Name : Shivendranath Karsade

Reg. no. : 2021bit504

DAA Practical No 3

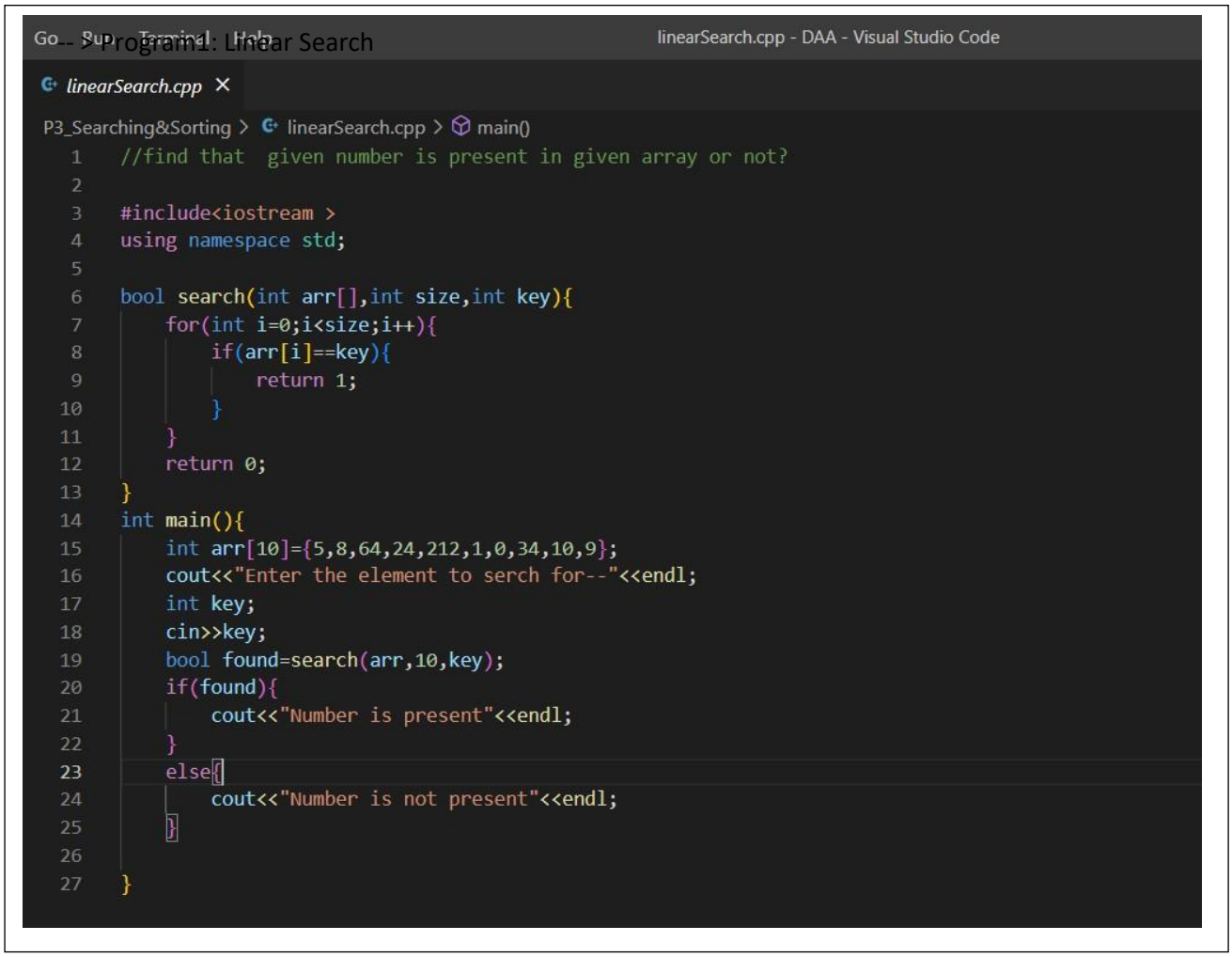
Aim: Write C/C++ code to implement concept of

1)Searching Algorithm (Any three)

2)Sorting Algorithm (Any Three)

1)Searching Algorithm

Program1: Linear Search



-- >Program2: Binary Search

Go Run Terminal Help BinarySearch.cpp - DAA - Visual Studio Code

BinarySearch.cpp

P3_Searching&Sorting > BinarySearch.cpp > main(void)

```cpp
// C++ program to implement recursive Binary Search
#include <bits/stdc++.h>
using namespace std;

// A recursive binary search function. It returns location of x in given array arr[l..r] is present,otherwise -1

int binarySearch(int arr[], int l, int r, int x)
{
    if (r >= l) {
        int mid = l + (r - l) / 2;
        // If the element is present at the middle itself
        if (arr[mid] == x)
            return mid;
        // If element is smaller than mid, then it can only be present in left subarray
        if (arr[mid] > x)
            return binarySearch(arr, l, mid - 1, x);

        // Else the element can only be present in right subarray
        return binarySearch(arr, mid + 1, r, x);
    }
    // We reach here when element is not present in array
    return -1;
}

int main(void)
{
    int array[] = { 2, 3, 4, 10, 40 ,50,0,78,100};
    int x;
    cout<<"Enter the element which you want to search"<<endl;
    cin>>x;
    int n = sizeof(array) / sizeof(array[0]);
    int result = binarySearch(array, 0, n - 1, x);
    (result == -1)
        ? cout << "Element is not present in array"
        : cout << "Element is present at index " << result;
    return 0;
}
```

Output:

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\DELL\Desktop\DAA> cd "c:\Users\DELL\Desktop\DAA\P3_Searching&Sorting"
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting> & .\"BinarySearch.exe"
Enter the element which you want to search
78
Element is present at index 7
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting> & .\"BinarySearch.exe"
Enter the element which you want to search
250
Element is not present in array
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting>
```

-- >Program 3: Meta Binary Search

Go Run Terminal Help metaBinarySearch.cpp - DAA - Visual Studio Code

metaBinarySearch.cpp

P3_Searching&Sorting > metaBinarySearch.cpp > ...

