University of Illinois at Urbana-Champaign
Department of Computer Science

Final Exam

CS 428/429 Software Engineering II
Spring 2014

May 14, 2014

TIME LIMIT = 3 hours
COVER PAGE + 15 PAGES

Upon receiving your exam, print your name and netid neatly in the space provided below. Then, 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.

Answering **I don't know** (and nothing else) to any exam question is automatically worth 25% partial credit for that question. A blank answer is NOT awarded the partial credit.

Do all the problems in this booklet. Do your work inside this booklet, using the back 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 may get 0 points**.

There are 13 questions on this exam and the maximum grade is **104 points**.

Page	Points	Score
1	5	
2	4	
3	4	
4	6	
5	6	
Total:	25	

Page	Points	Score
6	10	
7	8	
8	5	
9	7	
10	10	
Total:	40	

Page	Points	Score
11	8	
12	8	
13	7	
14	7	
15	9	
Total:	39	

Your final score in this exam is: _____

1. Process

[3] (a) How does Agile differ from the Waterfall software development process with respect to the following activities:

Testing:

Design:

Documentation:

2. Risk Management

[2] (a) In chapter 22 on project management from Ian Sommerville's book (required reading), Sommerville describes four important stages that constitute the risk management process. Briefly describe any **two** out of those four stages.

2 (b) The Agile Manifesto says that it values:
Individuals and interactions over Processes and tools
Working software over Comprehensive documentation
Customer collaboration over Contract negotiation
Responding to change over Following a plan
Pick any **two** out of the above four Agile values and for **each** chosen value, give an example of a software development risk and describe how your chosen Agile value serves to mitigate that risk.

(1)

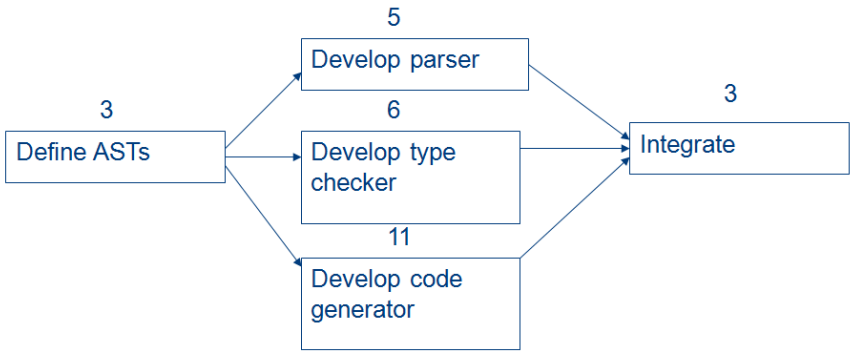
(2)

3. Software Testing

2 (a) Your team was required to have some advanced tests (parameterized unit tests or mock tests or advanced GUI tests or behavioral tests) for the project. Choose **one** advanced testing technique and describe how you used that technique for testing your software.

4. Software Planning

[3] (a) In Lecture 2 on planning and risks, Professor Marinov discussed the following PERT diagram for developing a compiler:



Draw a Gantt chart below for the project schedule that corresponds to the PERT diagram drawn above.

[1] (b) What is the critical path in the Gantt chart you drew above?

5. Specifications

2 (a) Most software companies do not consider it cost-effective to apply formal specifications in their software development processes. Name **one** software domain where using formal specifications is still considered cost-effective and describe why.

2 (b) Give **one** advantage and **one** disadvantage of using tests as program specifications, as opposed to using (non-executable) formal specifications.

Advantage:

Disadvantage:

6. Quality Assurance

2 (a) In Chapter 20 on software quality in Code Complete 2, Steve McConnell talks about several techniques for detecting defects in software, like writing unit tests or integration tests, performing peer code reviews, pair programming, etc. In practice, most organizations follow not only one of these techniques but a range of them. Why is that?

2 (b) Chapter 20 on software quality in Code Complete 2 describes several external and internal software quality characteristics. Some examples of external quality characteristics are: **Usability**, **Integrity**, and **Efficiency**. Some examples of internal quality characteristics are: **Portability**, **Readability**, and **Testability**.

Pick **one** external and **one** internal quality characteristic from above and describe how your project ensured your software was of high quality with respect to these characteristics.

2 (c) In Chapter 21 in Code Complete 2, Steve McConnell describes the pros and the cons of having reviewers who are familiar with the code under review for an inspection. In general it has been found that the code reviews are most beneficial when the reviewers know enough about the code but don't know too much about the code. According to the book, why is this true?

2 (d) In Chapter 21 of Code Complete 2, Steve McConnell says that the moderator should produce an inspection report within a day of the inspection meeting. List **two** things that are part of this inspection report.

7. Requirements

[2] (a) Efficiency (performance) is one of the main issues when developing software. Why is efficiency **not** a functional requirement?

[2] (b) The lectures on Requirements discussed some primary killers of software projects. Briefly describe **two** characteristics of requirements that can kill a project?

[4] (c) In a fully dressed use case, there are two types of scenarios: Main Success Scenario and Extensions. Explain each scenario by giving an example from your own project.

[2] (d) According to the assigned reading "Use Case Fundamental" by Alistair Cockburn, what is the relationship between use cases and scenarios?

2 (e) Alistair Cockburn believes that business people and developers should work together when writing use cases. Why is that?

2 (f) According to the description below, **which one** of the four choices is not a user story for the following system and **why**?

