WIA2005 Algorithm Design &Analysis
Semester 2, 2016/17
Lab 2

PART 1 – Implementation

1. Implement the buble sort algorithm.

```
BUBBLESORT(A)
1  for i = 1 to A.length − 1
2      for j = A.length downto i + 1
3          if A[j] < A[j − 1]
4              exchange A[j] with A[j − 1]
```

The output of the program should look like this:

```
run:
Array Before Bubble Sort
4 29 2 2 110 99 5
Array After Bubble Sort
2 2 4 5 29 99 110
```

2. Figure 1 is the counting sort algorithm. Implement the algorithm. The output is given in Figure 2.

```
COUNTING-SORT(A, B, k)
 1  let C[0..k] be a new array
 2  for i = 0 to k
 3      C[i] = 0
 4  for j = 1 to A.length
 5      C[A[j]] = C[A[j]] + 1
 6  // C[i] now contains the number of elements equal to i.
 7  for i = 1 to k
 8      C[i] = C[i] + C[i − 1]
 9  // C[i] now contains the number of elements less than or equal to i.
10  for j = A.length downto 1
11      B[C[A[j]]] = A[j]
12      C[A[j]] = C[A[j]] − 1
```

Figure 1

```
run:
Array Before Counting Sort
4 29 2 2 110 99 5
Array After Counting Sort
2 2 4 5 29 99 110
```

Figure 2

3. Bucket sort is another variation of sorting algorithm. The algorithm is depicted as follows:

```
BUCKET-SORT(A)
1  let B[0..n − 1] be a new array
2  n = A.length
3  for i = 0 to n − 1
4      make B[i] an empty list
5  for i = 1 to n
6      insert A[i] into list B[⌊n A[i]⌋]
7  for i = 0 to n − 1
8      sort list B[i] with insertion sort
9  concatenate the lists B[0], B[1], . . . , B[n − 1] together in order
```

Implement the algorithm.

4. Write a program that implements shell sort algorithm.

PART 2 – Discussion

You have implemented several types of sorting algorithm in Lab 2. Discuss the advantages and the disadvantages of each algorithm in terms of it's complexity and practicality.