Practical – 8

AIM: Implementation and time analysis of Stack and its applications (infix, postfix, prefix).

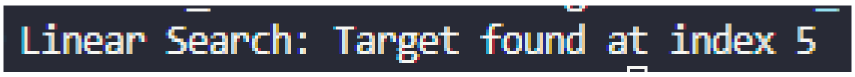
Linear Search

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

int linearSearch(const int arr[], int n, int target)
{
    for (int i = 0; i < n; ++i)
    {
        if (arr[i] == target)
        {
            return i;
        }
    }
    return -1;
}

int main()
{
    const int size = 8;
    int array[size] = {4, 2, 8, 1, 7, 5, 3, 6};
    int target = 5;

    int result = linearSearch(array, size, target);

    if (result != -1)
    {
        cout << "Linear Search: Target found at index " << result << endl;
    }
    else
    {
        cout << "Linear Search: Target not found in the array" << endl;
    }
    return 0;
}
```

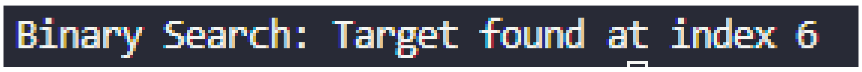
Binary Search

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

int binarySearch(const int arr[], int low, int high, int target) {

    while (low <= high) {
        int mid = low + (high - low) / 2;
        if (arr[mid] == target) {
            return mid;
        } else if (arr[mid] < target) {
            low = mid + 1;
        } else {
            high = mid - 1;
        }
    }
    return -1;
}

int main() {
    const int size = 8;
    int array[size] = {11,22,1,3,4,9,99,44};
    int target = 99;

    int result = binarySearch(array, 0, size - 1, target);

    if (result != -1) {
        cout << "Binary Search: Target found at index " << result <<endl;
    } else {
        cout << "Binary Search: Target not found in the array" <<endl;
    }
    return 0;
}
```

OUTPUT

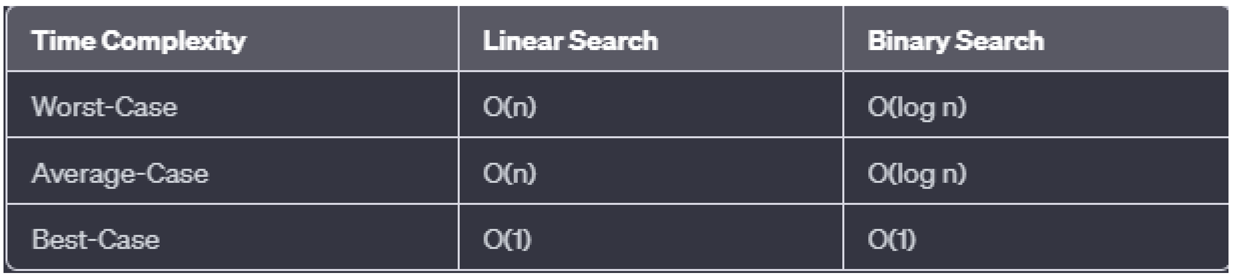


```
Linear Search: Target found at index 5
```



```
Binary Search: Target found at index 6
```

Time analysis



Time Complexity	Linear Search	Binary Search
Worst-Case	O(n)	O(log n)
Average-Case	O(n)	O(log n)
Best-Case	O(1)	O(1)

Applications

Linear Search:

- ➢ Finding an element in an unsorted list.
- ➢ Checking for the presence of an item.
- ➢ Traversal of unordered data.

Binary Search:

- Searching in a sorted list or array.
- Finding the middle element.
- Dictionary-like searches.
- Efficient search in large databases.
- Spell checker in sorted word lists.
- Finding closest values.
- Implementation of data structures.
- Searching in virtual memory.