ASSINGMENT-1(DSA)

Animesh Maiti

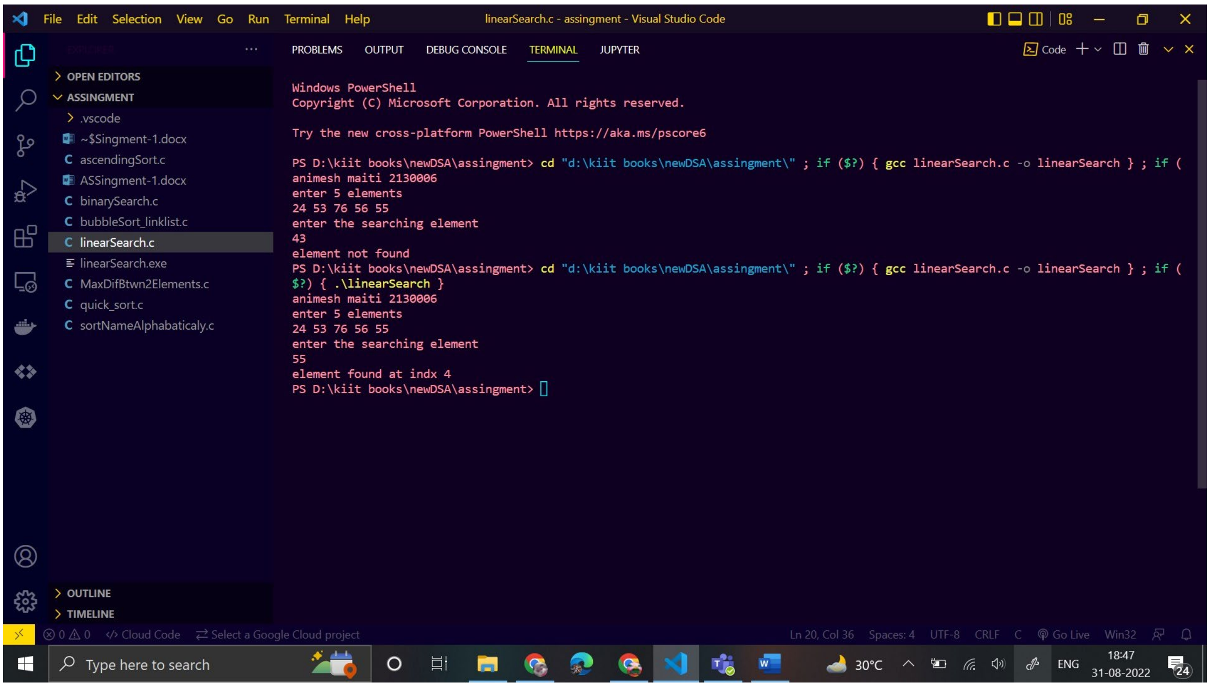
2130006

Q1. *// WARP (Write a Recursive Program) to search an element in a dynamic array of n integers using linear search.*

```
#include <stdio.h>
#include <stdlib.h>
int searchElement(int arr[], int size, int element)
{
    for (int i = 0; i < size; i++)
    {
        if (arr[i] == element)
        {
            printf("element found at indx %d",i);
            return i;
        }
    }
    printf("element not found");
}

int main()
{
    int *arr, n=5,element;
    printf("animesh maiti 2130006");
    arr = (int *)malloc(n * sizeof(int));
    printf("enter 5 elements\n");
    for (int i = 0; i < n; i++)
    {
        scanf(" %d",&arr[i]);
    }
    printf("enter the searching element\n");
    scanf("%d",&element);
