



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

Paper Code: ARA 210

Subject: OOPS and Data Structures

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3

T/P
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Credits
3

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 utilize concepts of abstract data types.
CO2:	Ability of students to design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications.
CO3:	Ability of students to design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.
CO4:	Ability of students to practically implement knowledge gained for computing graph problems and implement efficient graph algorithms to solve them.

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	3	1	-	-	3	1	2	3
CO2	3	3	3	3	3	1	-	-	3	1	2	3
CO3	3	3	3	3	3	1	-	-	3	1	2	3
CO4	3	3	3	3	3	1	-	-	3	1	2	3

Unit I

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 [10]

Unit II

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 [10]

Unit III

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 [10]

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Unit IV

Tree Structures Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multiway search trees [10]

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.

Reference Books

1. Horowitz, E. (1978). *Fundamentals of computer algorithms*. Galgotia publications.
2. Tanenbaum, *Data Structures using C*, Pearson/PHI.
3. Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2022). *Introduction to algorithms*. MIT press
4. Sharma, A. K. (2013). *Data Structures using C*, 2nd edition. Pearson Education India.
5. Ellis Horowitz and Sartaz Sahani, *Fundamentals of Computer Algorithms*, Computer Science Press

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