5 Years Integrated M.Sc.(IT) – Semester 3
Practical Problem
IT4002 – Data Structures

Practical No: 1	**Enrollment No:**
Practical Problem	1. Write a program to insert five elements into array and display it. 2. Write a program to find second highest value from array elements. 3. Write a program to take array of ten elements. Insert values into all elements in array. Display sum and average of array elements. 4. Write a program to insert five different subjects' marks of student and display result with total, percentage and class [Distinction, first class, second class, pass class, fail]. 5. Write a program to input element at the position of user's choice. 6. Write a program to input n elements into array and display it. n must be any positive number. 7. Write a program to take array of n elements. Insert Values in it and count the total number of odd values, even values and zero in array and display it. 8. Write a program to find positions of inputted value from array. 9. Write a program to delete an element of array at position of user choice. 10. Write a program to input old value and new value. Find old value from array and replace with new value.
Objective(s)	Student can get the knowledge about the use of Array
Pre-requisite	Basics of C++
Duration for completion	3 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO1: Identify essential Data Structures and analyse the complexity of algorithms and identify the optimized algorithm. CO2: Recognize problem properties where Arrays, stacks, queues, and deques are appropriate data structures.
Solution must	Source Code, Sample Calculation and Implementation must be using

contain	Class
Nature of submission	Handwritten
Post Laboratory questions	1. Which are the operations are performed in an array? 2. Which formula is used to calculate address in one-dimensional array? *3.* What are the disadvantage of an array? *4.* What is ADT?

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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Practical No: 2	**Enrollment No:**
Practical Problem	1. Write a program to search value in array. 2. Write a program to take array of 16 elements. Insert only binary digits into an array and display its equivalent decimal number. Example: Input: 0000000000010100 Output: 20 3. Write a program to insert string. Display each character in different lines. 4. Write a program to insert string and display the length of string. 5. Write a program to insert string and display total number of words of the string. 6. Write a program to insert string and print in reverse order. 7. Write a program to insert string and character. Display index of the first occurrence of the character in string. 8. Write a program to insert string and convert it into upper case and display it. 9. Write a program to insert string and display total number of capital alphabet, small alphabet, digits and special symbol. 10. Write a program to input string and check whether it is palindrome or not.
Objective(s)	Student can get the knowledge about the use of Array
Pre-requisite	Basics of C++
Duration	3 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO1: Identify essential Data Structures and analyse the complexity of algorithms and identify the optimized algorithm. CO2: Recognize problem properties where Arrays, stacks, queues, and deques are appropriate data structures.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. What is an array? 2. What is the use of index? 3. How many elements are there in array D[1:35]? 4. If base address of A[-4:17] is 110 then what is address of

	A[9]?

Assessment		
	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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Practical No: 3	**Enrollment No:**
Practical Problem	1. Write a program to input string and count the occurrence of each character in it. 2. Write a program to insert string and display in following pattern. Input String is: HELLO H H E H E L H E L L H E L L O 3. Write a program to insert string and display in following pattern. Input String is: HELLO H H E H E L H E L L H E L L O 4. Write a program to insert string and display in following pattern. Input String is: HELLO H H E H E L H E L L H E L L O 5. Write a program to input 3X3 matrix. Display it's in proper matrix format. 6. Write a program to input 3X3 matrix. Display diagonal elements of matrix and sum of its values. 7. Write a program to input 3X3 matrix. Display transpose of a matrix. 8. Write a program to input 2 matrices and display the addition matrix of both. 9. Write a program to input 2 matrices and display the multiplication matrix of both. 10. Write a program to implement sparse matrix.

Objective(s)	Student can get the knowledge about the use of Array
Pre-requisite	Basic of C++
Duration for completion	4 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO1: Identify essential Data Structures and analyse the complexity of algorithms and identify the optimized algorithm. CO2: Recognize problem properties where Arrays, stacks, queues, and deques are appropriate data structures.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. How many elements are there in A[3][2]? 2. What is row major order? *3.* What is column major order? *4.* Which data structure is used to store finite number of same type?

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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Practical No: 4	**Enrollment No:**
Practical Problem	1). Write a program to implement stack-using array. Following operation should be performed: A. Insert element (Push) B. Remove element (Pop) C. Display 2). Write a program to implement stack using student class. Student class conations property like id, name and marks. Following operation should be performed: A. Insert Student (Push) B. Remove Student (Pop) C. Display (Note: Program should be menu driven)
Objective(s)	Student can get the knowledge about the use of Stack
Pre-requisite	Basics of C++
Duration for completion	4 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO1: Identify essential Data Structures and analyse the complexity of algorithms and identify the optimized algorithm. CO2: Recognize problem properties where Arrays, stacks, queues, and deques are appropriate data structures.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. What is stack? 2. What is the meaning of push, pop and peep? 3. When stack is said to be overflow? Write condition for he same. 4. List the application of stack.