    searchElement(arr,n,element);


    return 0;
}
```



```
Windows PowerShell
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc linearSearch.c -o linearSearch } ; if (
animesh maiti 2130006
enter 5 elements
24 53 76 56 55
enter the searching element
43
element not found
PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc linearSearch.c -o linearSearch } ; if (
$?) { .\linearSearch }
animesh maiti 2130006
enter 5 elements
24 53 76 56 55
enter the searching element
55
element found at indx 4
PS D:\kiit books\newDSA\assingment>
```
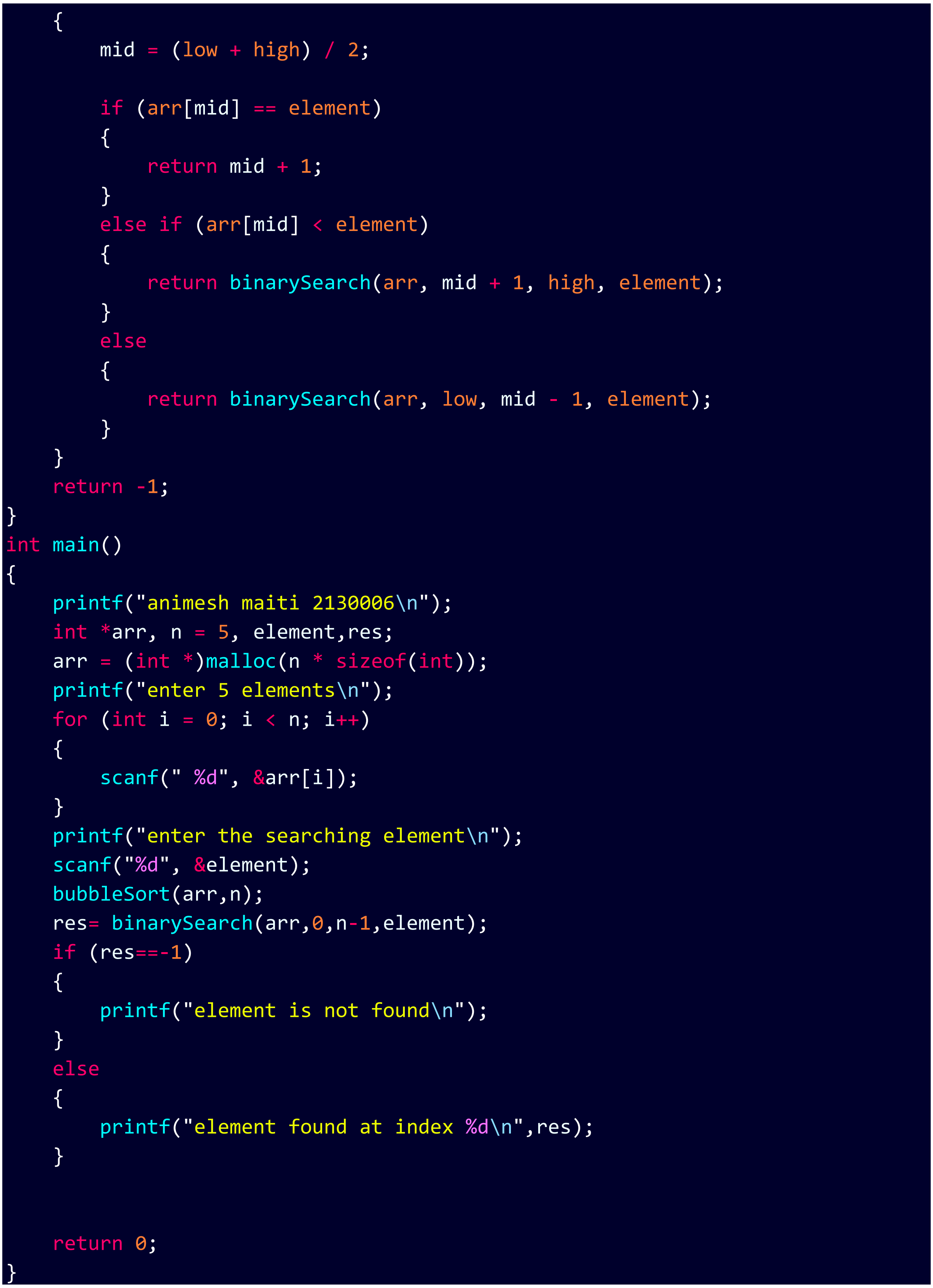
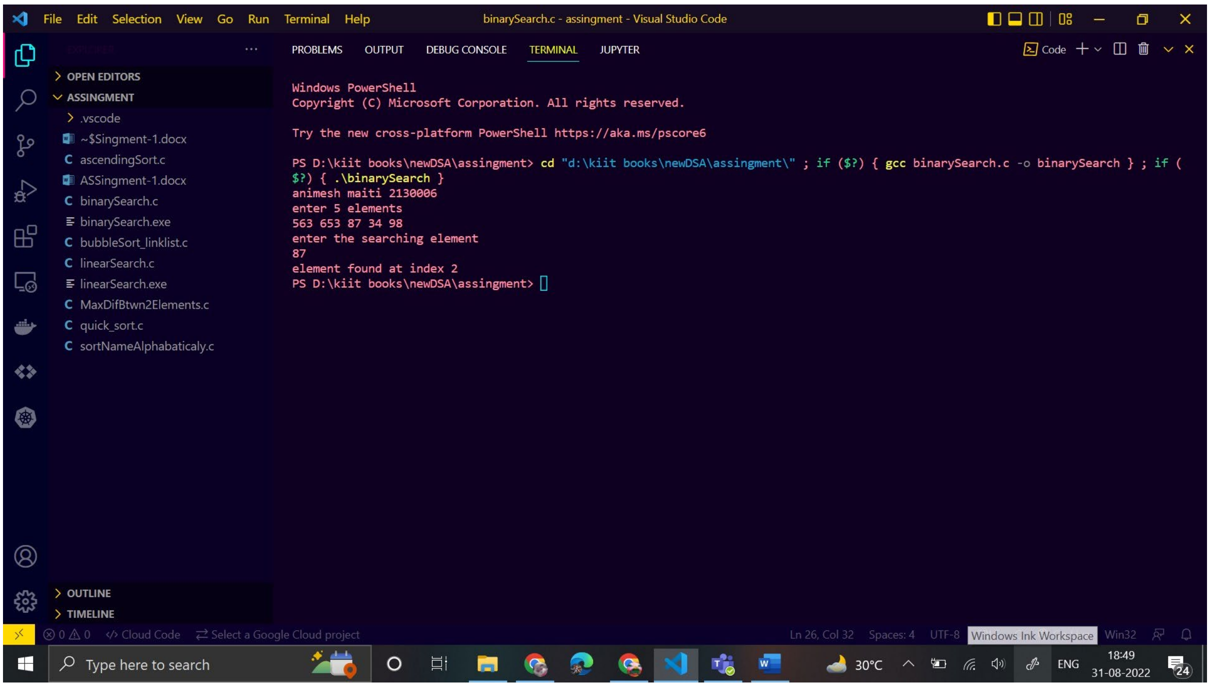

Q2. WARP using recursion to search an element in a dynamic array of n integers using binary search.

```c
// WARP using recursion to search an element in a dynamic array of n integers using binary search.
