4.Sort a given set of N integer elements using Merge Sort technique and compute its time taken. Run the program for different values of N and record the time taken to sort.

Code:

```
 #include <stdio.h>
#include <stdlib.h>

void merge(int low,int mid,int high,int a[])
{
    int c[50];
    int i,j,k;
    i=low;
    j=mid+1;
    k=low;
    while(i<=mid&&j<=high)
    {
        if(a[i]<a[j])
        {
            c[k]=a[i];
            i++;
            k++;
        }
        else{
            c[k]=a[j];
            j++;
            k++;
        }
    }
    while(i<=mid)
    {
        c[k]=a[i];
        k++;
        i++;
    }
    while(j<=high)
    {
        c[k]=a[j];
        k++;
        j++;
    }
    for(i=low;i<=high;i++)
    {
```

```
        a[i]=c[i];

    }
}

void mergeSort(int low, int high,int a[])
{
    if(low<high)
    {
        int mid=(low+high)/2;
        mergeSort(low, mid, a);
        mergeSort(mid+1,high,a);
        merge(low, mid, high, a);


    }
}
void main()
{
    int n;
     printf("\nEnter the size");
    scanf("%d",&n);
    int i, a[50], low=0, high=n-1;

    printf("Enter the elements to be sorted: ");
    for(i=0;i<n;i++)
    {
        scanf("%d",&a[i]);
    }
    mergeSort(low, high, a);
    for(i=0;i<n;i++)
    {
        printf("%d\t",a[i]);
    }


}
```

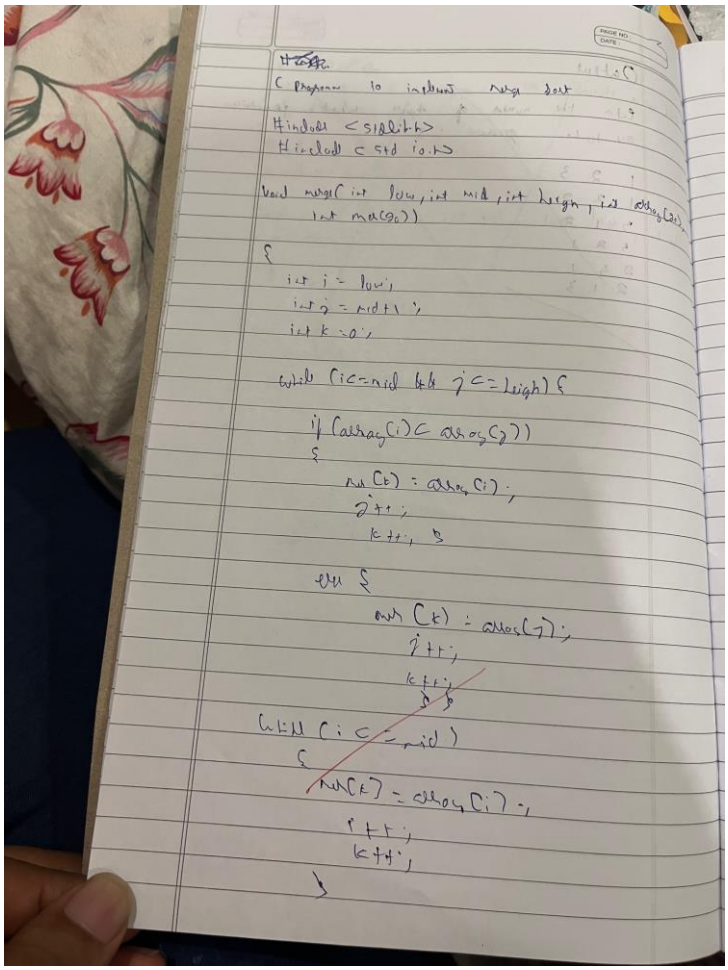
Output:

