University of Illinois at Urbana-Champaign
Department of Computer Science

Final Exam

CS 428 Software Engineering II
Spring 2010

May 14, 2010

TIME LIMIT = 3 hour
COVER PAGE + 17 PAGES

Print your name and netId neatly in the spaces provided below; print your netid in the upper right corner of every page.

Name: _____

NetId: _____

This is a closed book, closed notes examination. You may not use calculators or any other electronic devices. Any sort of cheating on the examination will result in a zero grade.

We cannot give any clarifications about the exam questions during the test. If you are unsure of the meaning of a specific question, write down your assumptions and proceed to answer the question on that basis.

Do all the problems in this booklet. Do your work inside this booklet, using the backs of pages if needed. The problems are of varying degrees of difficulty so please pace yourself carefully, and answer the questions in the order which best suits you. Answers to essay-type questions should be as brief as possible. If the grader cannot understand your handwriting you will get 0 points.

There are 10 questions on this exam and the maximum grade on this exam is 124 points.

Page	Points	Score
1	8	
2	8	
3	8	
4	8	
5	10	
6	6	
7	8	
8	6	
Total:	62	

Page	Points	Score
9	6	
10	6	
11	15	
12	8	
13	5	
15	10	
16	4	
17	8	
Total:	62	

1. Quality Assurance

[2] (a) In lecture, Prof. Marinov discussed the notion that "Quality is Free". Explain what it means.

[2] (b) What is the difference between *failure analysis* and *flaw analysis*?

[4] (c) Explain why it is important to keep track of information about bugs found while developing software? Provide ***two*** examples of how this information can be used.

2. Reviews and Inspections

[4] (a) One goal of conducting technical reviews is improving the quality of the product being developed. Name ***two*** other goals of performing these reviews.

[2] (b) In *Code Complete*, Steve McConnell indicates that when performing technical reviews and inspections it is **not** desirable to solve identified problems during the review. Explain why.

[2] (c) Despite the cost of performing design reviews, they can often reduce overall development costs. Why is this the case?

4 (d) Code walkthroughs have been shown to be less effective at finding problems than formal inspections. Give ***two*** reasons why you might still choose to conduct code walkthroughs.

3. Requirements and Design

2 (a) Use cases are not always an effective technique. Describe a situation or system where use cases do not work or cannot easily be used.

2 (b) Students in a softare engineering course are creating a web application that allows photographers to post their photos for clients to see. While browsing the project's wiki page, you see the following use case: "Create a database to hold photographs." Why is this not a use case?

4 (c) You decide to help this group out, and rewrite their use case to show them how it's done. Create **two** informal use cases to replace the original. Keep them brief.

4 (d) Create a decision table to decide the reimbursement percentage for the following medical insurance scenario. (note: this scenario is from Bill Rogers' Systems Analysis & Design course at Saint Xavier University)

No charges are reimbursed to the patient until the deductible has been met. After the deductible has been met, the amount to be reimbursed depends on whether or not the doctor or hospital is a "Preferred Provider." For preferred providers, Doctor's office visits are reimbursed at 65% and Hospital visits are reimbursed at 95%. For other providers reimburse 50% for Doctor's Office visits or 80% for Hospital visits.

4. Performance

[6] (a) In *Code Complete*, Steve McConnell argues that developers should consider code tuning only as a last resort. Describe ***three*** other possible ways to improve performance you should consider first.

[2] (b) What is the Pareto Principle? Explain how this principle applies in the context of program optimization.

5. Security

[2] (a) Name a design principle that helps improve security, and briefly describe how it does that.

2 (b) As mentioned in lecture, the mail transport agent *qmail* has had no security failures. What major architectural feature of qmail has helped keep it secure?

2 (c) Name two common mistakes made when developing software that lead to security holes.

2 (d) Why is security more than just a technical issue? Explain, and provide an example of a non-technical issue that must be taken into account to ensure a system is secure.

6. Web Applications

[4] (a) How does a three-tier architecture separate content from presentation? What is an advantage of separating content from presentation?