#include <stdio.h>
#include <stdlib.h>
void bubbleSort(int arr[], int n)
{
    int i, j, temp;
    for (i = 0; i < n - 1; i++)
    {
        for (j = 0; j < n - i - 1; j++)
        {
            if (arr[j] > arr[j + 1]) // condition for swaping
            {
                // swap element
                temp = arr[j];
                arr[j] = arr[j + 1];
                arr[j + 1] = temp;
            }
        }
    }
}
int binarySearch(int arr[], int low, int high, int element)
{
    int mid;
    if (high >= low)
```



```
    {
        mid = (low + high) / 2;

        if (arr[mid] == element)
        {
            return mid + 1;
        }
        else if (arr[mid] < element)
        {
            return binarySearch(arr, mid + 1, high, element);
        }
        else
        {
            return binarySearch(arr, low, mid - 1, element);
        }
    }
    return -1;
}
int main()
{
    printf("animesh maiti 2130006\n");
    int *arr, n = 5, element,res;
    arr = (int *)malloc(n * sizeof(int));
    printf("enter 5 elements\n");
    for (int i = 0; i < n; i++)
    {
        scanf(" %d", &arr[i]);
    }
    printf("enter the searching element\n");
    scanf("%d", &element);
    bubbleSort(arr,n);
    res= binarySearch(arr,0,n-1,element);
    if (res==-1)
    {
        printf("element is not found\n");
    }
    else
    {
        printf("element found at index %d\n",res);
    }


    return 0;
}
```



```
Windows PowerShell
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc binarySearch.c -o binarySearch } ; if (
$?) { .\binarySearch }
animesh maiti 2130006
enter 5 elements
563 653 87 34 98
enter the searching element
87
element found at index 2
PS D:\kiit books\newDSA\assingment>
```

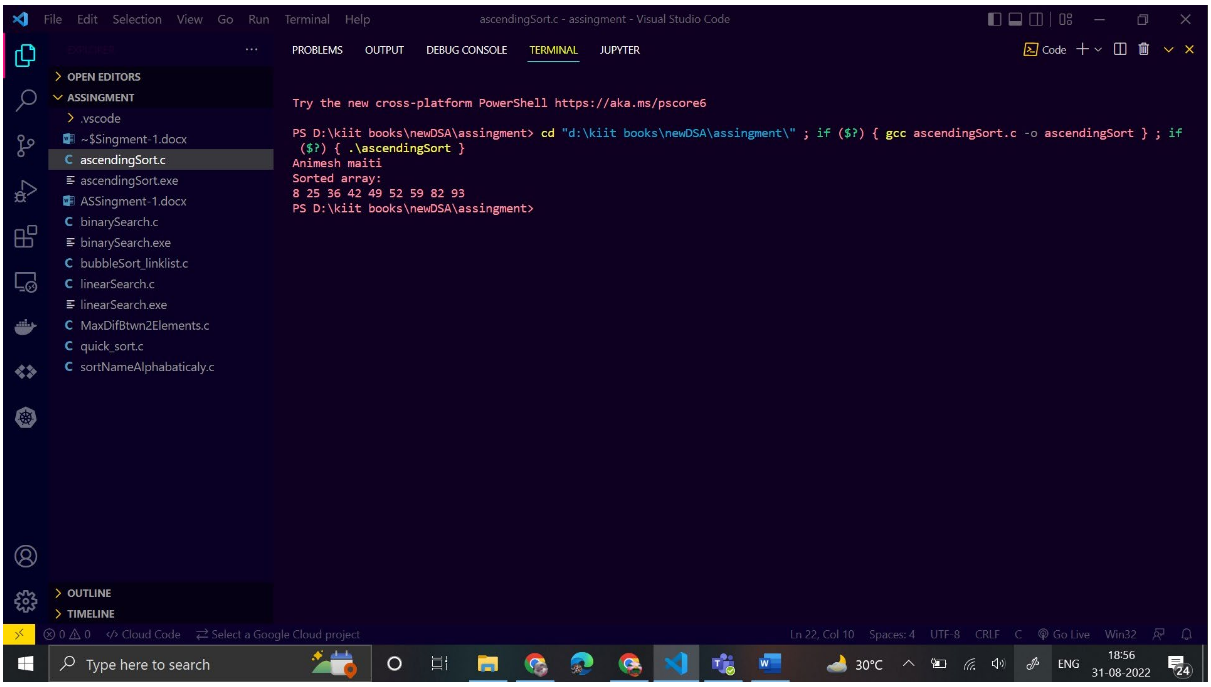
Q3. WAP to sort the given array, Arr = {82, 42, 49, 8, 25, 52, 36, 93, 59} in an ascending order. Use selection sort method.