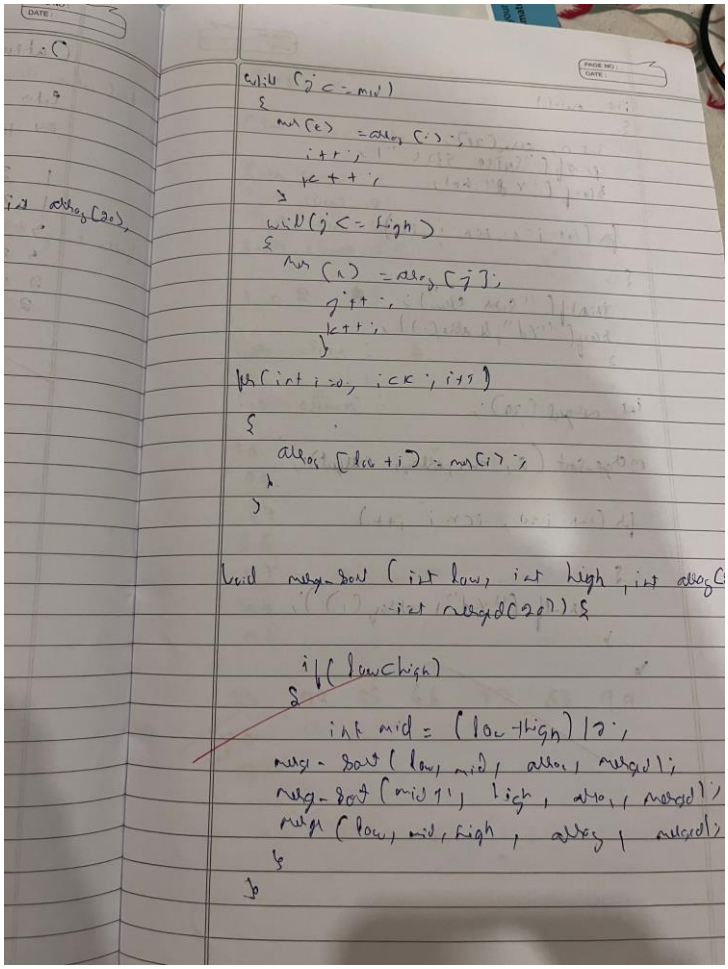
```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL                                                    Code

PS D:\VS Code\ADA> cd "d:\VS Code\ADA\" ; if ($?) { gcc monotonic.c -o monotonic } ; if ($?) { .\monotonic }

Enter the size7
Enter the elements to be sorted: 99 88 77 66 55 44 33
33      44      55      66      77      88      99
PS D:\VS Code\ADA>
```

Observation:

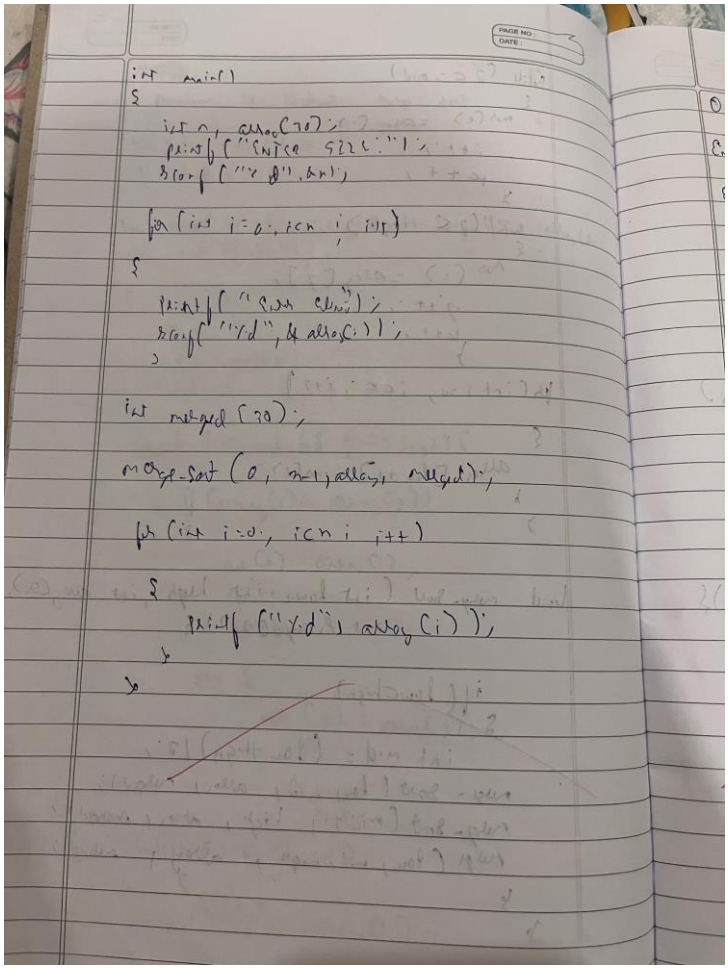




```
while (i <= mid)
{
  merged[k] = array[i];
  i++;
  k++;
}
while(j <= high)
{
  for (k) = array[j];
    j++;
    k++;
}
for(int i=0; i<k; i++)
{
  array[low+i] = merged[i];
}

void merge_sort (int low, int high, int array[
    int merged[20]) {

  if(low<high)
  {
    int mid = (low+high)/2;
  merge_sort(low, mid, array, merged);
  merge_sort(mid+1, high, array, merged);
  merge(low, mid, high, array, merged);
  }
}
```



