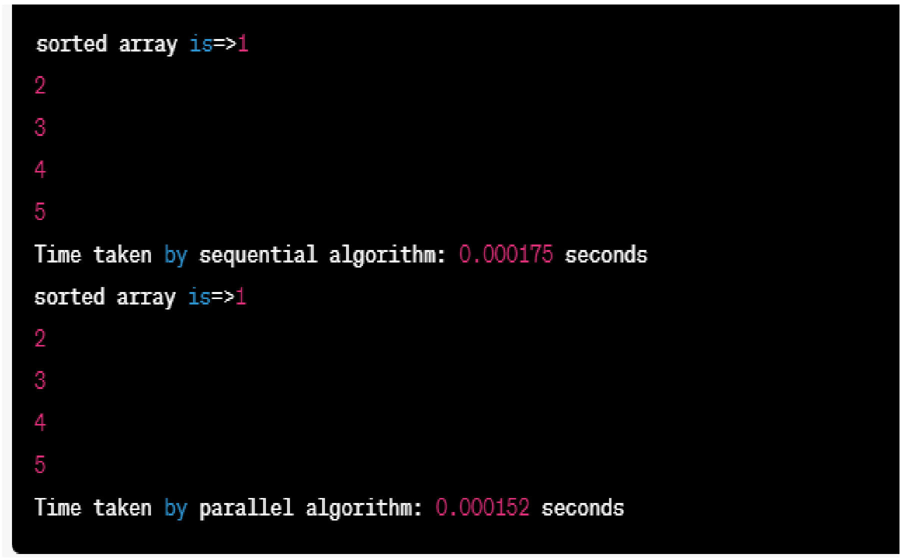
EXPERIMENT NO:02

BUBBLE SORT:

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

void bubble(int *, int);
void swap(int &, int &);
void bubble(int *a, int n)
{
   int swapped;
   for(  int i = 0;  i < n;  i++ )
    {
       int first = i % 2;
       swapped=0;
       #pragma omp parallel for shared(a,first)
       for(  int j = first;  j < n-1;  j += 2  )
         {
          if(  a[ j ]  >  a[ j+1 ]  )
           {
                swap(  a[ j ],  a[ j+1 ]  );
                swapped=1;
           }
            }
            if(swapped==0)
            break;
    }
}
void swap(int &a, int &b)
{

   int test;
   test=a;
   a=b;
   b=test;

}
int main()
{

   int *a,n;
   cout<<"\n enter total no of elements=>";
   cin>>n;
   a=new int[n];
```

```
    cout<<"\n enter elements=>";
    for(int i=0;i<n;i++)
{
        cin>>a[i];
    }
double start_time = omp_get_wtime(); // start timer for sequential algorithm
    bubble(a,n);
    double end_time = omp_get_wtime(); // end timer for sequential algorithm
 cout<<"\n sorted array is=>";
    for(int i=0;i<n;i++)
    {
        cout<<a[i]<<endl;
    }
 cout << "Time taken by sequential algorithm: " << end_time - start_time << " seconds" << endl;
start_time = omp_get_wtime(); // start timer for parallel algorithm
    bubble(a,n);
    end_time = omp_get_wtime(); // end timer for parallel algorithm
 cout<<"\n sorted array is=>";
    for(int i=0;i<n;i++)
    {
        cout<<a[i]<<endl;
    }
 cout << "Time taken by parallel algorithm: " << end_time - start_time << " seconds" << endl;
return 0;
}
```

OUTPUT:

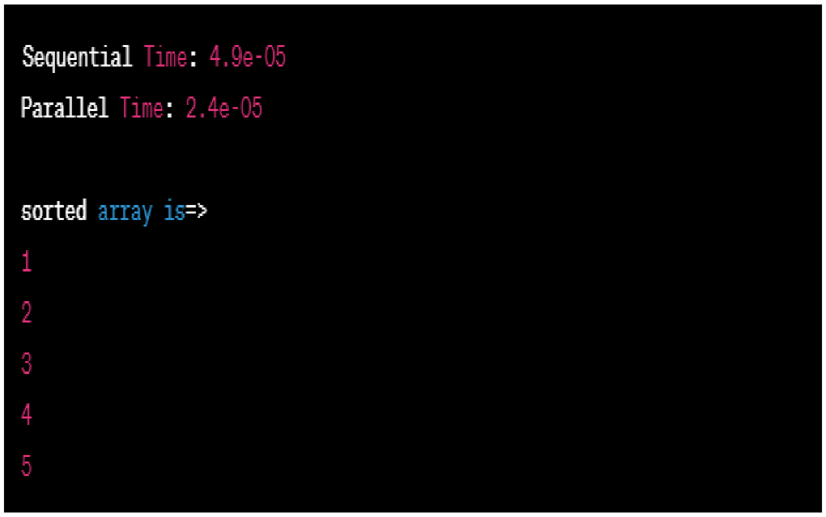


```
sorted array is=>1
2
3
4
5
Time taken by sequential algorithm: 0.000175 seconds
sorted array is=>1
2
3
4
5
Time taken by parallel algorithm: 0.000152 seconds
```

MERGE SORT:

```
#include<iostream>
#include<stdlib.h>
#include<omp.h>
using namespace std;
void mergesort(int a[],int i,int j);
void merge(int a[],int i1,int j1,int i2,int j2);
void mergesort(int a[],int i,int j)
{
    int mid;
    if(i<j)
    {
        mid=(i+j)/2;
         #pragma omp parallel sections
        {
  #pragma omp section
            {
                mergesort(a,i,mid);
            }
            #pragma omp section
            {
                mergesort(a,mid+1,j);
            }
        }

    merge(a,i,mid,mid+1,j);
    }

}

void merge(int a[],int i1,int j1,int i2,int j2)
{
    int temp[1000];
    int i,j,k;
    i=i1;
    j=i2;
    k=0;
      while(i<=j1 && j<=j2)
    {
        if(a[i]<a[j])
        {
            temp[k++]=a[i++];
        }
        else
        {
           temp[k++]=a[j++];
              }
    }

    while(i<=j1)
    {
       temp[k++]=a[i++];
    }

    while(j<=j2)
    {
       temp[k++]=a[j++];
    }

    for(i=i1,j=0;i<=j2;i++,j++)
    {
       a[i]=temp[j];
    }
}


int main()
{
    int *a,n,i;
    double start_time, end_time, seq_time, par_time;

    cout<<"\n enter total no of elements=>";
    cin>>n;
    a= new int[n];

    cout<<"\n enter elements=>";
    for(i=0;i<n;i++)
    {
       cin>>a[i];
    }

    // Sequential algorithm
    start_time = omp_get_wtime();
    mergesort(a, 0, n-1);
    end_time = omp_get_wtime();
    seq_time = end_time - start_time;
    cout << "\nSequential Time: " << seq_time << endl;

    // Parallel algorithm
    start_time = omp_get_wtime();
    #pragma omp parallel
    {
        #pragma omp single
        {
            mergesort(a, 0, n-1);
        }
    }
    end_time = omp_get_wtime();
    par_time = end_time - start_time;
    cout << "\nParallel Time: " << par_time << endl;

    cout<<"\n sorted array is=>";
    for(i=0;i<n;i++)
    {
        cout<<"\n"<<a[i];
    }

    return 0;
}
```

OUTPUT



```
Sequential Time: 4.9e-05
Parallel Time: 2.4e-05


sorted array is=>
1
2
3
4
5
```