

CS 5343 Algorithm Analysis and Data Structures

Assignment #1



Submitted by

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Program 1

Code :

```
#include <iostream>
#include <stdlib.h>
using namespace std;

struct Node
{
    int value;
    struct Node* next;
};

void nodelink(struct Node** ref_head, struct Node* a, struct Node* b, struct Node* prevb)
{
    *ref_head = b;
    prevb->next = a;
    struct Node* temp = b->next;
    b->next = a->next;
    a->next = temp;
}

struct Node* recursion(struct Node* head)
{
    if (head->next == NULL)
        return head;
    struct Node* min = head;
    struct Node* prevmin = NULL;
    struct Node* ptr;
    for (ptr = head; ptr->next != NULL; ptr = ptr->next)
    {
        if (ptr->next->value < min->value)
        {
            min = ptr->next;
            prevmin = ptr;
        }
    }
    if (min != head)
        nodelink(&head, head, min, prevmin);
    head->next = recursion(head->next);
    return head;
}

void sort(struct Node** ref_head)
{
    if ((*ref_head) == NULL) return;
```

```

        *ref_head = recursion(*ref_head);
    }
void Insert(struct Node** ref_head, int new_value)
{
    struct Node* new_node =(struct Node*)malloc(sizeof(struct Node));
    new_node->value = new_value;
    new_node->next = (*ref_head);
    (*ref_head) = new_node;
}
void display(struct Node* head)
{
    while (head != NULL)
    {
        cout << head->value << " ";
        head = head->next;
    }
}
int main()
{
    struct Node* head = NULL;

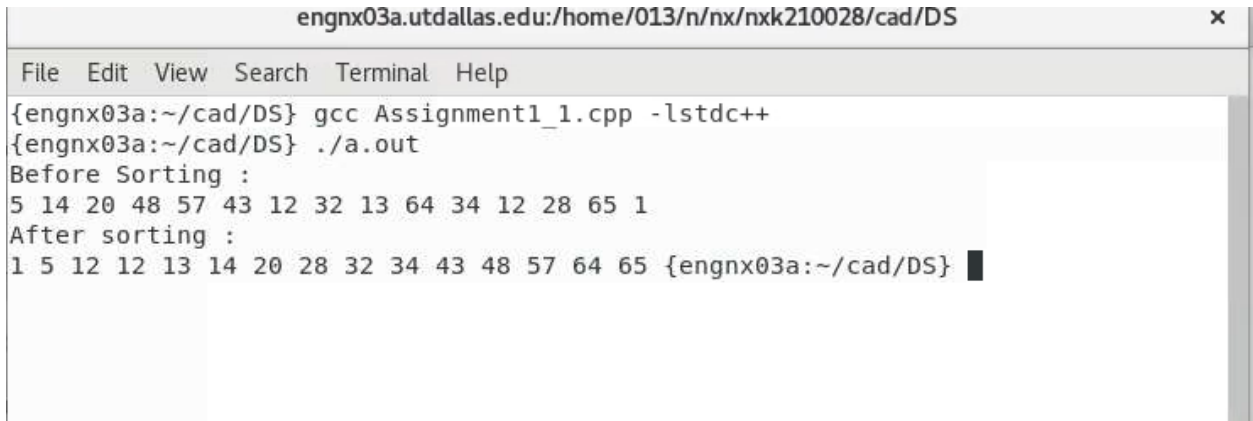
    Insert(&head, 1);
    Insert(&head, 65);
    Insert(&head, 28);
    Insert(&head, 12);
    Insert(&head, 34);
    Insert(&head, 64);
    Insert(&head, 13);
    Insert(&head, 32);
    Insert(&head, 12);
    Insert(&head, 43);
    Insert(&head, 57);
    Insert(&head, 48);
    Insert(&head, 20);
    Insert(&head, 14);
    Insert(&head, 5);

    cout << "Before Sorting : " << endl ;
    display(head);
    sort(&head);
    cout << "\nAfter sorting : " << endl ;
    display(head);
    "\n";

    return 0;
}

```

Program Execution :



```
engnx03a.utdallas.edu:/home/013/n/nx/nxk210028/cad/DS x
File Edit View Search Terminal Help
{engnx03a:~/cad/DS} gcc Assignment1_1.cpp -lstdc++
{engnx03a:~/cad/DS} ./a.out
Before Sorting :
5 14 20 48 57 43 12 32 13 64 34 12 28 65 1
After sorting :
1 5 12 12 13 14 20 28 32 34 43 48 57 64 65 {engnx03a:~/cad/DS} █
```

Program 2

Code :

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

int binary(int arr[],int x,int y,int n)
{
    int mid1,mid2,s;

    if(y>=x)
    {
        s = (y-x)/3;
        mid1 = x +2*s;
        mid2 = x+s ;
        if (arr[mid1] == n)
        {
            return mid1;
        }
        if (arr[mid2] == n)
        {
            return mid2;
        }
        if (arr[mid1] > n)
        {
```