```
#include <stdio.h>
void swap(int *xp, int *yp)
{
    int temp = *xp;
    *xp = *yp;
    *yp = temp;
}
void selectionSort(int arr[], int n)
{
    int i, j, minIndex;
    // One by one move boundary of unsorted subarray
    for (i = 0; i < n - 1; i++)
    {
        // Find the minimum element in unsorted array
        minIndex = i;
        for (j = i + 1; j < n; j++)
            if (arr[j] < arr[minIndex])
                minIndex = j;
        // Swap the found minimum element with the first element
        if (minIndex != i)
            swap(&arr[minIndex], &arr[i]);
        }
}

void printArray(int arr[], int size)
{
```

```c
    for (int i = 0; i < size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}

int main()
{
    printf("Animesh maiti\n");
    int arr[] = {82, 42, 49, 8, 25, 52, 36, 93, 59};
    int n = sizeof(arr) / sizeof(arr[0]);
    selectionSort(arr, n);
    printf("Sorted array: \n");
    printArray(arr, n);
    return 0;
}
```



```
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc ascendingSort.c -o ascendingSort } ; if
 ($?) { .\ascendingSort }
Animesh maiti
Sorted array:
8 25 36 42 49 52 59 82 93
PS D:\kiit books\newDSA\assingment>
```
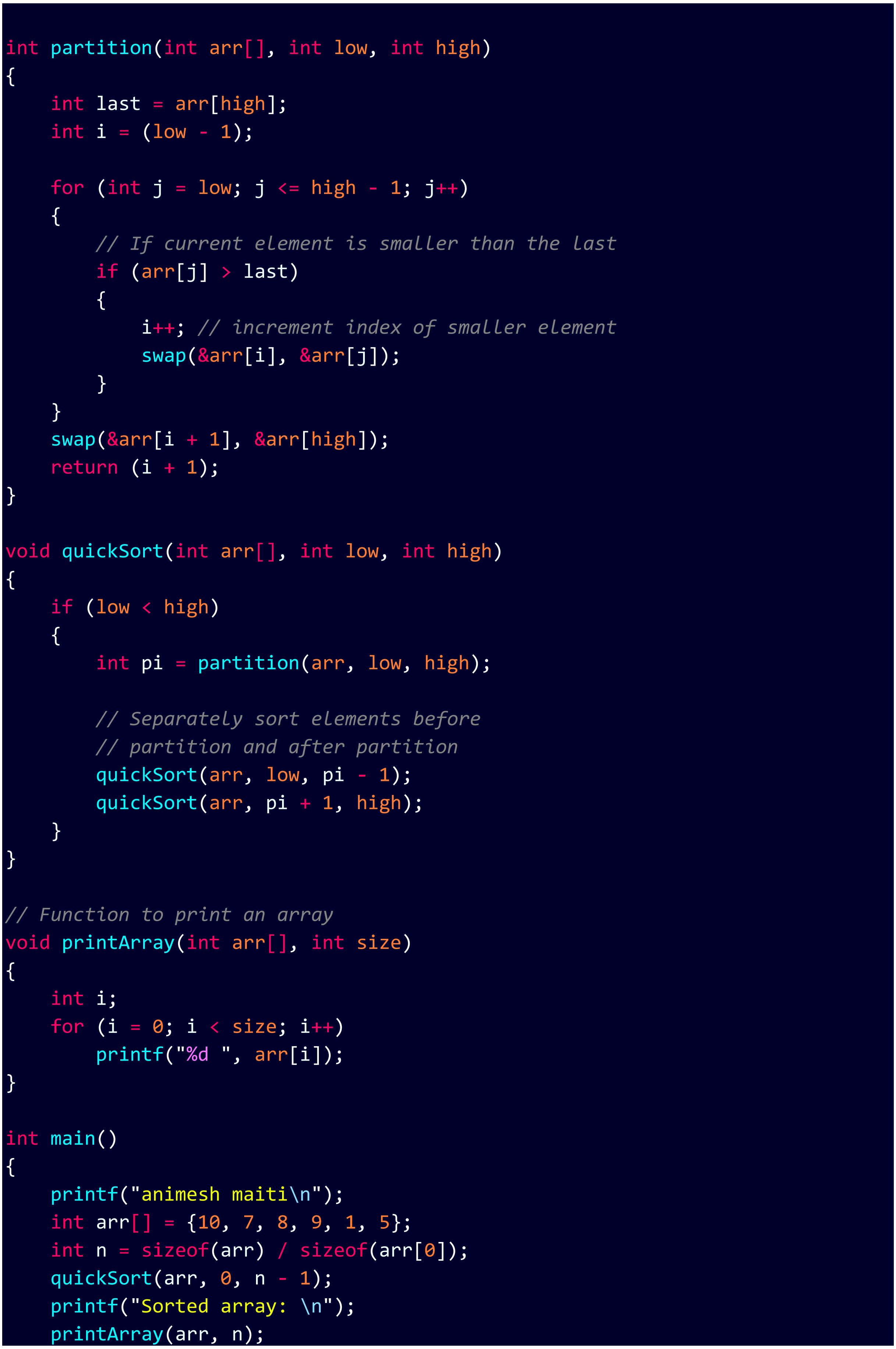
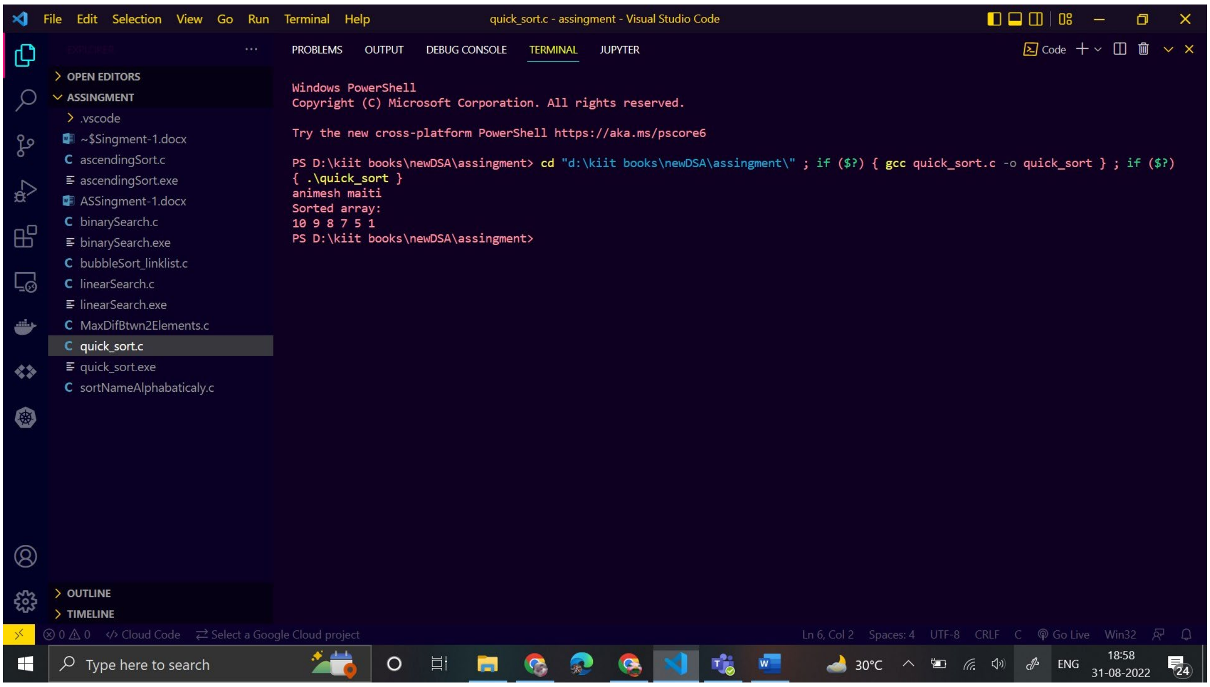

Q4. *WAP to sort an array of n doubles in a descending order using quick sort.*

```c
// WAP to sort an array of n doubles in a descending order using quick sort.
