

CS 32 THR

Long Exam 4

November 25, 2014

General Instructions

- Answer the items completely.
- Write as legibly as possible. Illegible or unreadable answers may not merit any points.
- Refrain from making unnecessary motions and sounds during the exam. Any suspicious behavior will be dealt with accordingly.
- Direct all questions to the proctor.
- If you need to go to the CR, hand your questionnaire and scratch paper to the proctor before heading out. Only one person at any given time is allowed to go out.
- Once the exam period is over, wait for the proctor's dismissal before leaving the exam site.

Questions

Consider the following table of keys and the outputs from 2 hash functions, h and h' :

k	$h(k)$	$h'(k)$
<i>ADA</i>	12	9
<i>BENJ</i>	6	0
<i>DUSTIN</i>	8	2
<i>EDGAR</i>	7	1
<i>JAH</i>	5	14
<i>KELVS</i>	6	2
<i>PAUL</i>	7	8
<i>PHIL</i>	7	5
<i>TIN</i>	0	11
<i>TOPE</i>	0	9

1. Assume that the keys were placed inside an ordered sequential table of size 10. Using *Fibonacci search*, give the *list of unique keys* that are visited/checked in the table when the following are used as search keys:
 - (a) EDGE
ANSWER: PHIL (twice visited, one prior to entering loop and another in initial loop), JAH, DUSTIN, EDGAR
 - (b) JAH
ANSWER: PHIL (twice visited, one prior to entering loop and another in initial loop), JAH
 - (c) PAUL
ANSWER: PHIL (twice visited, one prior to entering loop and another in initial loop), JAH, PAUL
 - (d) TIN
ANSWER: PHIL (visited in pre-loop statement only), KELVS, TIN

2. Assume an **erroneous** attempt was made to insert the keys inside a sequential table of size 10 *in preparation for multiplicative binary search*, with the following result:

1	<i>PAUL</i>
2	<i>EDGAR</i>
3	<i>BENJ</i>
4	<i>TIN</i>
5	<i>TOPE</i>
6	<i>KELVS</i>
7	<i>PHIL</i>
8	<i>ADA</i>
9	<i>DUSTIN</i>
10	<i>JAH</i>

List down the keys that are in *incorrect positions*. Additionally, tell what index should be the correct position of the erroneously placed keys.

ANSWER: TIN (correct index = 3), BENJ (correct index = 4), KELVS (correct index = 5), PHIL (correct index = 6), and TOPE (correct index = 7).

3. Show the final result of inserting the keys (in top-to-bottom order as they appear in the table shown in the first part of the questionnaire) into a *hash table of size 13* (with $h(k)$ as the primary hash function) when the following collision resolution techniques are used:

- (a) Linear Probing

ANSWER:

0	<i>TIN</i>
1	
2	<i>PHIL</i>
3	<i>PAUL</i>
4	<i>KELVS</i>
5	<i>JAH</i>
6	<i>BENJ</i>
7	<i>EDGAR</i>
8	<i>DUSTIN</i>
9	
10	
11	<i>TOPE</i>
12	<i>ADA</i>

- (b) Double Hashing

ANSWER:

0	<i>TIN</i>
1	
2	<i>PHIL</i>
3	<i>TOPE</i>
4	<i>KELVS</i>
5	<i>JAH</i>
6	<i>BENJ</i>
7	<i>EDGAR</i>
8	<i>DUSTIN</i>
9	<i>PAUL</i>
10	
11	
12	<i>ADA</i>

4. Assume that the keys were inserted in a hash table of size 13 with *linear probing* as collision resolution, as in item 3.(a). Show the adjusted table when PAUL is deleted from the table by *rehashing affected entries* in the table.

ANSWER:

0	<i>TIN</i>
1	
2	
3	<i>PHIL</i>
4	<i>KELVS</i>
5	<i>JAH</i>
6	<i>BENJ</i>
7	<i>EDGAR</i>
8	<i>DUSTIN</i>
9	
10	
11	<i>TOPE</i>
12	<i>ADA</i>

Scoring Mechanics

The exam is good for a total of **8 points**. 1 point is given to each sub-items of Items 1 and 3, as well as for Items 2 and 4.

1. For Items 1.(a), 1.(b), 1.(c), 1.(d): **0.2 point deduction** is given for each incorrectly listed key. **No points given if all keys listed are wrong.**
2. For Item 2: **0.1 point deduction** is given for each incorrectly listed key and/or index.
3. For Items 3.(a), 3.(b), and 4: **0.1 point deduction** for each mistake.