Data Structures and Algorithms

Assignment 5

1. Sort the sequence 3, 1, 4, 7, 5, 9, 2, 6, 8 using Insertion Sort (Please present the sorting procedure as shown on page 15 in slides of Course_09) and calculate the number of swaps.

2. Sort the sequence 9, 8, 7, 6, 5, 4, 3, 2, 1 using Shell Sort with the increments {7, 3, 1} (Please present the sorting procedure as shown on page 34 in slides of Course_09) and calculate the number of swaps.

3. Sort 3, 1, 4, 7, 5, 9, 2, 6, 8 using Merge Sort (Please present the sorting procedure as shown on page 45 in slides of Course_09).

4. Sort 3, 1, 4, 7, 5, 9, 2, 6, 8 using Quick Sort with median-of-three pivot selection and the partitioning strategy (Please present the sorting procedure as shown in pages 67 and 68 in slides of Course_09).

5. Implement the following 3 sorting algorithms in C programming (Note: Please provide an interface for user to input a sequence of integers (at most 100 integers) separated with space, i.e., the input is like "12 5 8 45 93 13 65 38 37", and output the final sorted result on screen.):
   a) Shell Sort using the increments {1, 3, 7};
   b) Merge Sort;
   c) Quick Sort with median-of-three pivot selection, the partitioning strategy and a cut-off of 3 (along with the Insertion Sort).

6. Given the keys as the full names of the students selecting DSA course, as shown in the following string array, please design an appropriate hash function as well as a collision resolution strategy to make the number of collisions as small as possible. Please implement the hash function in C, and output the formula of your hash function, the number of collisions, and the size of your hash table.

```
char Name[59][20] ={"jinshan", "linanning", "xujiadong", "cuiwubing",
"denghua", "wangsiping", "limengxin", "qiaozhengping", "fanyingxue",
"zhangjianwei", "louhongxuan", "weixianzhu", "lijiachen", "zoulinwei",
"litingwei", "wujiaxin", "guozijie", "gengziyin", "yujiangyue",
"xuxingchen", "wangyue", "bixiaoyu", "zhouyaoxiang", "liumin", "guoyan",
"jinenze", "xuechen", "panzhaoyue", "weixiao", "xiaqiuhan", "zhanwenhao",
"wujiaxiang", "yeliang", "liyanxuan", "like", "yangqi", "helizhe",
"huangbotao", "houmingrong", "gaohao", "dengweihao", "zhangxuefeng",
"yangzeyuan", "zhanghongsen", "xiaochangrong", "houbairu", "leichenyong",
"wuzijian", "liyifan", "jilincheng", "wangtianyu", "zhuzifei", "liziyue",
"shezhucheng", "chenkening", "shengyinuo", "shenyihua", "liyinwen",
"linzhenghuan"};
```

- All the names are spelt with Chinese Pinyin and sorted by ID.

Note:

- Please provide the solutions to Exercises 1, 2, 3 and 4 in a doc file.
- Due date: Dec. 19th.