#include <stdio.h>

// A function to swap two elements
void swap(int *a, int *b)
{
    int t = *a;
    *a = *b;
    *b = t;
}
```



```c
int partition(int arr[], int low, int high)
{
    int last = arr[high];
    int i = (low - 1);

    for (int j = low; j <= high - 1; j++)
    {
        // If current element is smaller than the last
        if (arr[j] > last)
        {
            i++; // increment index of smaller element
            swap(&arr[i], &arr[j]);
        }
    }
    swap(&arr[i + 1], &arr[high]);
    return (i + 1);
}

void quickSort(int arr[], int low, int high)
{
    if (low < high)
    {
        int pi = partition(arr, low, high);

        // Separately sort elements before
        // partition and after partition
        quickSort(arr, low, pi - 1);
        quickSort(arr, pi + 1, high);
    }
}

// Function to print an array
void printArray(int arr[], int size)
{
    int i;
    for (i = 0; i < size; i++)
        printf("%d ", arr[i]);
}

int main()
{
    printf("animesh maiti\n");
    int arr[] = {10, 7, 8, 9, 1, 5};
    int n = sizeof(arr) / sizeof(arr[0]);
    quickSort(arr, 0, n - 1);
    printf("Sorted array: \n");
    printArray(arr, n);
    return 0;
}
```



```
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc quick_sort.c -o quick_sort } ; if ($?)
{ .\quick_sort }
animesh maiti
Sorted array:
10 9 8 7 5 1
PS D:\kiit books\newDSA\assingment>
```
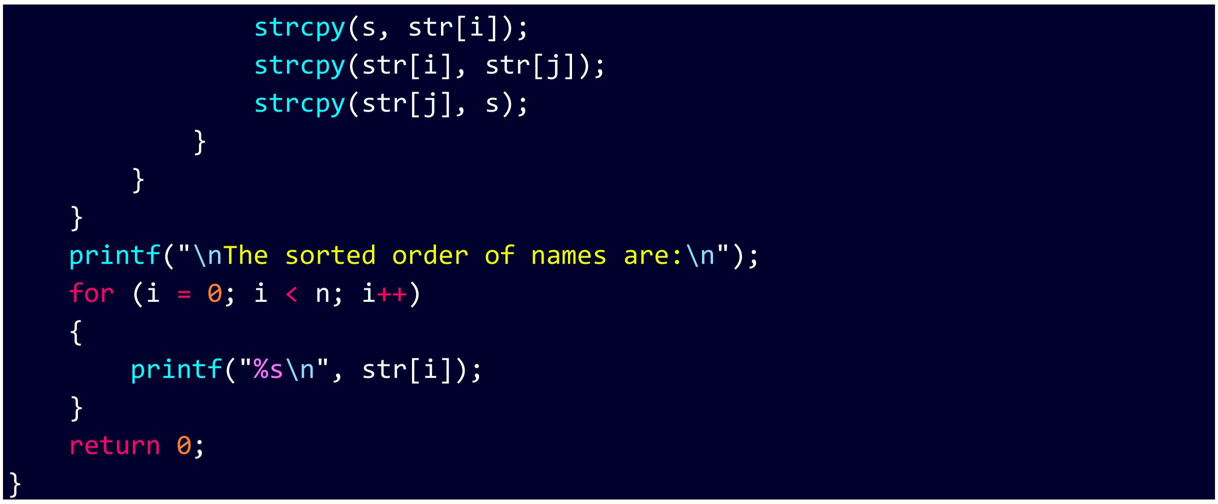
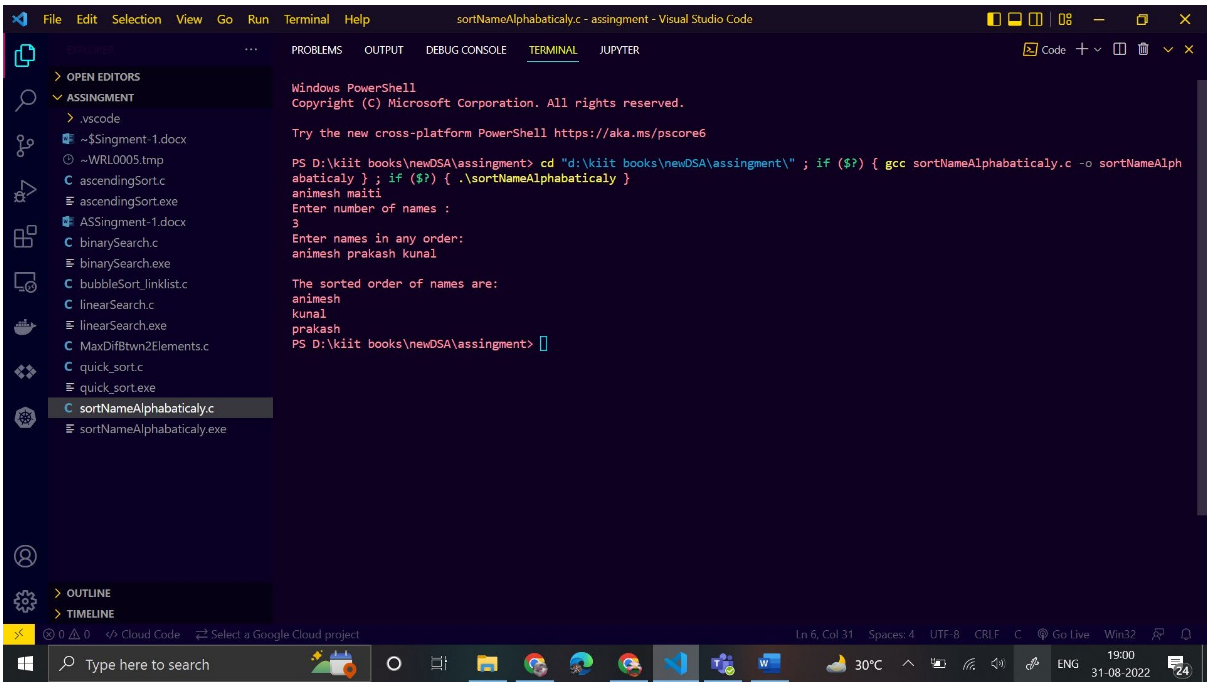

Q5. *WAP sort the n names in an alphabetical order.*

```
// WAP sort the n names in an alphabetical order.
