CS-C3150 Software Engineering
Fall 2024
Final Exam
December 11th, 2024

Name: [redacted]

Student number:

Instructions

1. Write your name in the top right corner of **every page**.
2. Write your student number (student id) in the top right corner on this page
3. Check that your paper is complete — the exam contains 4 questions and 8 pages (including this cover page).
4. Answer each question using pen and paper. Read the question carefully before answering.
5. You cannot use any supporting material or technology during this exam.
6. **GOOD LUCK!**

Grade Table (for course personnel use only)

Question	Points	Score
1	20	[redacted]
2	40	
3	20	
4	20	
Total:	100	

1. (20 points) Define the following terms.

(a) (4 points) Software testing

[redacted]

(b) (4 points) Scrum

[redacted]

(c) (4 points) UML

[redacted]

(d) (4 points) Global software engineering

[redacted]

(e) (4 points) Software architecture

[redacted]

2. (40 points) Mark the correct alternative(s) below. The grading is +2 for a fully correct answer, -2 for an incorrect one, and 0 if the subquestion is left unanswered.

(a) (2 points) What does Brooks mean by the statement *No Silver Bullet*?

- [x] That silver bullets are not useful in software development projects.
- [x] It is unlikely that any new single development in technology or management could promise an order-of-magnitude improvement in software project productivity, reliability, or simplicity.
- [x] That software engineering theories are real and can provide concrete benefits, whereas silver bullets are only used to kill fictitious werewolves.
- [x] That software complexity is constantly reduced, and no silver bullets are needed to help us improve software engineering state-of-the-art
- [x] That improving the state of software development requires heavy armor, not small silver bullets

(b) (2 points) According to Parnas and Clements (as cited by Larman and Basili), while a waterfall process is a good ideal, it is impractical for several reasons, including:

- [x] Users typically don't know what they want
- [x] External forces lead to requirements changes during the project, making it necessary to change previously made decisions
- [x] Many details cannot be thoroughly understood until actually implementing the software
- [x] Developers don't like the model, as it is too strict
- [x] It does not stress communication enough

(c) (2 points) What are the benefits of incremental development compared to the waterfall model?

- [x] The cost of accommodating changes to customer requirements is reduced.
- [x] It is easier to get customer feedback on development work that has been done.
- [x] More rapid delivery and deployment of useful software to the customer is possible.
- [x] Having a formal and heavy change process minimizes unnecessary changes from the customer's side.
- [x] Strict phases, deadlines and document approvals make contractual enforcement of agreements simple.

(d) (2 points) Time-boxing refers to the principle of allowing the schedule to flex while keeping the content of the project constant.

- [x] True
- [ ] False

(e) (2 points) Problems with agile methods include:

- [x] Little or no up-front planning makes their application to large systems difficult
- [x] Their application in large organizations is difficult, as the agile way of working might conflict with existing quality procedures and standards.
- [x] Team members with a high skill level find them naive

(f) (2 points) Which of the following are true about test-driven development (TDD)?

- [x] Tests are written before writing new functional code
- [x] Test-driven development treats the writing of tests as part of the requirements/design activity
- [x] A benefit of TDD is that the tests provide good documentation of the requirements
- [x] Adopting TDD is difficult, since developers are not used to write tests before coding.
- [x] As the adoption of TDD is easy, many organizations report successful implementation
- [x] A weakness of test-driven development is the poor level of traceability achieved.

(g) (2 points) Requirements should always be documented in the greatest detail possible, to make implementation easy.

- [x] True
- [ ] False

(h) (2 points) One of the main drivers for selecting an appropriate architecture is the set of non-functional requirements that the system must meet.

- [x] True
- [ ] False

(i) (2 points) Architecturally significant design decisions are characterized by the following:

- [x] They are hard to change later on.
- [x] It is the responsibility of the software architect to figure out which design decisions are architecturally significant
- [x] In agile development, there are no architecturally significant design decisions

(j) (2 points) Match the UML model and its use (draw lines from the description on left to the model type on the right)

Description	Diagram
Shows the activities involved in a process or data processing	Use case diagram
Shows the interactions between a system and its environment	Class diagram
Shows the object classes and their relations	Activity diagram
Shows how the system reacts to internal and external stimuli	State diagram

(k) (2 points) Pair programming can be considered one form of real-time peer review that helps improve code quality.

