TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Student ID: _____

EXAMINATIONS — 2011

MID-YEAR

SWEN 223

Software Engineering Analysis

Time Allowed: 120 Minutes

Instructions: There are 120 possible marks on the exam.
Answer all questions in the boxes provided.
Every box requires an answer.
If additional space is required you may use a separate answer booklet.
Non-electronic Foreign language dictionaries are allowed.
Calculators ARE NOT ALLOWED (and not required).
No other reference material is allowed.

Question	Topic	Marks	Achieved
1.	Software Engineering	20	☐
2.	Design Principles	20	☐
3.	UML	20	☐
4.	Interaction Diagrams	20	☐
5.	State Diagrams	20	☐
6.	Conceptual Modelling	20	☐
	Total	120	

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Question 1. Software Engineering [20 marks]

(a) [4 marks] Briefly discuss the meaning and significance of "maintenance" in software engineering.

(b) [6 marks] The maintainability of a component correlates with the size of its interface. Briefly describe this correlation and mention two technical properties that components with the desirable interface size will typically exhibit.

(c) [4 marks] Identify the core problems in software engineering today. What are the main issues that plague many software projects?

(d) [6 marks] Discuss the challenges, potential benefits and dangers involved in reusing components.

Question 2. Design Principles

[20 marks]

(a) [4 marks] Briefly explain what "modular protection" is and what one may do to achieve it?

(b) [4 marks] Briefly explain the relationship between coupling and information hiding.

(c) [4 marks] Briefly explain which criteria – internal or external – of a software system matter the most and why? Why does one care about the other as well?

(d) [4 marks] Explain why polymorphism and dynamic binding are so valuable for creating extensible software.

(e) [4 marks] Briefly explain the relationship between "modular continuity" and "maintenance".

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Question 3. UML

[20 marks]

(a) [3 marks] Briefly explain what a "use case" is. Include the ultimate criterion that determines whether something really should be regarded as a use case.

(b) [2 marks] Briefly explain the idea of an "essential use case" (as opposed to a "system use case").

(c) [6 marks] Why does modelling with the UML sometimes require the use of OCL? Explain the need for OCL in general and provide two examples (not necessarily providing OCL code) for typical usage scenarios for OCL.

Consider an ATM machine where customers may withdraw money by identifying themselves using EFTPOS cards or through a fingerprint reader. It may occur that the ATM machine has no online connection to a card verification service but is still expected to work, e.g., by trying to reconnect.

(d) [4 marks] In what way can the potentially rich use case "Withdraw money" be factored into multiple smaller parts that are easier to deal with on their own? Base your factorization on the three UML use case relationships.

(e) [5 marks] Draw the UML use case diagram for your design of question (d).

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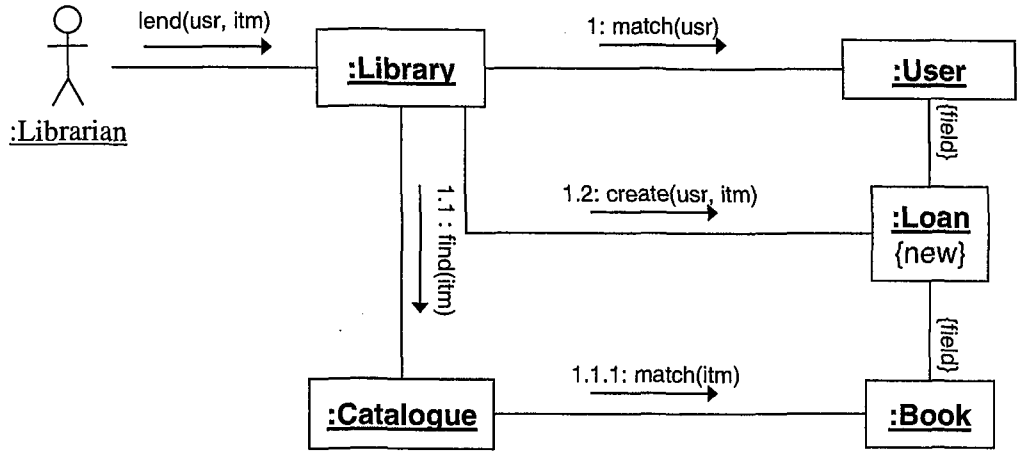
Question 4. Interaction Diagrams

[20 marks]

(a) [12 marks] Create a sequence diagram which contains at least the information of the following communication diagram:



Your sequence diagram should show how values are returned even though this is not shown in the communication diagram.

(b) [2 marks] In what way can you capture alternative execution paths in a communication diagram?

(c) [2 marks] In what way can you capture alternative execution paths in a sequence diagram?

(d) [4 marks] Briefly explain how you could use interaction diagrams in both implementation and testing phases respectively.

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Question 5. State Diagrams

[20 marks]

(a) [15 marks] Create a UML state diagram that describes the states and events of a phone with the following behaviour: Initially, the phone is idle. When an incoming call arrives, it keeps ringing until the user picks up or the caller aborts the call. In the former case the phone is connected to the calling party, in the latter case it becomes idle again. In the case of an outgoing call, when the user picks up the handle, the phone keeps accepting digits until a valid number has been dialled. In the latter case, it becomes connected to the called party. At any point during the dialling or while being connected, the user may hang up, causing the phone to become idle again. Marks are awarded for the appropriate use of advanced notation.

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Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.

(b) [5 marks] Briefly explain what superstates are typically used for and why they are considered to be an important feature of state diagrams.

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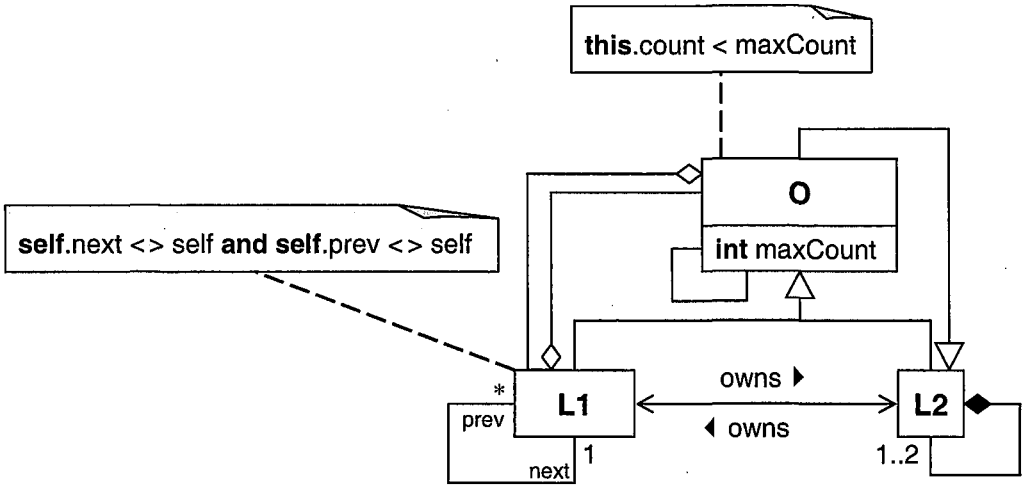
Question 6. Conceptual Modeling [20 marks]

The following class diagram contains a number of errors/problems.



(a) [12 marks] List four errors/problems. For each, i) identify it with a numbered circle in the diagram, ii) briefly explain it, and iii) describe the least invasive way to correct it.

1)

2)

3)

4)

(b) [8 marks] A colleague asks you what the direction of the inheritance relationship between the concepts "Circle" and "Ellipse " should be. Advise your colleague of three alternative options and briefly explain the rationale for each option.

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Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.

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