```cpp
// Meta Binary Search also called as one sided Binary Search.

#include <iostream>
#include <cmath>
#include <vector>
using namespace std;
// Function to show the working of Meta binary search
int bsearch(vector<int> A, int key_to_search)
{
    int n = (int)A.size();
    // Set number of bits to represent largest array index
    int lg = log2(n-1)+1;
    int pos = 0;
    for (int i = lg ; i >= 0; i--) {
        if (A[pos] == key_to_search)
            return pos;

        // Incrementally construct the index of the target value
        int new_pos = pos | (1 << i);

        // find the element in one direction and update position
        if ((new_pos < n) && (A[new_pos] <= key_to_search))
            pos = new_pos;
    }

    // if element found return pos otherwise -1
    return ((A[pos] == key_to_search) ? pos : -1);
}

int main(void){

    vector<int> A = { -2, 10, 100, 250, 32315 };
    cout << bsearch(A, 10) << endl;

    return 0;
}

```

Output:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS C:\Users\DELL\Desktop\DAA> cd "c:\Users\DELL\Desktop\DAA\P3_Searching&Sorting"
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting> & .\"metaBinarySearch.exe"
1
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting>
```

2)Sorting Algorithms

-- >Program 1: Selection Sort

Go Run Terminal Help SelectionSort.cpp - DAA - Visual Studio Code

SelectionSort.cpp

P3_Searching&Sorting > SelectionSort.cpp > main()

```cpp
#include<iostream>
using namespace std;
int main(){
    int i,j,num;
    int p;
    int temp;
    int min;
    int arr[10];
    cout<<"Enter the number of elements:"<<endl;
    cin>>num;
    cout<<"Enter the elements:"<<endl;

    for(int i=0;i<num;i++){
        cin>>arr[i];

    }
    for(i=0;i<num-1;i++){
        min=arr[i];
        p=i;
        for(j=i+1;j<num;j++){
            if(min>arr[j]){
                min=arr[j];
                p=j;
            }
        }
        temp=arr[i];
        arr[i]=arr[p];
        arr[p]=temp;
    }
    cout<<"Sorted elements : "<<endl;
    for(int i=0;i<num;i++){
        cout<<arr[i]<<" ";
    }
    return 0;
}
```

Output:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS C:\Users\DELL\Desktop\DAA> cd "c:\Users\DELL\Desktop\DAA\P3_Searching&Sorting"
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting> & .\"SelectionSort.exe"
Enter the number of elements:
4
Enter the elements:
8 10 45 0
Sorted elements :
0 8 10 45
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting>
```

-->Program 2: Bubble Sort

Go Run Terminal Help BubbleSort.c - DAA - Visual Studio Code

BubbleSort.c

P3_Searching&Sorting > BubbleSort.c > ...

```c
//Bubble Sort
#include <stdio.h>
int main()
{
    int a[100], number, i, j, temp;

    printf("\n Please Enter the total Number of Elements in array : ");
    scanf("%d", &number);

    printf("\n Please Enter the Array Elements : ");
    for(i = 0; i < number; i++)
        scanf("%d", &a[i]);

    for(i = 0; i < number-1; i++)
    {
        for(j = 0; j < number -i - 1; j++)
        {
            if(a[j] > a[j + 1])
            {
                temp = a[j];
                a[j] = a[j + 1];
                a[j + 1] = temp;
            }
        }
    }
    printf("\n List Sorted in Ascending Order:");
    for(i = 0; i < number; i++)
    {
        printf(" %d \t", a[i]);
    }
    printf("\n");
    return 0;

}

```

Output:

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\DELL\Desktop\DAA> cd "c:\Users\DELL\Desktop\DAA\P3_Searching&Sorting"
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting> & .\"BubbleSort.exe"

 Please Enter the total Number of Elements in array : 5

 Please Enter the Array Elements : 40 12 78 5 100

 List Sorted in Ascending Order: 5       12      40      78      100
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting>
```

-->Program 3: Insertion Sort

Go Run Terminal Help InsertionSort.cpp - DAA - Visual Studio Code

InsertionSort.cpp

P3_Searching&Sorting > InsertionSort.cpp > main()

```cpp
#include<iostream>
using namespace std;

int main(){
    int i,j,num;
    int temp;
    int arr[30];
    cout<<"Enter the number of elements:"<<endl;
    cin>>num;
    cout<<"Enter the elements: "<<endl;

    for(int i=0;i<num;i++){
        cin>>arr[i];
    }

    for(int i=0;i<num;i++){
        temp=arr[i];
        j=i-1;

        while((temp<arr[j]) && (j>=0)){
            arr[j+1]=arr[j];
            j=j-1;

        }
        arr[j+1]=temp;
    }
    cout<<"Sorted elements :"<<endl;
    for(i=0;i<num;i++){
        cout<<arr[i]<<" ";
    }

    return 0;
}
```

Output:

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\DELL\Desktop\DAA> cd "c:\Users\DELL\Desktop\DAA\P3_Searching&Sorting"
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting> & .\"InsertionSort.exe"
Enter the number of elements:
5
Enter the elements:
30 40 7 100 70
Sorted elements :
7 30 40 70 100
PS C:\Users\DELL\Desktop\DAA\P3_Searching&Sorting>
```