selection Algorithms? Selection by Sorting, Partition-based Selection Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest Elements in Sorted Order Selection Algorithms: Problems & Solutions	20%
IV	**Symbol Tables** Introduction, What are Symbol Tables? Symbol Table Implementations, Comparison Table of Symbols for Implementations **Hashing** What is Hashing? Why Hashing? HashTable ADT, Understanding Hashing Components of Hashing, Hash Table, Hash Function, Load Factor, Collisions, Collision Resolution Techniques, Separate Chaining, Open Addressing, Comparison of Collision Resolution Techniques, How Hashing Gets O(1) Complexity? Hashing Techniques, Problems for which Hash Tables are not suitable, Bloom Filters, Hashing: Problems & Solutions **String Algorithms** Introduction, String Matching Algorithms, Brute Force Method,	20%

	Robin-Karp String Matching Algorithm, String Matching with Finite Automata, KMP Algorithm, Boyce-Moore Algorithm, Data Structures for Storing Strings, Hash Tables for Strings, Binary Search Trees for Strings, Tries, Ternary Search Trees,Comparing BSTs, Tries and TSTs,Suffix Trees, Strings: Problems & Solutions	
V	**Dynamic Programming** Introduction, What is Dynamic Programming Strategy? Properties of Dynamic Programming Strategy, Can Dynamic Programming Solve All Problems? Dynamic Programming Approaches, Examples of Dynamic Programming Algorithms, Understanding Dynamic Programming, Longest Common Subsequence, Dynamic Programming: Problems & Solutions **Complexity Classes** Introduction, Polynomial/Exponential Time, What is a Decision Problem? Decision Procedure, What is a Complexity Class? Types of Complexity Classes Reductions, Complexity Classes: Problems & Solutions	20%
Basic Text & Reference Books :-		
1.	Data Structures And Algorithmic Thinking With Python, Narasimha Karumanchi, CareerMonk Publications	
2.	Introduction to Algorithms, Thomas H. Cormen, Prentice-Hall of India	