M.Sc. (Computer Science)
Semester-2
MSCS-2-02T: Data Structure & Algorithms

Total Marks: 100
External Marks: 70
Internal Marks: 30
Credits: 4
Pass Percentage: 40%

INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any ten questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt any two questions each from the sections A and B of the question paper and any ten short q questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

Course: Data Structure & Algorithms	
Course Code: MSCS-2-02T	
Course Outcomes (COs) After the completion of this course, the students will be able to:	
CO1	Understand basic data structures such as arrays, linked lists, stacks and queues.
CO2	Solve problem involving graphs, trees and heaps.
CO3	Apply stack for evaluation of arithmetic expressions, and conversion from infix to post fix and recursion.
CO4	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.
CO5	Design algorithm in context of space and time complexity and apply asymptotic notation.

SECTION-A

Unit I: Data Structure: Introduction to data structure and algorithm, various phases of algorithms, Pointers, working with pointers, pointers and function, structure, union, classification of data structures Algorithm analysis: Time space trade off algorithms and Big O notation.

Unit II: Arrays: Introduction, one dimensional and multidimensional arrays, memory representation of arrays, operations on arrays, sparse arrays and sparse matrices and their implementation, Advantages and limitation of arrays.

Unit III: Linked List: Introduction; operation on linked list, circular linked list, doubly linked list, header linked list, implementation of linked list, application of linked lists.

Unit IV: Stacks: Introduction; array representation of stacks, Operation on stacks; Linked representation of stacks, Application of stacks: matching parenthesis, evaluation of arithmetic expressions, and conversion from infix to post fix, recursion.

SECTION-B

Unit V: Queues: Introduction, operation on queues, linked representation of queue, Applications of queues, circular queue, memory representation of queues, priority queues, Multiple queues.

Unit VI: Trees: Introduction; Binary Tree; Complete Binary Trees, Extended Binary Trees, representation of binary trees in the memory, traversing a binary tree, Binary Search Tree, Operations on Binary Search Tree; Balanced Trees- AVL; B- Trees; Heap, Applications of trees.

Unit VII: Graphs: Introduction Graph: Graph terminology, Memory Representation of Graphs: adjacency matrix representation of graphs, adjacency list or linked representation of graphs, graph traversal algorithms, Operations performed on graphs.

Unit VIII: Searching: Linear Search, Binary Search, Fibonacci Search, Sorting: Selection Sort, Insertion Sort, Merge Sort, Bucket Sort, Radix Sort, Quick Sort and Heap Sort.

Reference Books:

- A. Tanenbaum, Y. Lanhgsamand A. J. Augenstein, “Data Structures Using C”, PHI.
- Loomis, Marry, “Data Management and File Structures”, PHI
- Seymour Lipschultz, “Theory and Practice of Data Structures”, Tata McGraw-Hill.
- E. Horowitz and S. Sahni, “Data Structures with Pascal”, Galgotia.
- M. J. Folk, B. Zoellick, G Riccardi, “File Structures”, Pearson Education.