```

        return binary(arr,x,mid1-1,n);
    }
    else if (arr[mid2]>n)
    {
        return binary(arr,mid1+1,mid2-1,n);
    }
    else
    {
        return binary(arr,mid2+1,y,n);
    }
}

return -1;
}

int main()
{
    int arr[] = {-1,2,12,26,28,32,57};
    int length,i,n,index ;

    cout << "Input Array is : " ;
    length = sizeof(arr)/sizeof(arr[0]);

    for(i=0;i<length;i++)
    {
        cout<<arr[i]<<" ";
    }

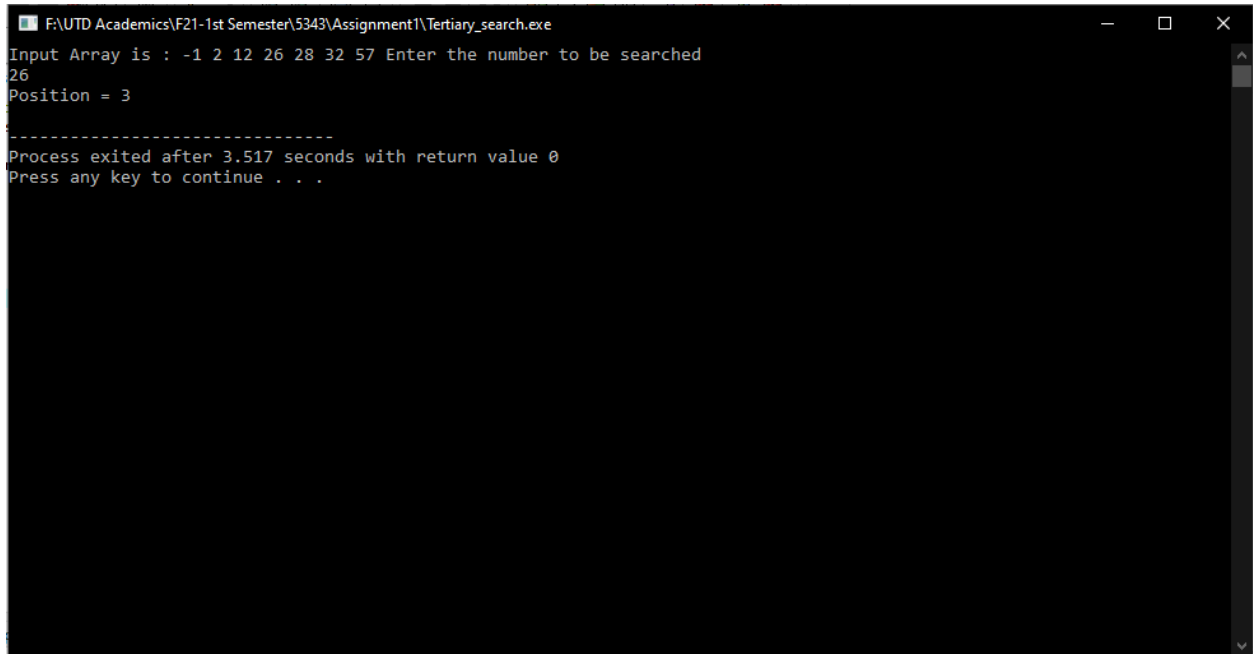
    cout <<"Enter the number to be searched" << endl ;
    cin >> n;
    index=binary(arr,0,length-1,n);

