# DSA(2) Homework I

1. Write the status of the list (12,2,16,30,8,28,4,10,20,6,18) at the end of each iteration of the for loop of Insertion sort.

Initial status

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 12 | 2 | 16 | 30 | 8 | 28 | 4 | 10 | 20 | 6 | 18 |

Insertion start from j = 2, insert 2

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 12 | | 16 | 30 | 8 | 28 | 4 | 10 | 20 | 6 | 18 |

Insert 16

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 2 | 12 | | 30 | 8 | 28 | 4 | 10 | 20 | 6 | 18 |

Insert 30

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 2 | 12 | 16 | | 8 | 28 | 4 | 10 | 20 | 6 | 18 |

Insert 8

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 12 | 16 | 30 | | 28 | 4 | 10 | 20 | 6 | 18 |

Insert 28

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 2 | 8 | 12 | 16 | 30 | | 4 | 10 | 20 | 6 | 18 |

Insert 4

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 8 | 12 | 16 | 28 | 30 | | 10 | 20 | 6 | 18 |

Insert 10

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 2 | 4 | 8 | 12 | 16 | 28 | 30 | | 20 | 6 | 18 |

Insert 20

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 2 | 4 | 8 | 10 | 12 | 16 | 28 | 30 | | 6 | 18 |

Insert 6

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 2 | 4 | 8 | 10 | 12 | 16 | 20 | 28 | 30 | | 18 |

Insert 18

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 2 | 4 | 6 | 8 | 10 | 12 | 16 | 20 | 28 | 30 | |

Final sorting result

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 4 | 6 | 8 | 10 | 12 | 16 | 18 | 20 | 28 | 30 |

2. Draw a figure similar to Figure 7.1 starting with the list (12,2,16,30,8,28,4,10,20,6,18).

| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| initial | [12 | 2 | 16 | 30 | 8 | 28 | 4 | 10 | 20 | 6 | 18] |
| pass 1 | [4 | 2 | 6 | 10 | 8] | 12 | [28 | 30 | 20 | 16 | 18] |
| pass 2 | [2] | 4 | [6 | 10 | 8] | 12 | [16 | 18 | 20] | 28 | [30] |
| pass 3 | 2 | 4 | 6 | [10 | 8] | 12 | 16 | [18 | 20] | 28 | 30 |
| pass 4 | 2 | 4 | 6 | [8] | 10 | 12 | 16 | 18 | [20] | 28 | 30 |
| pass 5 | 2 | 4 | 6 | 8 | 10 | 12 | 16 | 18 | 20 | 28 | 30 |

3. Quick Sort is an unstable sorting method. Give an example of an input list in which the

order of the records with equal keys is not preserved.

We use a list of (8,5,12,6,23,1,22,6), we have a pair of equal keys of 6 inside the list, to help recognition for the order changes, we noted the first 6 as l-6 (short for left 6) and r-6 (short for right 6), and the result show as below.

| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
|---|---|---|---|---|---|---|---|---|
| initial | [8 | 5 | 12 | l-6 | 23 | 1 | 22 | r-6] |
| pass 1 | [1 | 5 | r-6 | l-6] | 8 | [23 | 22 | 12] |
| pass 2 | 1 | [5 | r-6 | l-6] | 8 | [12 | 22] | 23 |
| pass 3 | 1 | 5 | [r-6 | l-6] | 8 | 12 | [22] | 23 |
| pass 4 | 1 | 5 | r-6 | [l-6] | 8 | 12 | 22 | 23 |
| pass 5 | 1 | 5 | r-6 | l-6 | 8 | 12 | 22 | 23 |

We can see that after quick sort, r-6 is at the left of l-6, which represent the order of r-6 at l-6's right have not been preserved, so quick sort is an unstable sorting method.