Paper Code(s): CIC-209	**L**	**P**	**C**
Paper: Data Structures	**4**	**-**	**4**

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To introduce basics of Data structures (Arrays, strings, linked list etc.)
2.	To understand the concepts of Stacks, Queues and Trees, related operations and their implementation
3.	To understand sets, heaps and graphs
4.	To introduce various Sorting and searching Algorithms

Course Outcomes (CO)

CO 1	To be able to understand difference between structured data and data structure
CO 2	To be able to create common basic data structures and trees
CO 3	To have a knowledge of sets, heaps and graphs
CO 4	To have basic knowledge of sorting and searching algorithms

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	3	-	-	-	2	2	2	3
CO 2	3	2	2	2	3	-	-	-	2	2	2	3
CO 3	3	2	2	2	3	-	-	-	2	2	2	3
CO 4	3	2	2	2	3	-	-	-	2	2	2	3

UNIT – I

Overview of data structure, Basics of Algorithm Analysis including Running Time Calculations, Abstract Data Types, Arrays, Arrays and Pointers, Multidimensional Array, String processing, General Lists and List ADT, List manipulations, Single, double and circular lists. Stacks and Stack ADT, Stack Manipulation, Prefix, infix and postfix expressions, recursion. Queues and Queue ADT, Queue manipulation.

UNIT – II

Sparse Matrix Representation (Array and Link List representation) and arithmetic (addition, subtraction and multiplication), polynomials and polynomial arithmetic.
Trees, Properties of Trees, Binary trees, Binary Tree traversal, Tree manipulation algorithms, Expression trees and their usage, binary search trees, AVL Trees, Heaps and their implementation, Priority Queues, B-Trees, B* Tree, B+ Tree

UNIT – III

Sorting concept, order, stability, Selection sorts (straight, heap), insertion sort (Straight Insertion, Shell sort), Exchange Sort (Bubble, quicksort), Merge sort (External Sorting) (Natural merge, balanced merge and

polyphase merge). Searching – List search, sequential search, binary search, hashing methods, collision resolution in hashing.

UNIT – IV

Disjoint sets representation, union find algorithm, Graphs, Graph representation, Graph Traversals and their implementations (BFS and DFS). Minimum Spanning Tree algorithms, Shortest Path Algorithms

Textbook(s):

1. Richard Gilberg , Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning, Oct 2004
2. E. Horowitz, S. Sahni, S. Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, Silicon Press (US), 2007.

References:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson, September, 1996
2. Robert Kruse, "Data Structures and Program Design in C", 2nd Edition, Pearson, November, 1990
3. Seymour Lipschutz, "Data Structures with C (Schaum's Outline Series)", McGrawhill, 2017
4. A. M. Tenenbaum, "Data structures using C". Pearson Education, India, 1st Edition 2003.
5. Weiss M.A., "Data structures and algorithm analysis in C++", Pearson Education, 2014.