

2013 CS140 Midterm Exam - Answer All Questions

Question 1 - Hashing

You have a hash table with 100 entries. Keys are strings, and you are using the **djbhash** hash function from lecture. You can see the result of **djbhash** on three strings to the right. I am giving you three scenarios below. For each scenario, tell me where the piece of data will go in the hash table when collisions are resolved with separate chaining, linear probing and quadratic probing. Use the answer sheet.

```
UNIX> echo Chloe Arpa | djbhash
2437388788
UNIX> echo Gabriel Isis | djbhash
600618099
UNIX> echo Austin Labyrinth | djbhash
2735462150
UNIX>
```

- **Scenario #1:** The only empty entries in the hash table are 15, 66 and 89, and you insert the key "Chloe Arpa."
- **Scenario #2:** The only empty entries in the hash table are 2, 4, 6, 8 and 98, and you insert the key "Gabriel Isis."
- **Scenario #3:** The only empty entries in the hash table are 13, 33, 63 and 83, and you insert the key "Austin Labyrinth."

Question 2 - Vector / Deque / List

```
void X(vector <double> &a);
```

Part A: Suppose I have a procedure **X()** with the prototype above. Implement that procedure in such a way that its performance will be very bad when **a** is a vector, but very good when **a** is a deque. I don't care what **X()** does, except it has to perform poorly when **a** is a vector and well when **a** is a deque. Explain to me why it is better with the deque. Please remember that you cannot call **push_front()** or **pop_front()** on a vector -- in your procedure, use methods that are common to both vectors and deques, such as **push_back()**, **pop_back()**, **insert()** or **erase()**. There are prototypes at the end of this page.

Part B: Explain to me in what situation you would use a list in preference to a vector or a deque. Be precise, and explain why.

Question 3 - Hexadecimal

- **A:** 47
- **B:** Binary 1010101001
- **C:** $6 \cdot 256 + 10$
- **D:** $(0xcb \ll 1)$

What are the following values in hexadecimal?

Question 4 - Stringstreams and Printf

The program to the right is in the file **sid.cpp**. Below are some Unix commands that will compile the program and run it on an input file. Tell me the output of the last Unix command. Do this on the answer sheet, where I have gray boxes that you can use, where each box is a space on the terminal.

```
UNIX> g++ sid.cpp
UNIX> cat input.txt
3.567 14.2
-5 Fred
  Dontonio
20.
17.4321
5000.01
UNIX> ./a.out < input.txt 10 Mario
```

```
#include <iostream>
#include <sstream>
#include <string>
using namespace std;

main()
{
    string s;
    istringstream ss;
    int i;
    double d;

    while (cin >> s) {
        ss.clear();
        ss.str(s);
        if (ss >> d) {
            if (s.find('.') != string::npos) {
                printf("%-10s %7.3lf\n", s.c_str(), d);
            } else {
                i = d;
                printf("%-10s %7d\n", s.c_str(), i);
            }
        } else cout << s << endl;
    }
}
```

Prototypes of Vector/Deque Methods

```
void push_back(double val);
void pop_back();
iterator insert(iterator pos, double value);
void erase(iterator pos);
```