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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Practical No: 5	**Enrollment No:**
Practical Problem	1). Write a menu driven program to implement following functionality with queue using array: A. Insert element (Enqueue) B. Remove element (Dequeue) C. Display the queue 2). Write a menu driven program to implement following functionality with circular queue using array: A. Insert element (Enqueue) B. Remove element (Dequeue) C. Display the queue 3). Write a menu driven program to implement following functionality with Deque using array: A. Insert element at Front B. Insert element at Rear C. Remove element at Front D. Remove element at Rear E. Display the queue
Objective(s)	Student can get the knowledge about the use of Queue
Pre-requisite	Basics of C++
Duration for completion	6 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO1: Identify essential Data Structures and analyse the complexity of algorithms and identify the optimized algorithm. CO2: Recognize problem properties where Arrays, stacks, queues, and deques are appropriate data structures.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	5. What is queue? 6. When queue is said to be full? 7. When queue is said to be empty? 8. What is the difference between stack and queue?
Assessment	
	Solution achieves the desired / **Viva**

	objective(s)		
Out of Marks	**10**	**5**	
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Practical No: 6	**Enrollment No:**
Practical Problem	1). Write a menu driven program to implement following functionality with Singly Linked List: A. Insert node at first B. Insert node at end of list (append) C. Insert node at user choice position D. Remove node from first E. Remove node from last F. Remove node at user choice position G. Display list 2). Write a menu driven program to implement following functionality with Doubly Linked List: A. Insert node at first B. Insert node at end of list (append) C. Insert node at user choice position D. Remove node from first E. Remove node from last F. Remove node at user choice position G. Display list 3). Write a menu driven program to implement following functionality with circular Linked List: A. Insert node at first B. Insert node at end of list (append) C. Insert node at user choice position D. Remove node from first E. Remove node from last F. Remove node at user choice position G. Display list 4). Write a menu driven program to implement following functionality with Linked Stack: A. Insert node (Push) B. Remove node (Pop) C. Display stack 5). Write a menu driven program to implement following functionality with Linked Queue: A. Insert node (Enqueue) B. Remove node (Dequeue) C. Display Queue
Objective(s)	Student can get the knowledge about the use of Linked List
Pre-requisite	Basics of C++

Duration for completion	7 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO3: Implement Linked Data Structure such as Linked List and Tree.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. What is linked list? 2. What is the need for linked representations of list? 3. What is the drawback of singly linked list? 4. What is dynamic memory allocation?

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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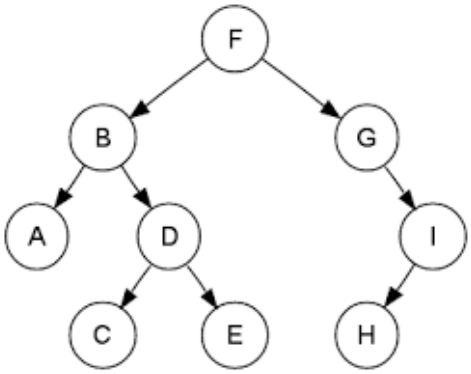
Practical No: 7	**Enrollment No:**
Practical Problem	1). Write a program to implement following tree and perform in-order, pre-order and post-order traversal.  2). Write a menu driven program to implement following functionality with Binary Search Tree. A. Insert node B. Remove node C. Update node D. Display tree using in-order traversal
Objective(s)	Student can get the knowledge about the use of Linked List
Pre-requisite	Basics of C++
Duration for completion	7 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO4: Represent hierarchical organization of information and traversal of information in hierarchical structure like Tree.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. Define tree. 2. Define binary tree. 3. List out type's binary tree. 4. List out different operations you can perform on tree.

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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Practical No: 8	**Enrollment No:**
Practical Problem	1). Write a program to implement selection sort. 2). Write a program to implement insertion sort. 3). Write a program to implement bubble sort. 4). Write a program to implement marge sort. 5). Write a program to implement quick sort.
Objective(s)	Student can get the knowledge about the use of Linked List
Pre-requisite	Basics of C++
Duration for completion	7 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO5: Comprehend various Sorting algorithms including Quick Sort, Merge Sort and Heap Sort.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. Define sort. 2. Which sorting techniques are an example of divide and conquer? 3. Can bubble sort ever perform better than quick sort? 4. What is the time complexity of quick sort?

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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Practical No: 9	**Enrollment No:**
Practical Problem	1). Write a program to implement following linear search technic. A. Array B. Linked List C. Order List D. Binary Search 2). Write a program to implement following non-linear search technic. A. Binary Search Tree B. Binary Tree Search
Objective(s)	Student can get the knowledge about the use of Linked List
Pre-requisite	Basics of C++
Duration for completion	7 hours
PEO(s) to be achieved	PEO2: To provide quality practical skill of tools and technologies to solve industry problems.
PO(s) to be achieved	PO6: Ability to use the techniques, skills and modern tools as necessary for software development.
CO(s) to be achieved	CO6: Identify the appropriate searching technique as and when require.
Solution must contain	Source Code, Sample Calculation and Implementation must be using Class
Nature of submission	Handwritten
Post Laboratory questions	1. Define ordered linear search. 2. Give any one difference between order linear searches and unordered linear search. 3. What are the advantages of binary search over linear search? 4. Write down complexity of worst case and best case in unordered linear search.

Assessment

	Solution achieves the desired objective(s)	**Viva**
Out of Marks	**10**	**5**
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