ACADEMY OF TECHNOLOGY

Lab Assignment (Assignment 18)

Paper name: Data Structure and Algorithm

Code: PCC-CS391 **Semester: 3rd**

Discipline: CSE **Time: 2 Hours**

Date: December 2, 2020

1. The following Insertion Sort Algorithm uses binary search to find the proper location to insert the selected item at each iteration.

   Study the following algorithm and implement this algorithm in C or C++ to compare it with normal Insertion Sort algorithm with respect to number of comparison and swapping.

Algorithm 1: INSERTION-SORT $(arr[],\ n)$

```
1  for i := 1 to n − 1 do
2  |   key := arr[i];
3  |   j := i − 1;
   |   // find the position pos where key should be inserted
4  |   pos := binarySearch(arr, 0, j, key);
   |   // Create space by move all elements after pos
5  |   while j ≥ pos do
6  |   |   arr[j + 1] := arr[j];
7  |   |   j := j − 1;
8  |   end
9  |   arr[j + 1] := key;
10 end
```

Algorithm 2: BINARY-SEARCH $(arr[],\ low,\ high,\ x)$

```
1  if high ≤ low then
2  |   if x > arr[low] then return (low + 1);
3  |   else return low;
4  end
5  mid := ⌊(low+high)/2⌋;
6  if x = arr[mid] then return (mid + 1);
7  if x > arr[mid] then return BINARY-SEARCH(arr, mid + 1, high, x);
8  return BINARY-SEARCH(arr, low, mid − 1, x);
```