#include <stdio.h>
#include <string.h>
int main()
{
    printf("animesh maiti\n");
    int i, j, n;
    char str[100][100], s[100];
    printf("Enter number of names :\n");
    scanf("%d", &n);
    printf("Enter names in any order:\n");
    for (i = 0; i < n; i++)
    {
        scanf("%s", str[i]);
    }
    for (i = 0; i < n; i++)
    {
        for (j = i + 1; j < n; j++)
        {
            if (strcmp(str[i], str[j]) > 0)//if ascii value is greater than
2nd strcmp give value 1 than swap if equal return 0 if less return -1
            {
                // swaping names by copying
```



```
                strcpy(s, str[i]);
                strcpy(str[i], str[j]);
                strcpy(str[j], s);
            }
        }
    }
    printf("\nThe sorted order of names are:\n");
    for (i = 0; i < n; i++)
    {
        printf("%s\n", str[i]);
    }
    return 0;
}
```



```
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc sortNameAlphabaticaly.c -o sortNameAlph
abaticaly } ; if ($?) { .\sortNameAlphabaticaly }
animesh maiti
Enter number of names :
3
Enter names in any order:
animesh prakash kunal

The sorted order of names are:
animesh
kunal
prakash
PS D:\kiit books\newDSA\assingment> 
```
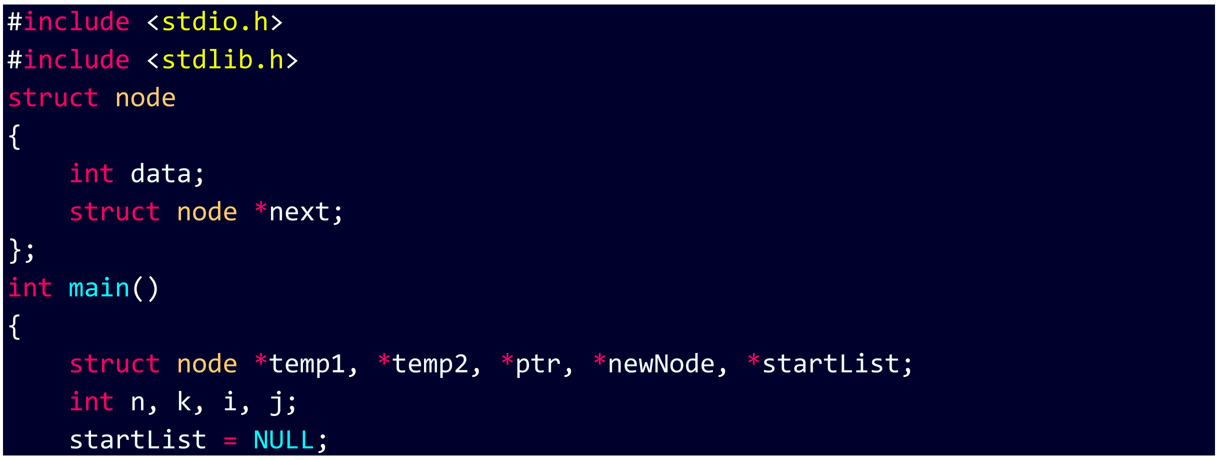
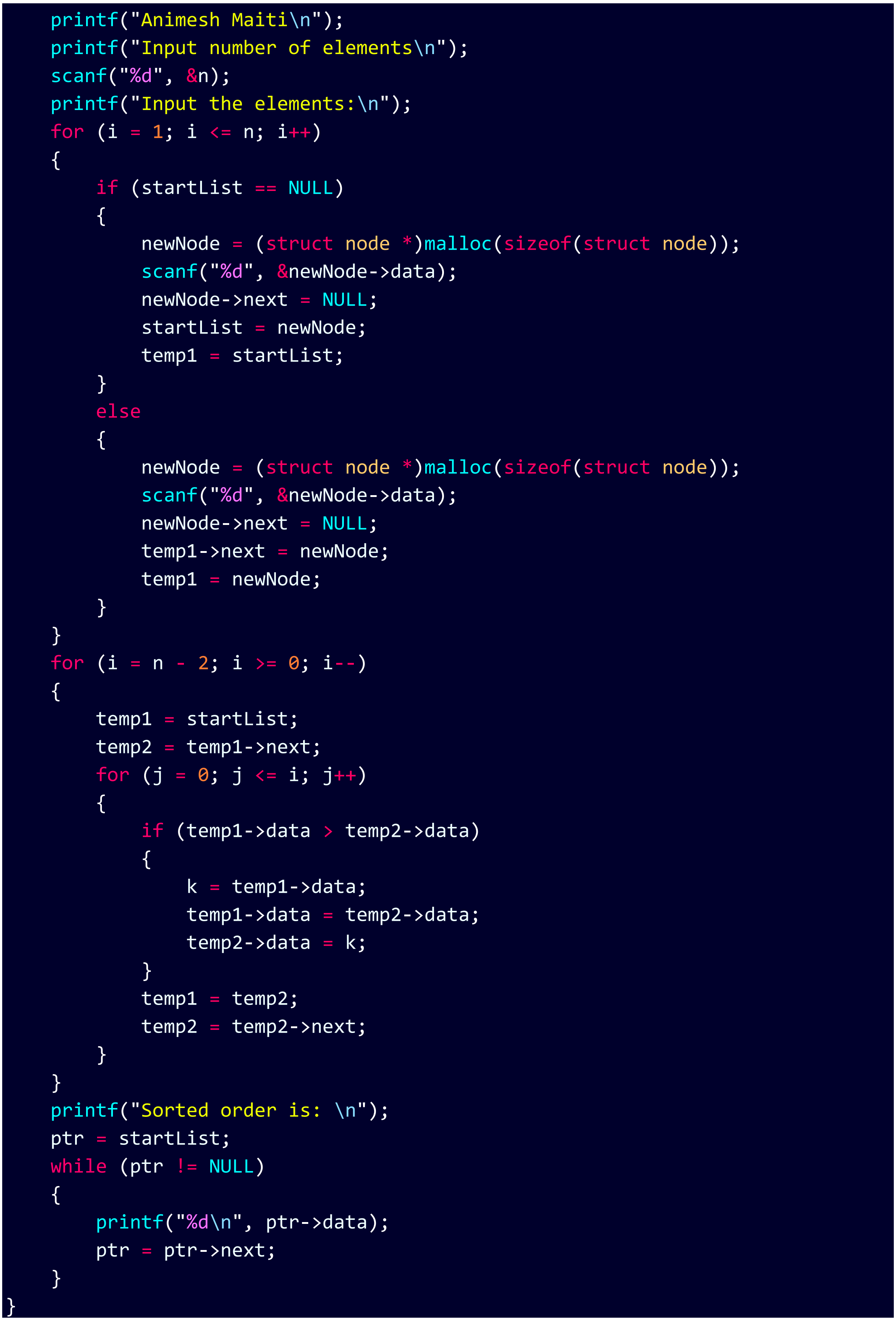
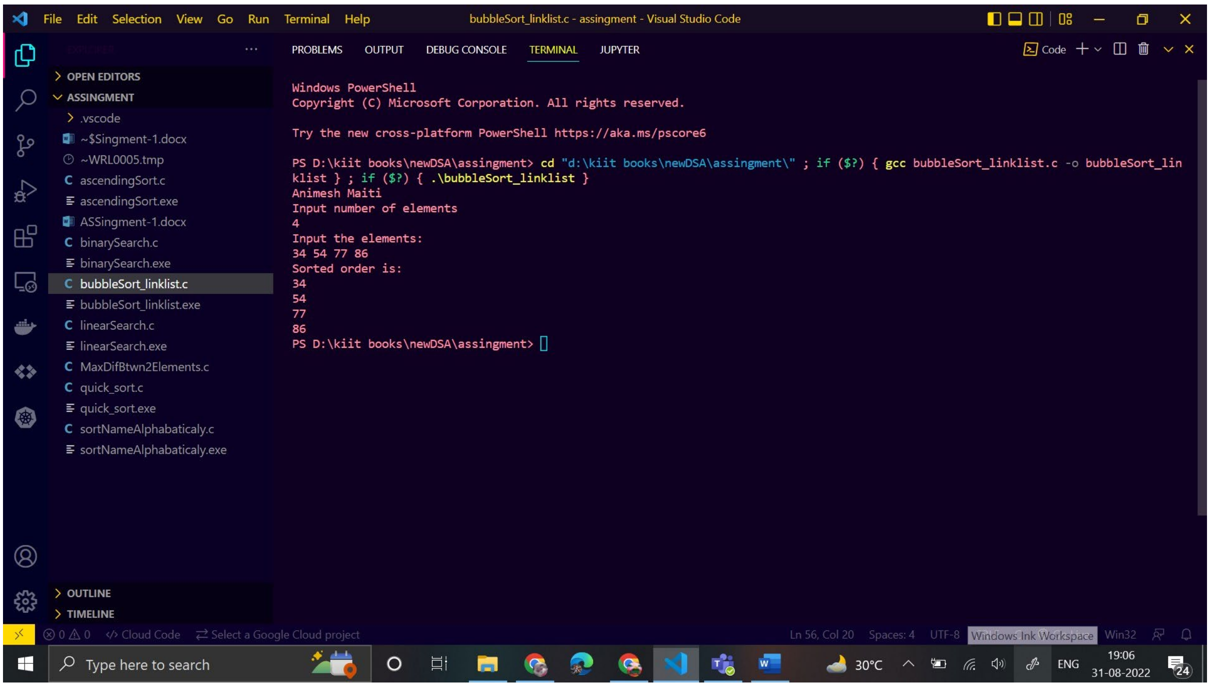

Q6. WAP demonstrating bubble sort using linked list.



