CS 2150 Exam 1

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!

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.

_____

_____

_____

_____

_____

Serious error.
All shortcuts have disappeared.
Screen. Mind. Both are blank.

(the bubble footer is automatically inserted into this space)

Page 2: C++

1. [3 points] What does the `friend` keyword do in C++? Why would we use it?

2. [3 points] Write a *small* snippet of C++ code that contains a dymanic memory hole. The shorter the better! We are just looking for the snippet of code – don't bother with the method it's in, `using namespace std;`, `#include` lines, etc.

3. [3 points] Other than syntax, what are the differences between a reference and a pointer?

4. [3 points] What is the purpose of the destructor? When are the situations when it is called?

Page 3: Lists

5. [3 points] What is an abstract data type? Why do we use them?

6. [6 points] Consider four primary operations for a list: `insert()`, `delete()`, `find()`, and `findKth()`. Assume that an `insert()` occurs at the end of the list, `delete()` takes in an iterator (i.e., the element has already been found), and that `find()` is passed the element to be searched for. What are the running times for each of those four operations when implemented with linked lists and when implemented with a vector? Please fill the running times into the table below.

Data type	`insert()`	`delete()`	`find()`	`findKth()`
Linked lists				
Vector				

7. [3 points] We don't write templated code in this course because of the horrendous error messages that are created from a programming mistake. Why does the compiler have such issues detecting errors in template code? (Note: claiming that g++ is a bad compiler is not a valid answer here, even though that may be true)

Page 4: Numbers

8. [3 points] What does it mean when we say that floating point numbers are not spatially uniform? Give an example.

9. [3 points] In a floating-point type, what are the benefits to a larger number of bits for the exponent? For the mantissa?

10. [3 points] Convert the little-Endian value of 0x75caedfe to big-Endian.

11. [3 points] How do you convert the binary representation of a two's complement integer to it's negative (i.e., x to -x)?

Page 5: Number conversions

Consider the code listed to the right. The questions on this page have to do with determining its output, which will be done in two steps. Assume that the code is properly inserted into a `main()` function, and that it compiles and runs. Note that a `short` is a 2-byte two's complement integer. Everything in this question is in big-Endian.

```
union {
   float f;
   int *p;
   short s[2];
} b;
b.f = -0.421875;
cout << b.p << endl;
cout << b.s[0] << endl;
cout << b.s[1] << endl;
```

12. [6 points] To determine what is output by the first `cout` line in the program, you have to covert -0.421875 = -27/64 to it's IEEE 754 hexadecimal encoding. Recall that everything in this problem is in big-Endian. Show your work!

13. [6 points] What are the values output by the last two `cout` lines? You do not need to worry which of the shorts is the "upper" end of the float and which is the "lower" end of the float, as we will accept the answers in either order. You may leave your answer as a sum of powers of 2, if that is easier.

Page 6: Miscellaneous

14. [3 points] Name 3 advantages that Emacs (or Vim, if you prefer) has over other text editors, such as TextWrangler, Notepad, GEdit, etc.

15. [3 points] Explain how to use the `x/x` commands to view the value of a variable in gdb (i.e., show sample usage, explain how it works, etc.).

16. [3 points] Briefly explain the what purpose the following UNIX commands perform: `grep`, `ps`, `pwd`.

17. [3 points] What are the largest and smallest values that a `long` (a 64-bit two's complement integer) can hold? You may leave your answers as powers of 2.