CS 2150 Final exam

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!

By signing below, you agree to surrender unto us your first-born child, unless you cross out this paragraph.

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.

_____

_____

_____

_____

A crash reduces
Your expensive computer
To a simple stone.

(the bubble footer is automatically inserted into this space)

Page 2: C++

1. [3 points] Write a snippet of C++ code that is *guaranteed* to cause a segmentation fault (i.e., not code that will just most likely cause a segmentation fault). Your code may not exceed 5 C++ statements!

2. [3 points] Consider two classes: Person and Student; Student is a sub-class of Person. There is a single `virtual` method in *both* Person and Student, called `foo()`. Lastly, consider the code `Person *p = new Student(); p->foo();`. Describe, in English, the *exact* steps the code must take to invoke `foo()`.

3. [3 points] Briefly describe the difference between shared and replicated multiple inheritance.

4. [3 points] Other than syntax, what are the three differences between references and pointers?

Page 3: Huffman Coding

For the three questions on this page, you are going to perform the Huffman coding of the string "computer" (without the quotes, of course); that string has exactly 8 characters.

5. [4 points] Draw the min-heap generated by this string.

6. [4 points] Draw the final Huffman coding tree. Please use scrap paper for your intermediate steps.

7. [4 points] What is the compression ratio of encoding the string "computer"? Compare this to straight encoding (where every character has the same bit code length). Did you obtain good compression? Why or why not?

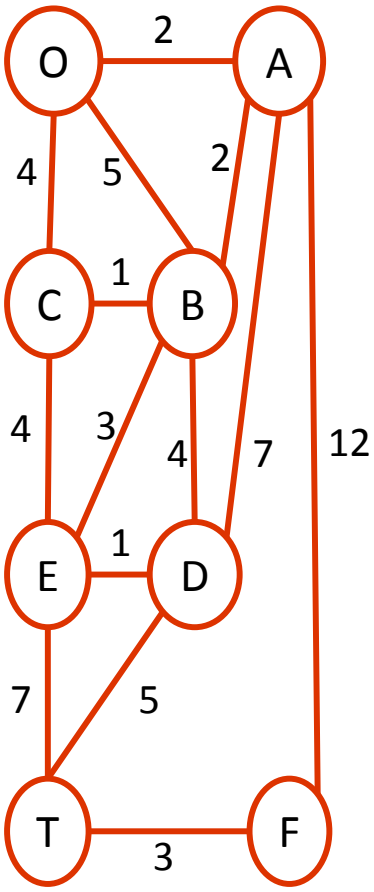
Page 4: Graphs

8. [4 points] Describe one advantage and one disadvantage of using an adjacency list versus an adjacency matrix (2-D array) to store a graph. You may not use the same reason twice! For example, if *a* is faster than *b*, then you can't also say that *b* is slower than *a*.

	Adjacency List	Adjacency Matrix
Advantage		
Disadvantage		

9. [8 points] Perform Dijkstra's shortest path algorithm on the graph below; start at node *O* (for Origin). Put your results in the table below. If a path has to be corrected, just cross out your old values in the distance or path box (i.e., don't erase them), as we want to see the history of the path generation.

Vertex	Known?	Distance	Path
O			
A			
B			
C			
D			
E			
F			
T			



Page 5: Other stuff

10. [3 points] Give three reasons why storing a heap in an array is better than using dynamic memory for allocating each node.

11. [3 points] Which is the best collision resolution strategy for hash tables? Why?

12. [6 points] Convert -35.125 to little-Endian hexadecimal using IEEE 754 floating point representation. Show your work!

Page 6: Demographics

Name & userid: _____

We meant to ask these in an end-of-the-semester survey, but we did not get to it in time. So we'll put it here for some extra points on the exam! Sorry if this page is a bit crowded...

13. [0 points] Did you put your name and userid at the top of this page? You need to do so in order to get the points on this page!

14. [2 points] What is your major or minor? If you have not declared, then answer with your intended major or minor. Please circle one.

    - BS CS
    - BA CS
    - BS CpE
    - CS minor
    - Other (please explain): _____
    - Neither majoring nor minoring in computing

15. [1 points] Have you already declared the major/minor mentioned above? Circle: Yes or No

16. [2 points] What CS 1 class did you take? Please circle one.

    - CS 1110
    - CS 1111
    - CS 1112
    - CS 1120
    - AP credit
    - Transfer credit
    - Other (please explain): _____
    - Placed out of it via the CS 1110 placement exam

17. [1 points] If you took your CS 1 class in college (i.e. CS 1110, CS 1111, CS 1112, CS 1120, or a transfer class), in what semester did you take it? Please specify a semester by season and calendar year (i.e., "fall 2012" and not "my second year").

18. [2 points] What CS 2 class did you take? Please circle one.

    - CS 2110
    - CS 2220
    - AP credit
    - Other (please explain): _____
    - Transfer credit

19. [1 points] If you took your CS 2 class in college (i.e. CS 2110, CS 2220, or a transfer class), in what semester did you take it? Please specify a semester by season and calendar year (i.e., "fall 2012" and not "my second year").

20. [1 points] Did you attend the final exam review session? You'll get full credit for this question, as long as you answer it honestly (we know most that were there, but not all).

21. [2 points] For the 3-credit courses in the upcoming spring semester:

    - How many CS courses are you enrolled in (not wait-listed)?
    - How many CS courses are you wait-listed for?
    - How many CS courses would you *like* to be enrolled in?