Sardar Vallabhbhai National Institute of Technology, Surat
Department of Artificial Intelligence
Data Structure (AI102)
B.Tech I - II Semester

Assignment-1

Q1: An array is a bitonic array if all integers from index 0 to index i are sorted in ascending order, and all subsequent integers from index i+1 to n-1 are sorted in descending order. Given a bitonic array of n distinct integers, write a C/C++ program to find the maximum integer in the array in O(log(n)) time.

Example:

Input: n = 6 , A[] ={1 2 4 8 7 6}

Output: 8

```c
#include<stdio.h>
int main()
{
    int n,i;
    printf("value of n\n");
    scanf("%d",&n);
    int A[n];
    printf("enter bitonic array elements\n");
    for(i=0;i<n;i++)
    scanf("%d",&A[i]);
    int mid;
    i=0;
    while(i<=n)
    {
        mid=i+n-1;
        if(A[mid]>A[mid-1]&&A[mid]>A[mid+1])
        break;
        else if(A[mid]<A[mid-1]&&A[mid]>A[mid+1])
        n=mid;
        else if(A[mid]>A[mid-1]&&A[mid]<A[mid+1])
        i=mid+1;
    }
    printf("%d hello",A[mid]);
}
```

Q2: Let A[n] be an array of n distinct integers. If i < j and A[i] > A[j], then the pair (i, j) is called an inversion of A. Write a C/C++ program that determines the number of inversions in any permutation on n elements.

Example: A = {4, 1, 3, 2} output is 4

```c
#include<stdio.h>
int main()
{
    int n,i,j;
    printf("value of n\n");
    scanf("%d",&n);
    int A[n];
    printf("enter array elements\n");
    for(i=0;i<n;i++)
    scanf("%d",&A[i]);
    int count=0;
    for(i=0;i<n;i++)
    {
        for(j=0;j<n;j++)
        {
            if((i<j)&&(A[i]>A[j]))
            count++;

        }
    }
    printf("\n%d",count);
}
```

Q3: Write a C program to manage the details of students using an array of structures. The program should:

1. Accept the number of students (n) from the user.
2. For each student, input the following details:
   - Roll number (integer)
   - Name (string)
   - Marks (floating-point value)
3. Store the details of all students in an array of structures.
4. Display the details of all students in a formatted way.

```c
#include <stdio.h>
#include <string.h>
struct Student_details {
    int roll_no;
    char name[50];
    float marks;
};

int main()
{
    int n,i;
    printf("no of students\n");
    scanf("%d",&n);
    struct Student_details student[n];
    for(i=0;i<n;i++)
    {
        printf("enter student roll no\n");
        scanf("%d",&student[i].roll_no);
        printf("\nenter student name\n");
        scanf(" %[^\n]",student[i].name);
        printf("\nenter student marks\n");
        scanf("%f",&student[i].marks);
    }
    for(i=0;i<n;i++)
    {
        printf(" student roll no\n");
        printf("%d",student[i].roll_no);
        printf("\nstudent name\n");
        printf("%s",student[i].name);
        printf("\nstudent marks\n");
        printf("%f",student[i].marks);
    }
}
```