21BRS1296 – Anika Kamath

Design and Analysis of Algorithms (Lab)

L37+L38

Experiment No.: 2.2

Q. Insertion Sort Algorithm (user input)

Code:

```
#include<iostream>
#include<ctime>

using namespace std;

void insertionSort(int a[],int n){
int key,j;
    for(int i=1;i<n;i++){
     key=a[i];
     j=i-1;
     while(a[j]>key && j>=0){
          a[j+1]=a[j];
          j--;
     }
        a[j+1]=key;
    }
    cout<<"Array sorted using Insertion Sort: "<<endl;
    for(int i=0;i<n;i++){
        cout<<a[i]<<" ";
    }
    cout<<endl;
}
```

```
int main(){
int n;
cout<<"Enter number of elements in array: ";
cin>>n;
int a[n];
for(int i=0;i<n;i++){
cout<<endl<<"Enter element "<<i+1<<": ";
cin>>a[i];
}
insertionSort(a,n);

    //time
    clock_t tstart=clock();
    double time1=(double)clock()-(tstart)/CLOCKS_PER_SEC;
    cout<<"Time taken to execute: "<<time1<<endl;

return 0;
}
```

Output:

1. **Best Case**

```
student@205A-scope--50:~/Desktop/21BRS1296$ g++ lab2_insertionsort.cpp
student@205A-scope--50:~/Desktop/21BRS1296$ ./a.out
Enter number of elements in array: 10

Enter element 1: 1

Enter element 2: 2

Enter element 3: 3

Enter element 4: 4

Enter element 5: 5

Enter element 6: 6

Enter element 7: 7

Enter element 8: 8

Enter element 9: 9

Enter element 10: 10
Array sorted using Insertion Sort:
1 2 3 4 5 6 7 8 9 10
Time taken to execute: 5154
```

2. **Worst Case**

```
student@205A-scope--50:~/Desktop/21BRS1296$ g++ lab2_insertionsort.cpp
student@205A-scope--50:~/Desktop/21BRS1296$ ./a.out
Enter number of elements in array: 10

Enter element 1: 10

Enter element 2: 9

Enter element 3: 8

Enter element 4: 7

Enter element 5: 6

Enter element 6: 5

Enter element 7: 4

Enter element 8: 3

Enter element 9: 2

Enter element 10: 1
Array sorted using Insertion Sort:
1 2 3 4 5 6 7 8 9 10
Time taken to execute: 5184
```

3. **Random Case**

```
student@205A-scope--50:~/Desktop/21BRS1296$ g++ lab2_insertionsort.cpp
student@205A-scope--50:~/Desktop/21BRS1296$ ./a.out
Enter number of elements in array: 10

Enter element 1: 2

Enter element 2: 6

Enter element 3: 3

Enter element 4: 8

Enter element 5: 3

Enter element 6: 67

Enter element 7: 243

Enter element 8: 34

Enter element 9: 2

Enter element 10: 43
Array sorted using Insertion Sort:
2 2 3 3 6 8 34 43 67 243
Time taken to execute: 5181
```