[2] (b) Why can it be easier to maintain web applications than other types of software?

[2] (c) In some ways, today's web applications resemble the mainframe programming model that died off long, long ago. Why, according to *The Other Road Ahead*, has this programming model come back?

7. User Interface

[2] (a) Why do software development processes not work well for user interface design?

[2] (b) What deficiency do use cases typically present when used for UI design?

[2] (c) How can use cases be used most effectively for UI design?

2 (d) According to *Joel on Software*, when is a user interface well designed?

2 (e) Is giving users more choices always a good approach for user interface design? Why or why not?

2 (f) List two techniques for user interface design that reduce what the user needs to remember.

2 (g) What user interface feature is the Command pattern most often used for?

2 (h) Why is it usually a bad idea to create a unique, innovative user interface for a program?

2 (i) Give an example of a user interface affordance.

8. Agile Software Development Processes

15 (a) In CS 428 you have learned a number of different agile development processes, some of which you have followed in your project. Different processes have different characteristics, strengths, and weaknesses. In the table given below, compare and contrast XP, Scrum, and Crystal Clear for **three** categories. Select the categories from the ones listed below.

Testing, Roles, Activities, Values, Planning, Risk Management, Deliverables

		Software Engineering Processes		
		XP	Scrum	Crystal Clear
Compare and Contrast Criteria				

9. Miscellaneous

[4] (a) As presented in lecture, diversity in project teams can be valuable. For ***two*** different types of diversity, discuss how diversity along these lines can be beneficial on a project.

[2] (b) What is the *most important* advantage that using version control provides for a software development team?

[2] (c) Recall the guest lecture on database and anonymization. Suppose that you anonymize a database once for some attributes. Suppose that you then change the database. Would it be a good idea to anonymize it for a different set of attributes? Explain your answer. A simple "yes" or "no" doesn't suffice.

3 (d) Describe a risk that was associated with your group's project at the beginning of the semester. Describe how your group dealt with this risk.

2 (e) A function in lambda calculus, sometimes written $f = \lambda x.T$ (where f is the function name, x the parameter, and T the body), is called a *lambda abstraction* because it abstracts over something. What does it abstract over?

10. UML

You have been hired by Southeastern North Dakota Polytechnic University (SNDPU) to design a new digital library system for research publications. The system will allow users to download and view information about published research papers and technical reports. The system will also track information about where papers were published, and which papers are cited or referenced by any particular paper.

The SNDPU Provost's office has identified the following features for the first iteration:

1. Because the system can only be used by the faculty, students and staff of SNDPU, users entering the system should be prompted for their university-wide UserId and Password.
2. Users should be able to display a list of all publications for a particular Author. The system stores data about Conference Papers, University Technical Reports and Journal Articles. Naturally, the title, the list of author(s) and the year of publication are tracked for each paper. Additional information varies by the type of publication: Conference Papers include conference name and location; Journal Articles include journal name, publication month, and publisher; and Technical Reports have unique ids assigned by the university.
3. Users should be able to display a list of all papers in the proceedings of a specified conference or a list of all articles in a specified edition of a journal.
4. Users should be able to download publications stored in the system. The system should keep track of the number of times a publication is downloaded.
5. Users should be able to display a list of all papers which cite a particular publication.

If anything is unclear, please **state your assumptions** when you answer the questions on the next three pages.

10 (a) Show the class diagram for the digital library system such that it can support implementation of all the features for the first iteration. Be sure to include all the details (instance variables, methods, relations between classes) necessary to implement the main functional requirements. You do not need to include accessor methods in the class diagram.

4 (b) Consider the following scenario:

Professor Biff Lattimer wants to better understand the impact his research is having in his field. As part of his efforts to do so, he wants to use the digital library system to automatically compile a list of all the papers that have cited his papers.

Write a *casual* use case that describes this scenario using the digital library system.

8 (c) Show the sequence diagram that describes your use case for the scenario in part (b) above. (Hint: Show the specific instances of classes where it makes sense.)