CptS 223 – Advanced Data Structures

Homework 4

Due: 5:00pm, March 21, 2008

Total Points: 40

1. (16 points) For each of the different hash tables described below, show the final hash table after inserting the keys 20, 10, 17, 14, 22, 77, 4, 21 (in this order) into an initially empty table.
   
a. (4 points) A hash table of size $M=7$ using collision-resolution by chaining and the hash function $hash(x) = x \mod M$. Your table should look similar to the one in Figure 5.5.
   
b. (4 points) A hash table of size $M=11$ using collision-resolution by open-addressing and the linear probing hash function $h_i(x) = (hash(x) + f(i)) \mod M$, where $hash(x) = x \mod M$, and $f(i) = i$. Your table should look similar to the one in Figure 5.19.
   
c. (4 points) A hash table of size $M=11$ using collision-resolution by open-addressing and the quadratic probing hash function $h_i(x) = (hash(x) + f(i)) \mod M$, where $hash(x) = x \mod M$, and $f(i) = i^2$. Your table should look similar to the one in Figure 5.19.
   
d. (4 points) A hash table of size $M=11$ using collision-resolution by open-addressing and the double hashing function $h_i(x) = (hash(x) + f(i)) \mod M$, where $hash(x) = x \mod M$, and $f(i) = i \times hash_2(x)$, and $hash_2(x) = R - (x \mod R)$, where $R = 7$. Your table should look similar to the one in Figure 5.19.

2. (5 points) Show the final binary heap after inserting 3, 7, 10, 8, 1, 5, 2, 9, 4, 6 (in this order) into an initially empty binary heap. Your final binary heap should be drawn as a tree, similar to Figure 6.2.

3. (5 points) Show the final binary heap after performing the linear-time buildHeap algorithm on the sequence 3, 7, 10, 8, 1, 5, 2, 9, 4, 6. Your final binary heap should be drawn as a tree, similar to Figure 6.2.

4. (4 points) Exercise 6.18, part (a).

5. (3 points) Show the binomial heap after inserting 7 into the binomial heap at the bottom of Figure 6.60.

6. (3 points) Show the binomial heap after performing a deleteMin on the binomial heap at the bottom of Figure 6.60.

7. (4 points) Show the binomial heap after merging the two binomial heaps in Figure 6.60.