```
#include <stdio.h>
#include <stdlib.h>
struct node
{
    int data;
    struct node *next;
};
int main()
{
    struct node *temp1, *temp2, *ptr, *newNode, *startList;
    int n, k, i, j;
    startList = NULL;
```



```
    printf("Animesh Maiti\n");
    printf("Input number of elements\n");
    scanf("%d", &n);
    printf("Input the elements:\n");
    for (i = 1; i <= n; i++)
    {
        if (startList == NULL)
        {
            newNode = (struct node *)malloc(sizeof(struct node));
            scanf("%d", &newNode->data);
            newNode->next = NULL;
            startList = newNode;
            temp1 = startList;
        }
        else
        {
            newNode = (struct node *)malloc(sizeof(struct node));
            scanf("%d", &newNode->data);
            newNode->next = NULL;
            temp1->next = newNode;
            temp1 = newNode;
        }
    }
    for (i = n - 2; i >= 0; i--)
    {
        temp1 = startList;
        temp2 = temp1->next;
        for (j = 0; j <= i; j++)
        {
            if (temp1->data > temp2->data)
            {
                k = temp1->data;
                temp1->data = temp2->data;
                temp2->data = k;
            }
            temp1 = temp2;
            temp2 = temp2->next;
        }
    }
    printf("Sorted order is: \n");
    ptr = startList;
    while (ptr != NULL)
    {
        printf("%d\n", ptr->data);
        ptr = ptr->next;
    }
}
```



```
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc bubbleSort_linklist.c -o bubbleSort_lin
klist } ; if ($?) { .\bubbleSort_linklist }
Animesh Maiti
Input number of elements
4
Input the elements:
34 54 77 86
Sorted order is:
34
54
77
86
PS D:\kiit books\newDSA\assingment> 
```
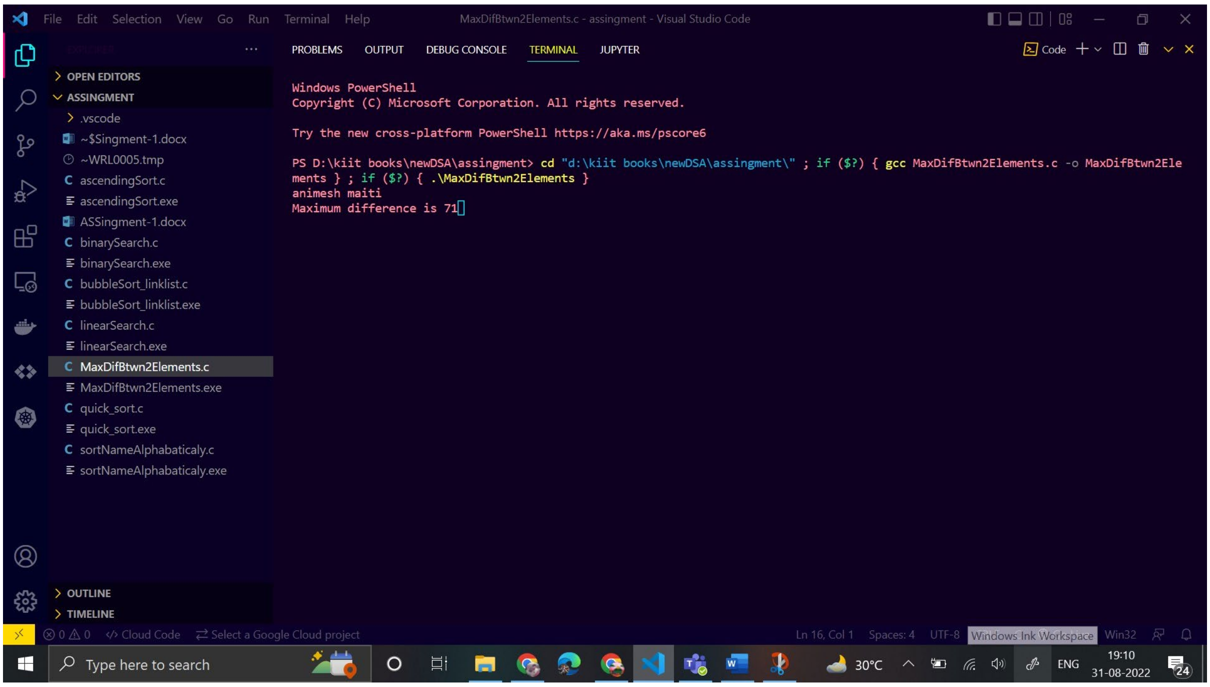

Q7. WAP to find the maximum difference between any two elements

```c
#include <stdio.h>
int maxDiff(int arr[], int arr_size)
{
    int maxDiff = arr[1] - arr[0];
    int min = arr[0];
    int i;
    for (i = 1; i < arr_size; i++)
    {
        if (arr[i] - min > maxDiff)
            maxDiff = arr[i] - min;
        if (arr[i] < min)
            min = arr[i];
    }
    return maxDiff;
}

int main()
{
    printf("animesh maiti\n");
    int arr[] = {20, 13, 53, 84, 10};
    int size = sizeof(arr) / sizeof(arr[0]);
    printf("Maximum difference is %d", maxDiff(arr, size));
    getchar();
    return 0;
}
```



```
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PS D:\kiit books\newDSA\assingment> cd "d:\kiit books\newDSA\assingment\" ; if ($?) { gcc MaxDifBtwn2Elements.c -o MaxDifBtwn2Ele
ments } ; if ($?) { .\MaxDifBtwn2Elements }
animesh maiti
Maximum difference is 71
```