

EXPERIMENT – 2

AIM: To perform linear search and binary search on an array.

THEORY

LINEAR SEARCH:

A linear search or sequential search is a method for finding an element within a list. It sequentially checks each element of the list until a match is found or the whole list has been searched.

BINARY SEARCH:

Binary search, also known as half-interval search, logarithmic search, or binary chop, is a search algorithm that finds the position of a target value within a sorted array. Binary search compares the target value to the middle element of the array.

PROGRAM 1

Linear search program

Source code:

```
#include <stdio.h>

int main()
{
    int array[100], i, n, search;

    printf("\n\n Syeda Reeha Quasar \n 14114802719 \n group - C7\n\n");

    printf("\n Enter the size of array: \n");

    scanf("%d", &n);

    printf("\n Enter %d array elements: \n", n);
    for (i = 0; i < n; i++)
    {
        scanf("%d", &array[i]);
    }

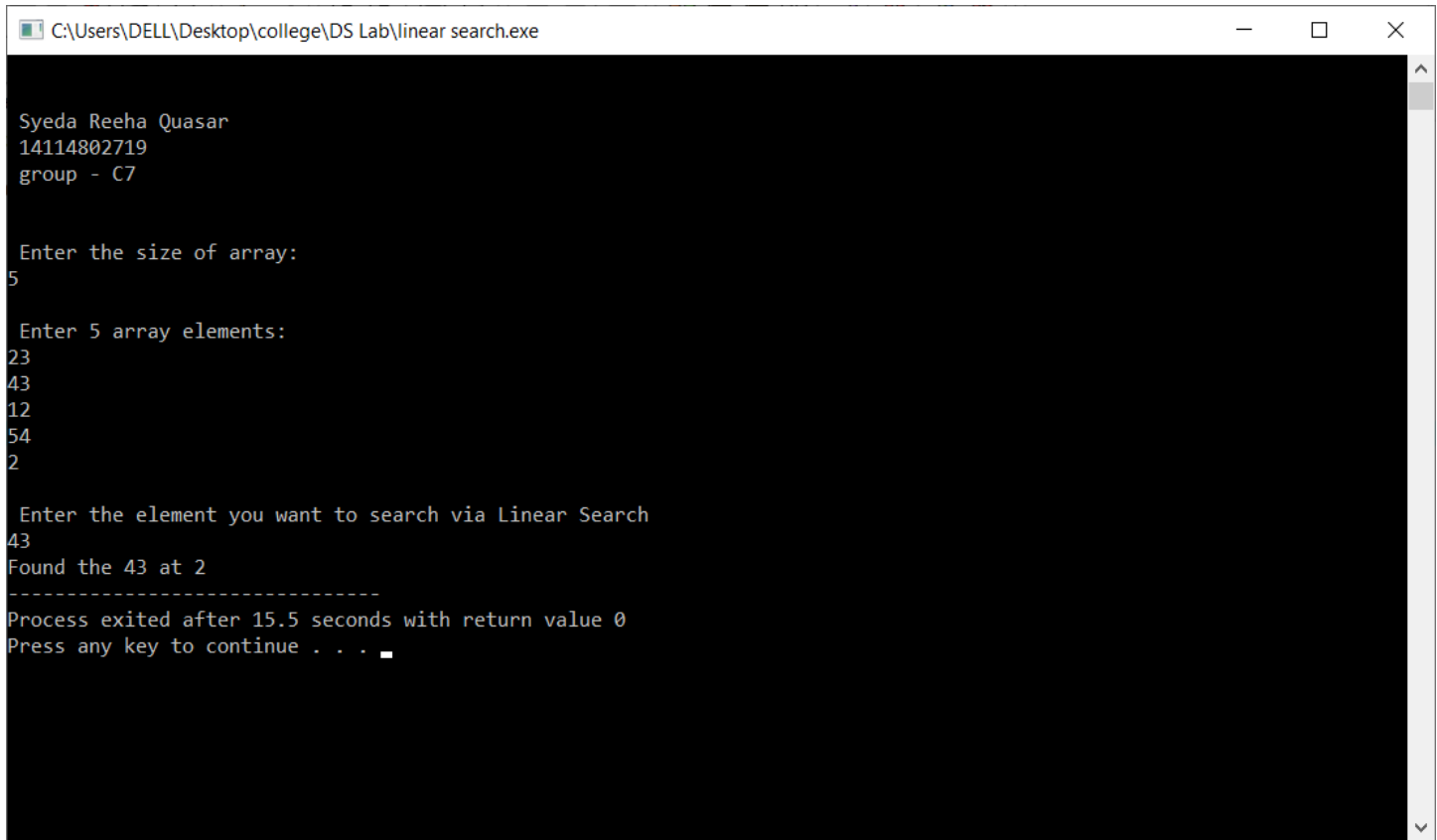
    printf("\n Enter the element you want to search via Linear Search \n");
    scanf("%d", &search);

    for (i = 0; i < n; i++)
    {
        if (array[i] == search)
        {
            printf("Found the %d at %d", search, i+1);

            break;
        }
        if (i == n)
        {
            printf("%d not found in the array", search);
        }
    }

    return 0;
}
```

