College of Engineering
CS261

Written Assignment 7

HashTables and Graphs - Final Assignment

CS261 Home
Schedule
Assignments
Resources
Policies
Grades

admin |
edit SideBar

This final assignment consists entirely of written solutions. Please read the questions carefully and answer them as concisely as possible. All solutions must be typed.

HASH TABLES

(Questions from chapters12 and 13...slightly modified in some cases)

1. In the dynamic array implementation of the dictionary, the put operation removes any
prior association with the given key before inserting a new association. An alternative
would be to search the list of associations, and if one is found simply replace the value field. If no association is found, then insert a new association. Write the put method using both approaches. Which is easier to understand? Which is likely to be faster?

2. When Alan wishes to join the circle of six friends, why can't Amy simply increase the
size of the vector to seven?

3. Amy's club has grown, and now includes the following members:

Abel	Abigail	Abraham	Ada
Adam	Adrian	Adrienne	Agnes
Albert	Alex	Alfred	Alice
Amanda	Amy	Andrew	Andy
Angela	Anita	Anne	Antonia
Arnold	Arthur	Audrey	

a) Find what value would be computed by Amy's hash function for each member of the
group. From chapter 12, this is a description of Amy's hash function:

"Amy uses an interesting fact. If she selects the
third letter of each name, treating the letter as
a number from 0 to 25, and then Mods the
number by 6, each name yields a different number"

b) Now, assume we use Amy's hash function and assign each member to a bucket by simply
modding the hash value (obtained from part a) by the number of buckets. Determine how many elements
would be assigned to each bucket (assume hashing with chaining) for a hash table of size 5. Do the same for a hash
table of size 11.

c) What is the load factor of the table?

4. In searching for a good hash function over the set of integer values, one student thought he could use the following:

```
int index = (int) Math.sin(value);
```

What was wrong with this choice?

5. Can you come up with a perfect hash function for the names of the week? The

names
of the months? Assume a table size of 10 for days of the week and 15 for names of the months. In case you cannot find any perfect hash functions, we will accept solutions that produce a small number of collisions (<3).

GRAPHS

6. Describe the following graph as both an adjacency matrix and an edge list:
Graph

7. Construct a graph in which a depth first search will uncover a solution (a path from one vertex to another) in fewer steps than will a breadth first search. You may need to specify an order in which neighbor vertices are visited. Construct another graph in which a breadth-first search will uncover a solution in fewer steps.

8. Complete Worksheet 41 (2 simulations). Show the content of the stack, queue, and the set of reachable nodes.

9. Complete Worksheet 42 (1 simulation). Show the content of the priority queue and the cities visited at each step.

10. Why is it important that Dijkstra's algorithm stores intermediate results in a priority queue, rather than in an ordinary stack or queue?

11. How much space does an edge-list representation of a graph require?

12. For a graph with V vertices, how much space will an adjacency matrix require?

13. Suppose you have a graph representing a maze that is infinite in size, but there is a finite path from the start to the finish. Is a depth first search guaranteed to find the path? Is a breadth-first search? Explain your answer.

WHAT TO SUBMIT

Submit a single **sols.pdf** file containing solutions to all questions.

SOLUTIONS:

sols7.pdf

rubric.txt