

CSC210: Data Structures and Algorithms
Assignment 5

due: 9:30, on 1.11.2018

Please explain your answers in detail.

1. Write the procedures `ALLOCATE-OBJECT` and `FREE-OBJECT` for a homogeneous collection of objects (e.g. doubly-linked list of objects) implemented by the single-array representation.
2. Write an $O(n)$ -time procedure that prints all the keys of an arbitrary rooted tree with n nodes, where the tree is stored using the left-child, right-sibling representation.
3. Consider a version of the division method in which $h(k) = k \bmod m$, where $m = 2^p - 1$ and k is a character string interpreted in radix 2^p . Show that if we can derive string x from string y by permuting its characters, then x and y hash to the same value.
4. Consider inserting the keys 10, 22, 31, 4, 15, 28, 17, 88, 59 into a hash table of length $m = 11$ using open addressing with the auxiliary hash function $h'(k) = k$. Illustrate the result of inserting these keys using:
 - (a) linear probing
 - (b) quadratic probing with $c_1 = 1$ and $c_2 = 3$
 - (c) double hashing with $h_1(k) = k$ and $h_2(k) = 1 + (k \bmod (m - 1))$.
5. Write pseudocode for `HASH-DELETE` as outlined in the lecture and modify `HASH-INSERT` to handle the special value `DELETED`
6. Consider an open-address hash table with uniform hashing. Give upper bounds on the expected number of probes in an unsuccessful search and on the expected number of probes in a successful search when the load factor is $3/4$ and when it is $7/8$.