University School of Automation and Robotics
GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
East Delhi Campus, Surajmal Vihar
Delhi - 110092

Paper Code: ARD 211	**L**	**T/P**	**Credits**
Subject: Data Structures	4	-	4

Marking Scheme

1. Teachers Continuous Evaluation: 25 Marks
2. End Term Theory Examination: 75 Marks

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 75**

1. There should be 9 questions in the end term examination question paper
2. 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 15 marks.
3. 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 15 marks.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes:

CO1:	Ability of students to implement the basic knowledge about components and layout of linkages in the assembly of a system/machine in terms of kinematics and dynamics.
CO2:	Ability of students to implement knowledge of the principles for analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
CO3:	Ability of students to utilize the motion resulting from a specified set of linkages; design few linkage and cam mechanisms for specified output motions.
CO4:	Ability of students to utilize basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: Low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	1	-	-	-	-	-	1	2
CO2	2	3	3	3	1	-	-	-	-	-	1	2
CO3	2	3	3	3	1	-	-	-	-	-	2	3
CO4	3	3	3	3	2	-	-	-	-	-	2	3

Unit I **[8]**

Abstract Data Types Abstract Data Types (ADTs) , ADTs and classes , introduction to OOP , classes in Python , inheritance , namespaces , shallow and deep copying, Introduction to analysis of algorithms , asymptotic notations , recursion , analyzing recursive algorithms

Unit II **[10]**

Linear Structures: List ADT , array-based implementations , linked list implementations , singly linked lists , circularly linked lists , doubly linked lists , applications of lists , Stack ADT , Queue ADT , double ended queues

Unit III **[10]**

Sorting And Searching: Bubble sort , selection sort , insertion sort , merge sort , quick sort , linear search , binary search , hashing , hash functions , collision handling , load factors, rehashing, and efficiency

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Unit IV **[12]**

Tree Structures: Tree ADT , Binary Tree ADT , tree traversals , binary search trees , AVL trees , heaps, multiway search trees

Graph Structures: Graph ADT , representations of graph , graph traversals , DAG , topological ordering , shortest paths , minimum spanning trees

Text Books:

1. Gilberg, R. F., & Forouzan, B. A. (2001). *Data structures*: A pseudocode approach with C++. Brooks/Cole Publishing Co..
2. Aho Alfred, V., Hopcroft John, E., Ullman Jeffrey, D., Aho Alfred, V., Bracht Glenn, H., Hopkin Kenneth, D., ... & Johnson, C. A. (1983). *Data structures and algorithms*. USA: Addison-Wesley.

References:

1. Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2022). *Introduction to algorithms*. MIT press.
2. Horowitz, E. (1978). *Fundamentals of computer algorithms*. Galgotia publications.

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