CS 2150 Exam 1, spring 2014

Name _____

You MUST write your e-mail ID on **EACH** page and bubble in your userid at the bottom of this first page. And put your name on the top of this page, too.

If you are still writing when "pens down" is called, your exam will be ripped up and not graded – even if you are still writing to fill in the bubble form. So please do that first. Sorry to have to be strict on this!

Other than bubbling in your userid at the bottom of this page, please do not write in the footer section of this page.

There are 6 pages to this exam. Once the exam starts, please make sure you have all the pages. Questions are worth different amounts of points.

If you do not bubble in this first page properly, you will not receive credit for the exam!

Answers for the short-answer questions should not exceed about 20 words; if your answer is too long (say, more than 30 words), you will get a zero for that question!

This exam is CLOSED text book, closed-notes, closed-calculator, closed-cell phone, closed-computer, closed-neighbor, etc. Questions are worth different amounts, so be sure to look over all the questions and plan your time accordingly. Please sign the honor pledge below.

_____

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You step in the stream,
But the water has moved on.
This page is not here.

(the bubble footer is automatically inserted into this space)

Page 2: C++

1. [3 points] What method(s) does C++ automatically provide for you, for free, in every class that you create?

2. [3 points] Why is a memory hole? How do you create one?

3. [3 points] Other than syntax, what are the three differences between pointers and references?

4. [3 points] What is the purpose of the destructor?

Page 3: Lists

5. [3 points] What is the primary reason we use Abstract Data Types (ADTs)?

6. [3 points] Consider a queue class implemented with a `vector` as the underlying data structure. When first created, we assume that the vector creates space for 100 elements. We then enqueue 100 elements, and then dequeue 90 of them. When we try to insert one more element, how does the queue class handle it, as there is an element in the last spot of the vector?

7. [6 points] Fill in the table below with the big-Theta running times of the operations on a stack for both a vector implementation and a linked-list implementation. Please just write the value inside the bit-Theta parenthetical – for example, just write '$\log n$' for a logarithmic running time, and not '$\Theta(\log n)$' and not 'log' and not 'logarithmic' (this makes it much easier for us to grade).

	push	pop	top	isEmpty	printAll
vector					
linked-list					

Page 4: Numbers

The questions on this page use the following code:

```
union {
  float f;
  int i;
  double *p;
} bar;
```

8. [6 points] Consider the two statements: `bar.f = -35.5; cout << bar.p;`. What is printed? Show your work!

9. [4 points] Consider the two statements: `bar.i = -234; cout << bar.p;`. What is printed? Show your work! Note that $234 = 128 + 64 + 32 + 8 + 2$.

10. [2 points] Consider the statement: `cout << sizeof(bar);`. What is printed?

Page 5: Numbers and more C++

11. [3 points] Convert 143 in base 5 to base 8

12. [3 points] If you were to design a floating point type, you would have to decide how many bits to put in the exponent versus in the mantissa. Briefly discuss the trade-offs of one versus the other (i.e., what does more bits in the exponent give you and what does more bits in the mantissa give you?)

13. [3 points] List two reasons why you would want to use a `float` over a `double` for a given variable, and two reasons why you would want to use a `double` over a `float`.

14. [3 points] Why does the C++ programming language include templates?

Page 6: Miscellaneous

15. [3 points] Why does C++ treat array base names as *constant* pointers?

16. [3 points] Big-Theta for a given running time forms an *equivalence class*. What does this mean?

17. [3 points] Describe the UNIX pipes, and briefly explain what they do.

18. [3 points] What is your favorite xkcd comic that we have gone over in lecture so far? These are the comics displayed when people are entering the classroom at the start of lecture.