COS212 (Data Structures and Algorithms)

Tutorial 11 Exercise
2021/06/29

Question 1 ..... (2 marks)

An unsorted array of 100 elements is given. The array is filled with positive integers in the range $[1, 999]$.

1.1 [1 point] How many passes through the entire array does radix sort require to sort the array?

1.2 [1 point] Is counting sort a good choice for the given array? Motivate your answer.

Question 2 ..... (5 marks)

Assume the following class is used to implement a Hash Table:

```
public class HashTable<T> {
        protected T [] data; // hash table
        protected int m;     // hash table size

        public HashTable(int m) {
                data = new T[m];
        }

        protected int hash(T) {
                // some hash function
        }
}
```

Write a function `boolean insertKey(T key)` that would place a given key into the table, applying quadratic probing for collision resolution. The function should return true if the key was placed, and false otherwise.

Question 3 ..... (5 marks)

The following data is given:

5	27	99	18	47	200	59	31	6	315	21

The data is to be stored in a hash table. The hash function is `h(K) = (K % 13) % 11`. Collision resolution must be handled using double hashing, `h'(K) = 7 - (K % 7)`. Collision resolution makes only one pass through the hash table (i.e., if you start at i, make full circle until you reach i again, then stop).

Fill the hash table below. If a key can not be placed, write it down outside the table.

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	