LAB 04: Sorting Algorithms

CS211 – Data Structures and Algorithms
Usman Institute of Technology
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- **How to submit:**
  - Online: Submit on your respective MS Teams.

A. Create a class Sorting and write the functions in the following order.

1. Add a class member *data* of list type. You can do this by using the following code:

```
class Sorting:
    data = []
```

2. Write a function ***GenerateRandom()*** that generates **n** random numbers and stores the numbers in *data*.

```
    def GenerateRandom(self,n):
        // your code goes here
```

3. Write a function ***BubbleSort()*** that sorts numbers stores in the data variable using Bubble Sort algorithm.

```
    def BubbleSort(self):
        // your code goes here
```

Example: RandomNumbers = [4,5,77,2,80,3]
SortedList = [2,3,4,5,77,80]

4. Write a function ***Print()*** that prints the numbers stores in the data.

```
    def Print(self):
        // your code goes here
```

5. Write a function ***InsertionSort()*** that sorts the numbers stores in the data variable using Insertion Sort algorithm.

```
    def InsertionSort(self):
        // your code goes here
```

Example: RandomNumbers = [4,5,77,2,80,3]
SortedList = [2,3,4,5,77,80]

```
procedure Insertion sort(A)

for i = 1 to A.length
    key = A[i]
    //Insert A[i] into the sorted sequence A[1.. i-1]
    j = i - 1
    while j>=0 and A[j]>key
        A[j+1] = A[j]
        j = j - 1

    A[j+1] = key


Source: Introduction to Algorithms by Thomas H.Cormen
```

6. Write a function ***SelectionSort()*** that sorts the numbers stored in data variable using Selection Sort algorithms.

```
    def SelectionSort(self):
        // your code goes here
```

Example: RandomNumbers = [4,5,77,2,80,3]
SortedList = [2,3,4,5,77,80]

```
procedure selection sort
   list: array of items
   n: size of list

   for i = 1 to n - 1
   /* set current element as minimum*/
      min = i

      /* check the element to be minimum */

      for j = i+1 to n
         if list[j] < list[min] then
            min = j;
```

```
         end if
      end for

      /* swap the minimum element with the current element*/
      if indexMin != i  then
         swap list[min] and list[i]
      end if
   end for

end procedure

Source: Tutorials Point
```

7. Write a function ***Search()*** that takes parameter v and returns the location of v in the list. The search should take place in O( ) time. This can achieve by using Binary Search but for this, your function must check whether list is already sorted or not. If the list is not sorted, then it should call any of the sorting functions created in above tasks to sort the list.

```
    def Search(self,value):
        // your code goes here
```

Example: List = [4,5,77,4,2,80,3,5]
SortedList = [2,3,4,5,77,80]
Value for Searching = 5
Location = 3