CSCI 202 Computer Science II Spring 2011 Version 1A

FINAL EXAMINATION (200 points max)

Print your name and Student Id. number on the back of the last sheet. **Closed book, open 2 sided sheet of notes. Calculator OK. No wireless communication or computers. Write answers on this paper. Attempt every question** (10 Questions, 1 per page).

1. (22 points) Arrays, Pointers, Recursion

a. (12 points) Arrays and Pointers. The following C++ program compiles and runs. Work out what it does when I run it. Write the output **in the box provided**.

b.(10 points) Recursion. Here is a program that includes a **recursive function**. Work out, carefully, and step by step, what it does. Note. This uses int division and modulus operations.

2 (22 Points) Inheritance and the UML

2a.**(12 points)** Draw a diagram of the following two (useless) classes and the relation between them using the Unified Modeling Language(UML)(3 points). Include all **classes**, **relations**, **operations**, and **attributes** (3 points). Indicate the access mode for each member and its data type (3 points). For operations/functions show the argument types and the returned type(3 points).

2b(10 points). In a *main program* that includes the two classes (**Base** and **Derived**)above I declare two variables

```
Base b;
Derived d;
```

Which of the following statements will compile (mark "OK")
and which will not compile (mark "NO")?
(1 point per answer, no answer=wrong answer=0 points)

3.(22 points) Polymorphism

3a.(10 points) What is output by the following useless but correct program?

b.(12 points) True or False? Circle the correct T|F choice

4.(24 points) Algorithms

Here are four algorithms that might be used to implement functions that operate on a vector *v* of numbers....Which are "sort" algorithms ?Which are "search" algorithms? Which are O(n)? Which are O(log(n))? .... Which algorithm would you choose for *to* ...? Why? (short sentence, 2 points)

5. (24points) Functions and Templates

a. (9 points) Correct the errors in the ... below.

b. (9 points, 3 points per blank). Complete the .... below.

c.(6 points) Correct the error(s) in the following attempt at a generic function that ....

6. (20 points max, blank answer = wrong=0 points, correct=2 point, near miss=1 point) The STL

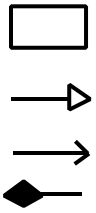
a. (14 points)STL Containers. For each situation below, **write down** the single **answer** that fits the situation or description **best**:

b.(6 points)STL. Fill in the blanks in the following program so that it ...Read the whole program and think before writing your answers. Note. This was a working program before I blanked out three things below. What were they(2 points each)?

7. (24 points). Linked Data Structures and Pointers. On the right is the design for a template class called a *Link*. It is used for implementing .... Each *Link* contains an *item* element and ....
a. (12points, 2 points max per blank, no answer=0) **Fill in blanks _____ in the code** below.

b.(8 points). **Study** the main program below that uses the class above and **work out a diagram** of the computer's memory showing every pointer and object created. Invent addresses as needed. Erase nothing, cross out old values. No points for tidiness. You may add arrows if you wish.
c.(4 points) Write down what appears on the screen when the above program is run:

8. (24 points) UML and Files
8a. (12 points). UML. Draw a class diagram using the **UML** notations for **class**, **generalization**, **association**, and **composition** indicated on the right. Do not use other kinds of links/associations. Show no attributes or operations. Use composition and association with **roles** and **multiplicities** instead. ...



8b. (12 points). Files and the arguments of main. Fill in the blanks (2 points each) to make a program that .... files given file names in the command line.

9.(18 points) STL Algorithms and Exceptions
a. (8 points) STL Algorithms
Fill in the blanks (_____) (2 pts each) in the following code that it....:
b. (10 points) Exceptions
Work out, **carefully**, what the following correct but useless program outputs when executed. Put the output on the right. Partial credit is given.

10. Your Last Project. Bonus Question -- Makes up a max of 10 points lost on rest of final