CS 2150 final exam, spring 2015

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 8 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.

_____

_____

_____

_____

Three things are certain:
Death, taxes, and lost data.
Guess which has occurred.

(the bubble footer is automatically inserted into this space)

Page 2: Exam 1 stuffs

1. [3 points] Why would we never bother to declare a reference as a variable *inside* a method (as opposed to as a parameter)?

2. [3 points] Other than syntax, what are the three differences between pointers and references?

3. [6 points] Given the IEEE 854 floating point encoded *little Endian* hex value of 0x00009f41, convert it to base 10 representation.

Page 3: Exam 2 stuffs

4. [3 points] What are the 5 properties of red-black trees?

5. [3 points] Consider a *trinary* tree, which has three children (left, middle, and right), and *two* values per node: v_1 and v_2. The search tree property still holds: all nodes in the left sub-tree are less than v_1, which is less than the values in the middle sub-tree, which is less than v_2, which is less than values in the right sub-tree. Assuming balanced version (AVL or red-black), what is the big-Theta running time of the three primary operations (insert, remove, find)? Briefly, why?

6. [6 points] Give one advantage and one disadvantage of each of the tree data types we studied in this course. You can't use the same reason twice (i.e., if *a* is better than *b*, then you can't also say that *b* is worse than *a*).

	Advantage	Disadvantage
BST		
AVL		
Red-black		
Splay		

Page 4: C++

7. [3 points] What is the difference between `public` and `private` inheritance?

8. [3 points] What is the difference between shared and replicated multiple inheritance?

9. [6 points] Write a *short* C++ code snippet that uses dynamic dispatch. You do not need to worrk about `#include` or `namespace` lines.

Page 5: x86

10. [3 points] List the steps in the C calling convention's *caller prologue*.

11. [3 points] List the steps in the C calling convention's *callee prologue*.

12. [3 points] List the steps in the C calling convention's *callee epilogue*.

13. [3 points] List the steps in the C calling convention's *caller epilogue*.

Page 6: Heaps and Huffman

14. [3 points] Excluding a binary heap, what is the best data structure to implement a priority queue with? Why?

15. [3 points] Give three reasons why it is better to keep binary heaps in an array format rather than the more traditional dynamically-allocated tree node format

16. [3 points] What is the expected running time of both `insert()` and `deleteMin()` into a binary heap? For both, briefly, why?

17. [3 points] Huffman compression works better for some types of data over others. What types of data does it work better for? Why?

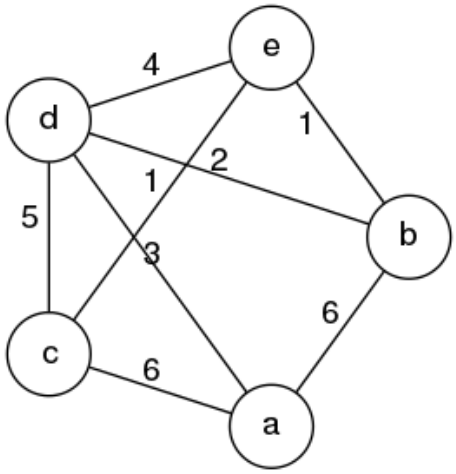
Page 7: Graphs

18. [6 points] Give one advantage and one disadvantage of the two types of graph representation we have studied: adjacency matrix and adjacency list. Note that you can't use the same reason twice! So if *A* is faster than *B*, you can't *also* say that *B* is slower than *A*.

	Advantage	Disadvantage
Adjacency list		
Adjacency matrix		

19. [6 points] Given the following graph, perform Dijkstra's shortest path in the table below. If a cell is updated, be sure to include both the original value(s) (crossed out), as well as the updated value(s). Start at node "a". Note that, in the diagram, the edge from "c" to "e" is the one of weight 1.

node	**known?**	**distance**	**path**
a		0	
b			
c			
d			
e			



Page 8: 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...

20. [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!

21. [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

22. [1 points] Have you already declared the major/minor mentioned above? Circle: Yes or No

23. [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

24. [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").

25. [2 points] What CS 2 class did you take? Please circle one.

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

26. [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").

27. [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).

28. [2 points] For the 3-credit courses for next semester (not summer or J-term):

    - 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?