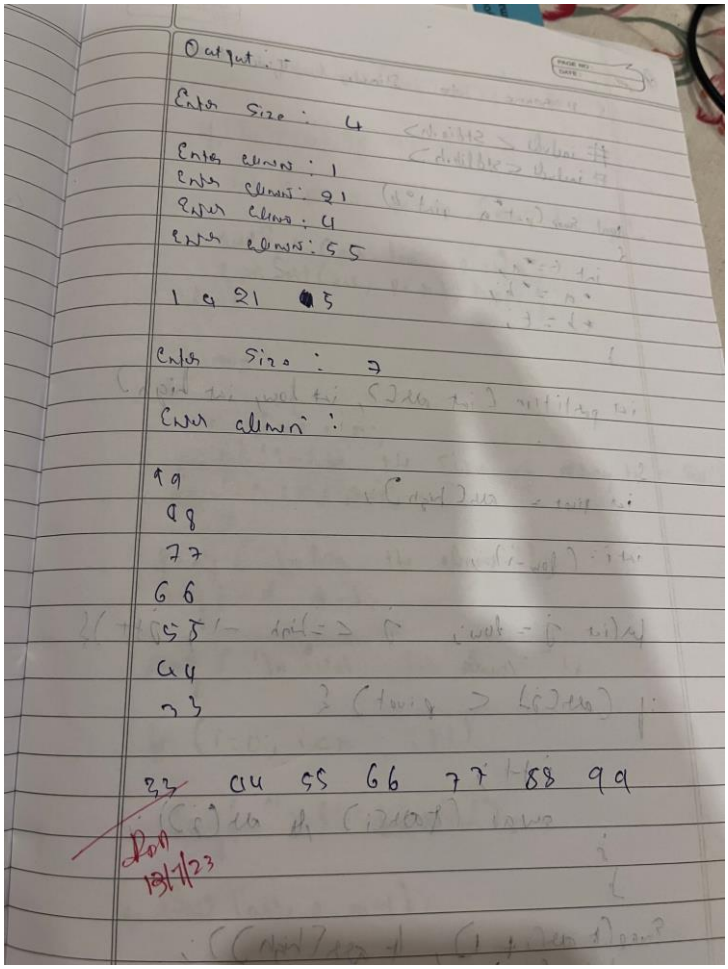
```
int main()
{
    int n, arr[20];
    printf("Enter size: ");
    scanf("%d", &n);

    for(int i=0; i<n; i++)
    {
        printf("Enter elem: ");
        scanf("%d", &arr[i]);
    }

    int merged[20];

    merge_sort(0, n-1, arr, merged);

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



Output :-

Enter size : 4

Enter elements : 1
Enter elements : 21
Enter elements : 4
Enter elements : 55

1 4 21 55

Enter size : 7

Enter elements :

11
99
77
66
55
44
33

33 44 55 66 77 88 99

Done
19/7/23