OUTPUT



```
C:\Users\DELL\Desktop\college\DS Lab\linear search.exe

Syeda Reeha Quasar
14114802719
group - C7

Enter the size of array:
5

Enter 5 array elements:
23
43
12
54
2

Enter the element you want to search via Linear Search
43
Found the 43 at 2
-----
Process exited after 15.5 seconds with return value 0
Press any key to continue . . .
```

PROGRAM 2

Binary search

Source Code:

```
#include <stdio.h>

int main()
{
    int array[100], i, n, search, temp, j;
    printf("\n\n Syeda Reeha Quasar \n 14114802719\n group - C7 \n\n");
    printf("\n Enter the size of array: \n");
    scanf("%d", &n);

    printf("\n Enter %d array elements: \n", n);
    for (i = 0; i < n; i++)
    {
        scanf("%d", &array[i]);
    }

    printf("\n Enter the element you want to search via binary Search \n");
    scanf("%d", &search);

    int first = 0, last = n-1, middle;
    middle = (first + last)/2;
```

```
//sorting the array

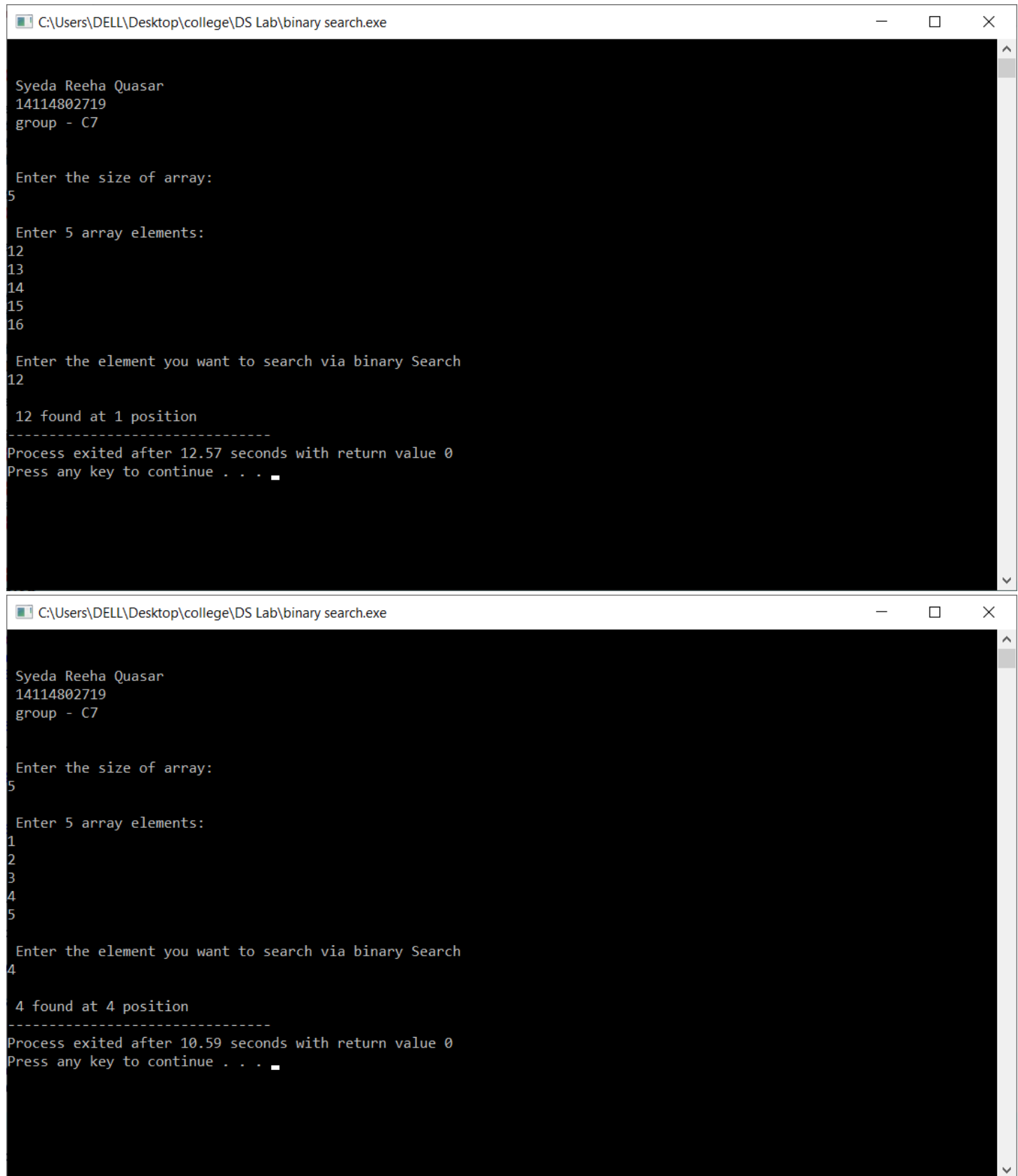
for (i = 0; i < n; i++)
{
    for (j = i+1; j < n; j++)
    {
        temp = array[i];
        array[i] = array[j];
        array[j] = temp;
    }
}

while (first <= last)
{
    if (array[middle] < search)
    {
        first = middle + 1;
    }
    else if (array[middle] == search)
    {
        printf("\n %d found at %d position", search, middle+1);
        break;
    }
    else
    {
        last = middle - 1;
    }
    middle = (first + last)/2;
}

if (first > last)
{
    printf("\n %d is not present in the array \n", search);
}

return 0;
}
```

