Paper ID: 44607

Code: IT607 **Paper:** Data Structure and Algorithm

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INSTRUCTIONS TO PAPER SETTERS:

Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks

Course Outcomes:

CO 1	To be able to understand the difference between data structure and structured data with few preliminary examples such as stack, queue and link list
CO 2	To be able to model different types of trees, balance trees and graphs
CO 3	To have a knowledge and ability to analyze the time/ space complexity and understanding different kinds of searching/ sorting algorithms
CO 4	To get equipped with the knowledge of dynamic paradigm, greedy paradigm and idea of NP complete problems.

Course outcomes mapping with Programme specific outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO1 0	PO1 1	PO12
CO1	3	3	3	3	3	-	3	2	-	-	2	1
CO2	3	3	3	3	3	-	3	2	-	-	2	1
CO3	3	3	3	3	3	-	3	2	-	-	2	1
CO4	3	3	3	3	3	-	3	2	-	-	2	1

UNIT – I

Introduction to data structures, arrays and its applications, Sparse Matrix, singly linked lists, doubly linked lists, circular list, Implementation of stacks and queues using arrays and linked lists, circular queues, applications of stack and queue.

UNIT – II

Trees, Binary Tree, terminology, representation, Binary Search tree (insertion, deletion and different traversals techniques), AVL Trees, B tree, B+ trees, Data Structure for Sets, disjoint sets implementation Graph Algorithms: Terminology, Representation, Graph traversals, Breadth-First Search, Depth-First Search, Shortest Paths, Minimum Spanning Trees.

UNIT – III

Notion of Algorithm, Growth of functions, Use of Big O , Θ etc. in analysis, Summations, Recurrences: The substitution method, The iteration method, The master method,
Searching Techniques: Sequential Search Binary Search, hashing

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Sorting techniques: Insertion Sort, Divide and conquer Paradigm of Problem solving (Merge sort, Quick Sort), Priority Queues implementation using Heap, sorting in linear time (count sort, radix sort, bucket sort).

UNIT – IV

Design Techniques with examples: Dynamic Programming, Greedy Algorithms, Concepts of P, NP and NP hard and NP complete Class Problems; NP-completeness and Reducibility, Introduction to the concepts of Approximation Algorithms.

Textbook(s):

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Pvt. Ltd. (Originally MIT Press); Third edition (February 2, 2010)
2. Ellis Horowitz, Sartaj Sahni, Anderson-Freed, Fundamentals of Data Structures in C, Second Edition, 2008, University Press
3. Ellis Horowitz, Sartaj Sahni, S. Rajeshkaran, Fundamentals of Computer algorithm, University Press, Jan 2008,

References:

1. R.Kruse, C.L. Tondo, BP Leung, Shashi M, "Data Structures and Program Design in C", Second Edition, Pearson Education.
2. Jon Kleinberg and Eva Tardos , "Algorithm Design", Pearson Edition, 2006.
3. Sanjoy Dasgupta , . "Algorithms", Christos Papadimitriou Umesh Vazirani TMH
4. A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, "DataStructures Using C", Pearson Education
5. B.W. Kernighan, Dennis M.Ritchie, "The C Programming Language", Pearson Education
6. S. Sahni and E. Horowitz, "Data Structures", Galgotia Publications.
7. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
8. Kamthane, "Introduction to Data Structure in C", Pearson Education
9. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education
10. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education
11. B.A. Forouzan and R.F. Gilberg, "Computer science, a structured programming approach using C" , Third edition, Cengage Learning.
12. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis Of Computer Algorithms", Pearson Education
13. Seymour Lipschutz, Data Structures, Schaum Series, Mc Graw Hills

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