- [x] True
- [ ] False

(l) (2 points) Benefits of test-driven development include:

- [x] You "automatically" get an automated regression test suite
- [x] Reading the tests can make understanding the code easier
- [x] As you write fewer tests, there is less testing code to maintain

[redacted]

[redacted] Test driven development guarantees that the customer is satisfied with the developed system.

(m) (2 points) In companies with a formal change management process, the change control board (CCB) prioritizes change requests and decides if and when to implement them.

[redacted] True
False

[redacted]

(n) (2 points) Match the term and its explanation (draw lines from the description on the left to the term on the right)

Description	Term
Anything that has been put under configuration control	[redacted] Workspace
An instance of a configuration item that differs, in some way, from other instances of that item	Version
A version of a system that has been released to customers for use	[redacted] Configuration item
A private work area where a developer can make changes to software without affecting other developers	Release

[redacted]

(o) (2 points) Algorithmic effort estimation models always outperform experience-based ones

[redacted] True
False

[redacted]

(p) (2 points) A milestone is automatically achieved when the date it is scheduled for arrives.

[redacted] True
False

[redacted]

(q) (2 points) One of the main challenges in global software engineering is communication.

[redacted] True
False

[redacted]

(r) (2 points) To succeed in global software engineering, it is crucial that all partners use exactly the same process.

[redacted] True
False

[redacted]

(s) (2 points) The driving idea behind process improvement is that product and process quality are closely related and therefore improvements to the process results in improved product quality.

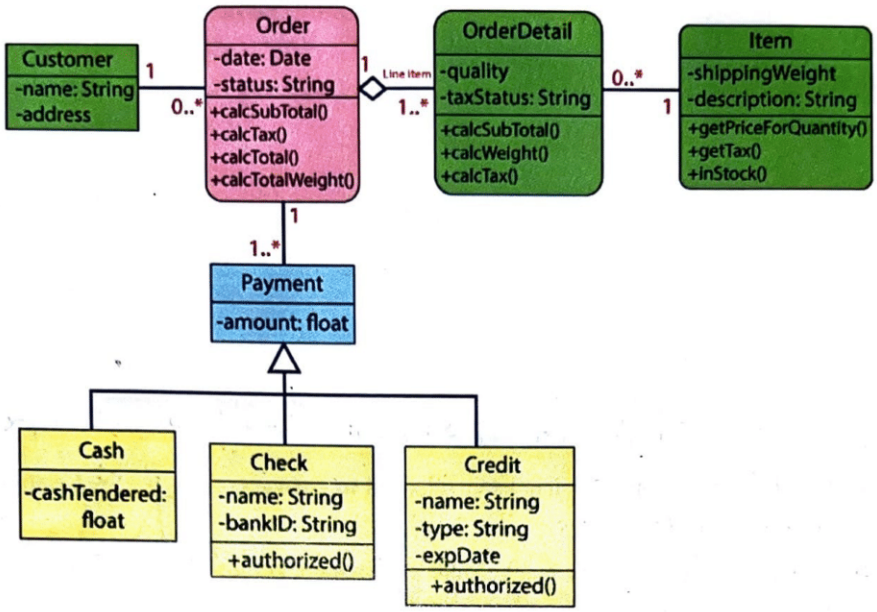
[redacted] True
False

[redacted]

(t) (2 points) When developing software for the public cloud, you need to make heavy investments in your own servers and related facilities.

[redacted] True
False

3. (20 points) Explain the following UML diagram.



[redacted]

4. (20 points) Answer one of the questions below. Circle the one you answer.

   a. Explain and contrast Scrum and Kanban. Describe the main workflow in both processes, and ponder their pros and cons.

   b. In his famous essay *No Silver Bullet: Essence and Accidents of Software Engineering*, Fred Brooks ponders why software engineering is hard. Explain what essential problems he identifies in software engineering, and how to deal with them. Ponder whether these are still relevant today, and what current technologies and trends have contributed towards working with the essential problems he identifies.

   c. The role of software architecture in agile development.

   d. Software testing as a means of achieving software quality.

   e. Challenges of global software engineering.

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