UCS301 Data Structures
Lab Assignment 2
(Week 2 and Week 3)

1) Implement the Binary search algorithm regarded as a fast search algorithm with run-time complexity of O(log n) in comparison to the Linear Search.

2) Bubble Sort is the simplest sorting algorithm that works by repeatedly swapping the adjacent elements if they are in wrong order. Code the Bubble sort with the following elements:

64	34	25	12	22	11	90

3) Design the Logic to Find a Missing Number in a Sorted Array. Given an array of n-1 distinct integers in the range of 1 to n, find the missing number in it in a Sorted Array
(a) Linear time
(b) Using binary search.

4) String Related Programs

    (a) Write a program to concatenate one string to another string.
    (b) Write a program to reverse a string.
    (c) Write a program to delete all the vowels from the string.
    (d) Write a program to sort the strings in alphabetical order.
    (e) Write a program to convert a character from uppercase to lowercase.

5) Space required to store any two-dimensional array is *number of rows × number of columns*. Assuming array is used to store elements of the following matrices, implement an efficient way that reduces the space requirement.

(a) Diagonal Matrix.
(b) Tri-diagonal Matrix.
(c) Lower triangular Matrix.
(d) Upper triangular Matrix.
(e) Symmetric Matrix

6) Write a program to implement the following operations on a Sparse Matrix, assuming the matrix is represented using a triplet.

(a) Transpose of a matrix.
(b) Addition of two matrices.
(c) Multiplication of two matrices.

7) Let A[1 .... n] be an array of n real numbers. A pair (A[i], A[j]) is said to be an *inversion* if these numbers are out of order, i.e., i < j but A[i]>A[j]. Write a program to count the number of inversions in an array.

8) Write a program to count the total number of distinct elements in an array of length *n*.

Additional Questions

- Write a program to find a saddle point in a two-dimensional array. A saddle point in a numerical array is a number that is larger than or equal to every number in its column, and smaller than or equal to every number in its row.

- https://www.interviewbit.com/problems/spiral-order-matrix-i/

- https://www.interviewbit.com/problems/spiral-order-matrix-ii/