    if(index == -1)
    {
        cout << "Number not available in the array" << endl;
    }
    else
    {
        cout << "Position = " << index << endl ;
    }
    return 0;
}

```

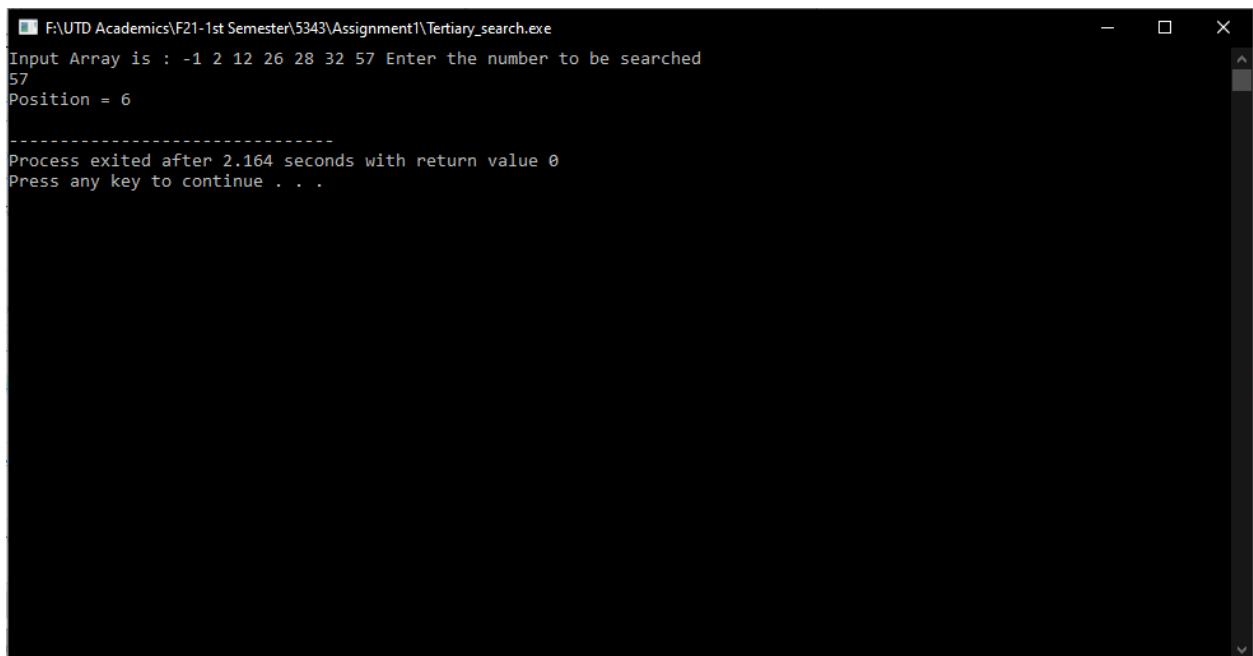
Code Executions :

1) Number to be searched : 26 O/p : Position = 3



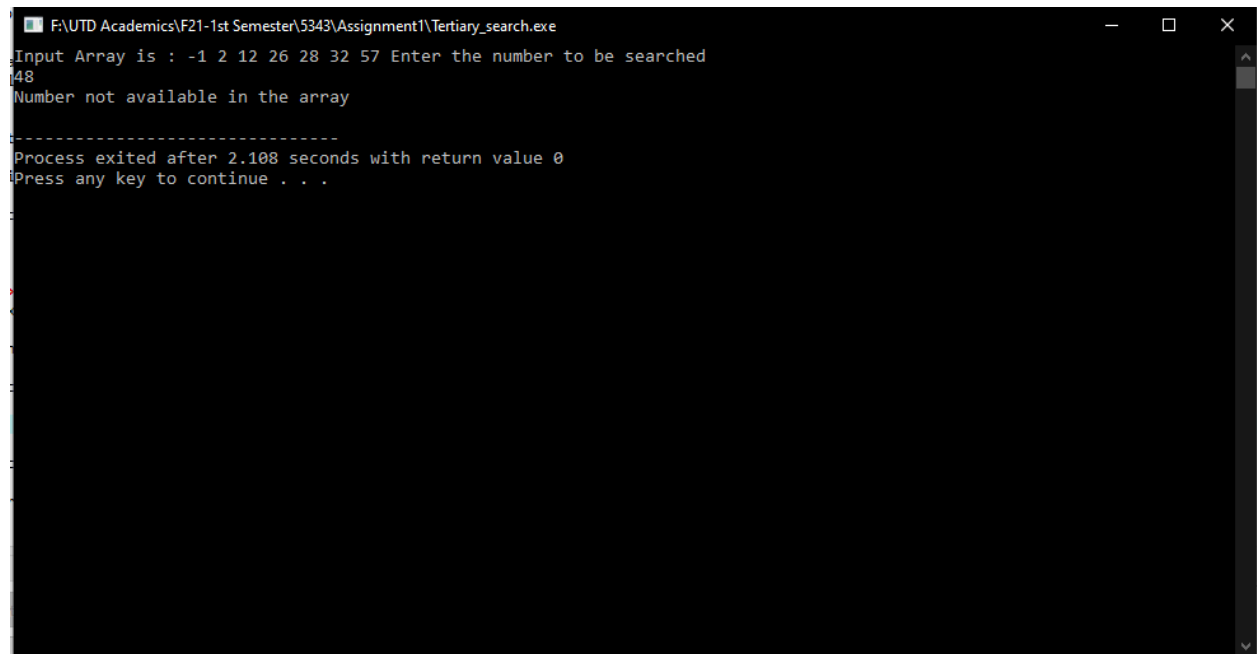
```
F:\UTD Academics\F21-1st Semester\5343\Assignment1\Tertiary_search.exe
Input Array is : -1 2 12 26 28 32 57 Enter the number to be searched
26
Position = 3
-----
Process exited after 3.517 seconds with return value 0
Press any key to continue . . .
```

2) Number to be searched : 57 O/p : Position = 6.



```
F:\UTD Academics\F21-1st Semester\5343\Assignment1\Tertiary_search.exe
Input Array is : -1 2 12 26 28 32 57 Enter the number to be searched
57
Position = 6
-----
Process exited after 2.164 seconds with return value 0
Press any key to continue . . .
```

3) Number to be searched : 48 Number not available in the array



```
F:\UTD Academics\F21-1st Semester\5343\Assignment1\Tertiary_search.exe
Input Array is : -1 2 12 26 28 32 57 Enter the number to be searched
48
Number not available in the array

-----
Process exited after 2.108 seconds with return value 0
Press any key to continue . . .
```