System description: A restaurant has a website for customers to order their food online.

a. As a user, I need to be able to make an online order.
b. As a user, I need to have a database to store the orders.
c. As a user, I need to be able to see the progress of my order getting ready.
d. As a user, I need to be able to pay for my order online.

8. User Interface

2 (a) The user model and the program model are usually different. If you want happy users, you have to make these models as similar to each other as possible.You have two choices: You can change either the user model or the program model. **Which choice** will result in happier users? **Why**?

2 (b) What does the term "Learned Helplessness" refer to according to Joel Spolsky?

3 (c) The lectures on user interface design discussed three "Golden Rules". Based on the user interface of your class projects, describe **one** application for **each** of these rules:

i. Letting User be in Control

ii. Reducing User's Memory Load

iii. Being Consistent

2 (d) **Why** do we use metaphors in designing interfaces? **Give an example** of a metaphor in an online shopping system.

2 (e) The lectures on User Interface Design discussed the Command Design Pattern. **What data structure** is commonly used for storing the command objects and **why**?

3 (f) The lectures on User Interface Design discussed some design alternatives for novice vs. expert users. Based on these slides, **name one element** of the user interface design that can be useful for novice users and not that useful for expert users and **explain why**.

2 (g) What are **two** examples of making an interface "safe"?

2 (h) Describe **two** benefits of separating the user interface and the business logic of software?

4 (i) The book "Designing Interfaces" discussed several UI patterns used to organize the content. **If you used** any of these patterns in your class project, **name one** pattern and describe how you used it. **If you didn't use** any of these patterns, **describe two** of them.

4 (j) Link the following UI elements to their corresponding UI concept by putting the numbers in blanks:

1) Smart Menu Items	___ a) Reducing user's memory load
2) Progress Indicator	___ b) Let the user be in control of the changes he makes
3) Multi-Level Undo	___ c) Make the modes of the application visible to the user
4) Wizards	___ d) Guide the users through actions with the option to leave

9. UML

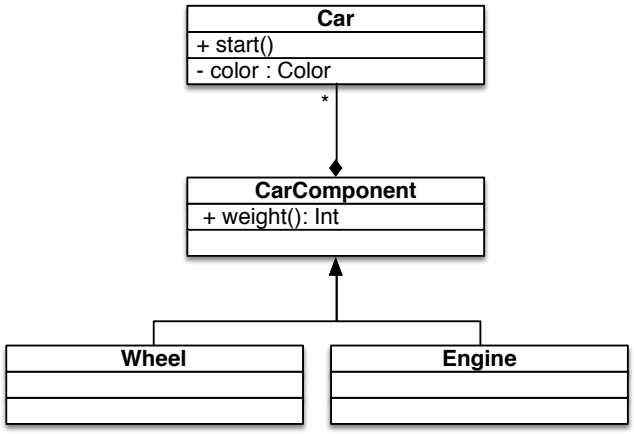
Based on the experience you accumulated from the Software Engineering courses, the CS department hires you to develop a conference room reservation system for the Siebel Center.

University employees can reserve conference rooms for various amounts of time. Conference rooms are identified by their room number. Each employee is identified by her or his first name, last name, and netid. A reservation is identified by a date, and start and end times. A conference room can be reserved by at most one person at a particular time.

8 (a) Draw the class diagram for your solution to the above system. Try to design a minimal but expressive solution. Do not include on your diagram any more details than necessary. Assume that all public attributes have accessor methods. Assume that the `Date` and `Time` (which represents the time in a day) classes are predefined. Your class diagram needs to include all methods needed in the sequence digram (the next question).

8 (b) Draw the sequence diagram for the story where an employee attempts to reserve a conference room, and she is successful. The diagram need **not** include combined fragment annotations (e.g., conditions, loops), but the diagram **does** need to include all important aspects of creating a reservation, including confirming that the reservation is possible.

2 (c) Identify at least **two** mistakes in the UML class diagram below. The diagram attempts to describe that a car is made of components, and that two types of such components are wheels and engines. Circle **two** mistakes you identified and explain why each of them is a mistake (by its side).



1 (d) What do the "+" and "-" signs mean in the diagram above?

4 10. Decision table

Consider the reservation system described in the question on UML. Fill in the decision table below for a function which determines whether a particular employee can reserve a particular room at a particular time. Conference rooms on the first floor can only be reserved by professors. Anyone can reserve any conference room on weekends, regardless of any other rule.

(Note: you do NOT need to update your UML diagrams to fit this new feature)

	Rules
Conditions	
Actions	

11. Design

2 (a) What is the difference between active and passive MVC, as described in the Microsoft article on MVC, which references Steve Burbeck's "Application Programming in Smalltalk-80: How to use Model-View-Controller (MVC)"?

3 (b) In "A Rational Design Process: How and Why to Fake It", Parnas and Clements give a list of reasons for which software projects cannot proceed in a "rational" way. State **two** of those reasons and explain how they affected your CS 428/429 class project.

12. Open source

2 (a) Describe one way in which the "Bazaar" from Eric Raymond's "The Cathedral and the Bazaar" resembles XP (eXtreme Programming).

2 (b) Describe one advantage and one disadvantage of Open Source in the context of security.

13. Performance

2 (a) Describe one reason for which profilers are sometimes imprecise.

2 (b) What is the difference between *soft* and *hard* performance requirements in software?

1 (c) Give an example of *throughput* in the context of software performance?

2 (d) What is a long-term performance disadvantage of low-level manual code tuning?