Jagannath University
Department of Computer Science & Engineering

Lab Manual : **01**
Course Code : **CSE2207**
Course Title : **Data Structures**
Instructor : **Dr. Md. Manowarul Islam, Adjunct Faculty,Department of CSE**

Objective:

The objective of this lab is to provide a fundamental idea of array using C programming. At the end of the lab, students are able to know:

- How to take input into a 1D array.
- How to insert and delete data from a linear array.
- How to sort and reverse a 1D array.
- Understand how to take input into a 2D array and print it.
- Utilize 2D arrays for matrix manipulation and operations.

Lab Tasks

Exercise 1

Write a program to find second maximum and minimum number of an integer array. Show the sample input and output clearly.

Sample Input	Sample Output
17, 4,5,6,2,10	Second Maximum: 10 Second Minimum: 4

Exercise 2

The following algorithm will print the duplicate entry in an integer array.

Write a program in C to find the duplicate number.

ALGORITHM:

- **STEP 1:** START

- **STEP 2:** INITIALIZE arr[]= {1, 2, 3, 4, 2, 7, 8, 8, 3}.
- **STEP 3:** length = sizeof(arr)/sizeof(arr[0])
- **STEP 4:** PRINT "Duplicate elements in given array:"
- **STEP 5:** SET i=0. REPEAT STEP 6 to STEP 9 UNTIL i<length
- **STEP 6:** SET j=i+1. REPEAT STEP 7 and STEP 8 UNTIL i<length
- **STEP 7:** if(arr[i] == arr[j])
  PRINT arr[j]
- **STEP 8:** j=j+1
- **STEP 9:** i+1.
- **STEP 10:** RETURN 0.
- **STEP 11:** END

Sample Input	Sample Output
1, 2, 3, 4, 2, 7, 8, 8, 3	Duplicate elements in given array: 2 3 8

3. Write a program in C to delete an element at desired position from an array.

Sample Input	Sample Output
Input array elements: 10 20 30 40 50 Input position to delete: 2	Array elements: 10, 30, 40, 50

4. Write a program in C to insert element in array at specified position.

Sample Input	Sample Output
Input array elements: 10, 20, 30, 40, 50 Input element to insert: 25 Input position where to insert: 3	Elements of array are: 10, 20, 25, 30, 40, 50

5. Find the elements of an array that are greater than a specific Threshold. Create a new array to store all the elements from the original array that exceed a given threshold.

Sample Input	Sample Output
Input array elements: 10,25,89,50,100	89,50,100

Threshold: 30	

6. Remove duplicate elements from the 1D array and print the modified array.

Sample Input	Sample Output
Input array elements: 10,20,10,30	10,20,30

7. Generate and print the first N elements of the Fibonacci series in a 1D array with initial conditions: *array* [0] =0, *array*[1]=1.

Sample Input	Sample Output
N=8.	0,1,1,2,3,5,8,13.

8. Find if an array contains a subarray (Suppose the Subarray length is 2) with a specific pattern. The subarray pattern is defined as a sequence of two consecutive elements.

Sample Input	Sample Output
Input array elements: 1,2,**5,7,**9,10 Subarray: 5,7 Input array elements: 1,2,3,4,5 Subarray: 1,4	Found Not Found

9. Write a program in C to modify array elements by adding 3 to elements at odd indexes and 2 to elements at even indexes.

Sample Input	Sample Output
Input array elements: 10, 20, 30,40, 50	Elements of array are: 13,22,33,42,53

10. Write a program in C to find the **majority element** in a given 1D array. A **majority element** is an element that appears **more than N/2 times**, where **N** is the size of the array. If no such element exists, print "No Majority Element Found".

Sample Input	Sample Output
Input array elements: 3, 3, 4, 2, 4, 4, 2, 4, 4	Majority Element: 4

11. Write a program in C to find the largest difference (max - min) between any two elements.

Sample Input	Sample Output
Input array elements: 1, 9, 3, 10	Largest difference is 1

12. Write a program in C that moves all zeros in an array to the end while maintaining the order of non-zero elements.

Sample Input	Sample Output
Input array elements: 0, 1, 0, 3, 12	Array after shifting: 1, 3, 12, 0, 0

13. Write a program in C to remove all occurrences of a specific element from the array.

Sample Input	Sample Output
Input array elements: 1, 2, 3, 2, 4, 2 Element to remove: 2	Modified array: 1 3 4

14. Write a program in C to rearrange the elements so that the first element is the largest, the second is the smallest, the third is the second-largest, the fourth is the second-smallest, and so on — alternating between the next largest and the next smallest values. This rearrangement creates a "zig-zag" pattern with high and low values alternating.

Sample Input	Sample Output
Input array elements: 1, 2, 3, 4, 5, 6	Modified array: 6 1 5 2 4 3

15. Write a program in C to find all leaders of an array. A leader is an element that is strictly greater than all the elements to its right. Note that the last element is always considered a leader by definition.

Sample Input	Sample Output
Input array elements: 16, 17, 4, 3, 5, 2	Leaders : 17 5 2

16. Write a program in C to Print all unique pairs of elements whose sum equals a given element.

Sample Input	Sample Output
Input array elements: 1, 5, 7, -1, 5 Element : 6	Pairs : (1,5) (7,-1)

17. Write a program in C to find whether a matrix is symmetric or not.

Sample Input	Sample Output
Input array elements: 1 1 -1 1 2 0 -1 0 5	The Matrix is Symmetric.

18. Write a program in C to find the product of non-Diagonal elements of a matrix.

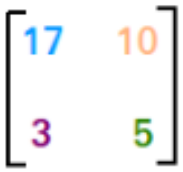
Sample Input	Sample Output
Input array elements: 1 2 3 4 5 6 7 8 9	The product of non-diagonal elements is: 8064

19. Write a program in C to find the transpose of a square matrix.

Sample Input	Sample Output
Input array elements:	

1 2 3 4 5 6 7 8 9	1 4 7 2 5 8 3 6 9

20. Write a program in C to perform matrix addition of two matrices of size *n x n*. Ensure that the program takes input for both matrices and displays the resulting matrix after addition.

Sample Input	Sample Output
Elements of 1st array :  Elements of 2nd array: 	Resulting array after addition: 

21. Write a program in C that takes a 2D array as user input and finds the column with the maximum sum (i.e., identify the column whose sum of elements is the highest among all columns in the array).

Sample Input	Sample Output
1 2 3 4 5 6 7 8 9	3 No. column has the maximum sum which is 18