OUTPUT



The image displays two screenshots of a Windows command prompt window titled "C:\Users\DELL\Desktop\college\DS Lab\binary search.exe".

Top Screenshot:

```
Syeda Reeha Quasar
14114802719
group - C7

Enter the size of array:
5

Enter 5 array elements:
12
13
14
15
16

Enter the element you want to search via binary Search
12

12 found at 1 position
-----
Process exited after 12.57 seconds with return value 0
Press any key to continue . . .
```

Bottom Screenshot:

```
Syeda Reeha Quasar
14114802719
group - C7

Enter the size of array:
5

Enter 5 array elements:
1
2
3
4
5

Enter the element you want to search via binary Search
4

4 found at 4 position
-----
Process exited after 10.59 seconds with return value 0
Press any key to continue . . .
```

Viva Questions

Q1. The sequential search, also known as **LINEAR SEARCH.**

Q2. What is the primary requirement for implementation of binary search in an array?

ANS. The array must be sorted first to be able to apply binary search.

Q3. Is binary search applicable on array and linked list both?

ANS. Yes, it is applicable to both in the case of array we can directly use the sorted array and find the element as shown in the programs above. Binary search is possible on the linked list if the list is ordered and you know the count of elements in list. But While sorting the list, you can access a single element at a time through a pointer to that node i.e. either a previous node or next node.

Q4. What is the principle of working of binary search?

ANS. Binary search works on sorted arrays. Binary search begins by comparing an element in the middle of the array with the target value. If the target value matches the element, its position in the array is returned. If the target value is less than the element, the search continues in the lower half of the array.

Q5. Which searching algorithm is efficient one?

ANS. Binary searching algorithm is more efficient searching algorithm which relies on the elements in the list being sorted. We apply the same search process to progressively smaller sub-lists of the original list, starting with the whole list and approximately halving the search area every time.