**Lets Upgrade - Data Structures And Algorithms**

**Pratyusha Chakravarty**

**Assignment 5**

Question 1

1. Write the function for insertion sort.

Ans.

Insertion sort is a simple sorting algorithm, which sorts the unsorted array. The elements from the unsorted array are picked up and are placed in the correct position.

Algorithm:

1. Select the array and iterate through the elements.
2. If the first element is larger than the second element, the positions of both the elements will get swapped.
3. If it is not larger, it remains in the same position.
4. Steps (2-3) are repeated, till the array gets sorted.

Example:

1. Suppose we have an unsorted array :

22, 21, 23, 15, 16

Sorting the array with insertion sort algorithm

1. Comparing the 1st element with the 2nd element, 22>21, swapping the positions :

**21, 22**, 23, 15, 16

1. Comparing the 2nd element with the 3rd element, 22<23, 21<23, remains in the same position :

21, **22, 23**, 15, 16

1. Comparing the 3rd element with the 4th element, 23>15, 22>15, 21>15, placing the 4th element in the 1st position :

**15, 21, 22, 23**, 16

1. Comparing the 4th element with the 5th element, 23>16, 22>16, 21>16, 15<16, placing the 5th element in the 2nd position :

**15, 16, 21, 22, 23**

This is the resultant sorted array.

Function:

#include <math.h>

#include <stdio.h>

/\* Function to sort an array using insertion sort\*/

void insertionSort\_func(int arr[], int n)

{

int i, key, j;

for (i = 1; i < n; i++) {

key = arr[i];

j = i - 1;

while (j >= 0 && arr[j] > key) {

arr[j + 1] = arr[j];

j = j - 1;

}

arr[j + 1] = key;

}

}

// A utility function to print an array of size n

void printArray(int arr[], int n)

{

int i;

for (i = 0; i < n; i++)

printf("%d ", arr[i]);

printf("\n");

}

/\* Driver program to test insertion sort \*/

int main()

{

printf("Lets Upgrade - Data Structures And Algorithms \n");

int arr[] = { 22, 21, 23, 15, 16 };

int n = sizeof(arr) / sizeof(arr[0]);

insertionSort\_func(arr, n);

printArray(arr, n);

return 0;

}

