

**Faculty of Arts and Science
University of Toronto**

Midterm Test

Department: Computer Science
Instructor: Steve Easterbrook
Date and Time: 10:10am, Thurs 28th Feb, 2008

Conditions: Closed Book
Duration: 50 minutes

This test counts for 20% of your final grade

Name: _____
(Please underline last name)

Student Number: _____

Question Marks

1 _____ /20

2 _____ /20

3 _____ /20

4 _____ /20

Total _____ /80 = _____ %

1. [Short Questions; 20 marks total]

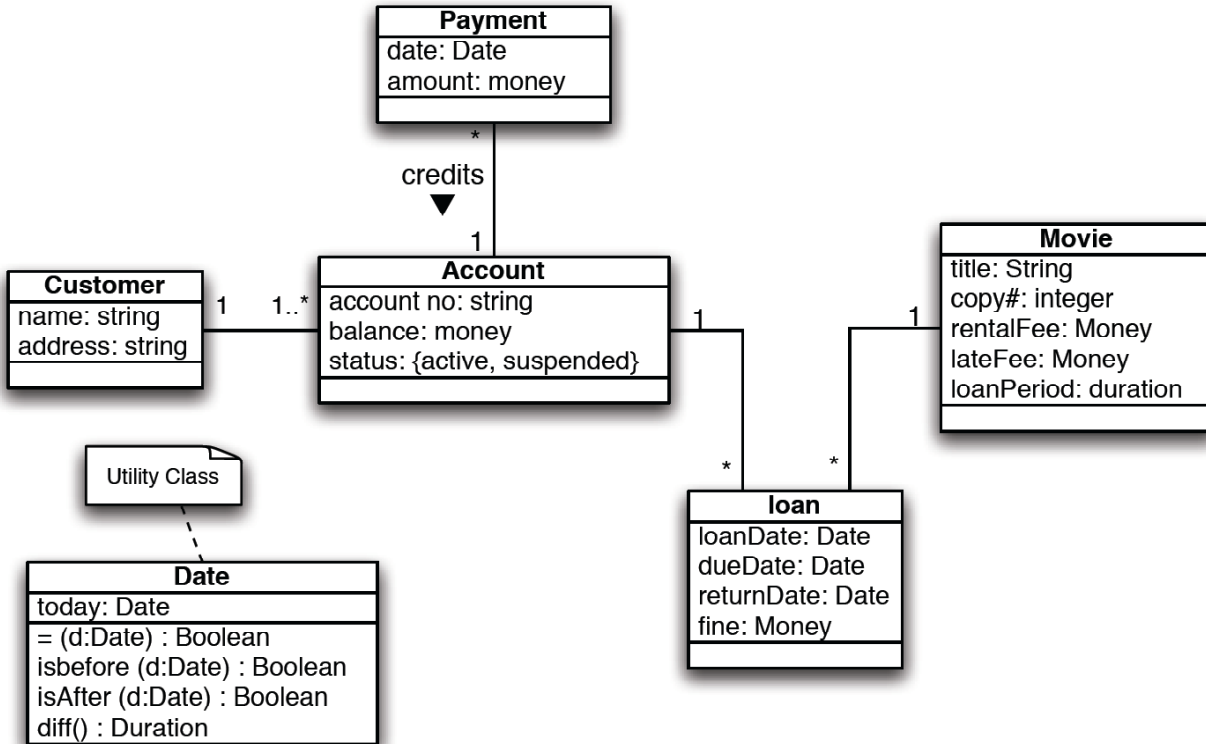
(a) [Conway's Law – 5 marks] Conway's law states that the structure of a large software system will reflect the structure of the organization that built it. Why does this happen, and what clues does it give us about how to organize large software development teams?

(b) [Risk Management – 5 marks] Identify the three biggest risks you face on your course project this term? How do you know these are the biggest risks?

(c) [**Software Aging – 5 marks**] What are the *causes* and *symptoms* of software aging? What steps can be taken to reduce the problems associated with software aging?

(d) [**Project Management – 5 marks**] What techniques do agile development methods offer for keeping track of progress on a software project? How do these compare with traditional techniques?

2. **[Class Diagrams – 20 marks]** The following class diagram shows part of the design of for software for EasyDVD, a web-based DVD rental agency. EasyDVD allows customers to browse its website to see the inventory of DVDs, and select DVDs for rent. DVDs are sent to the customer and returned by mail. Each DVD has a set rental fee and a set loan period.



- (a) [5 marks] There are no associations shown for the Date class. How would you redraw the diagram to show such associations? What are the advantages and disadvantages of adding these explicitly?
- (b) [5 marks] EasyDVD wants to restrict customers to have no more than 3 DVDs on loan at a time. How would you modify the diagram to show this constraint? Note: EasyDVD still needs to keep track of (a potentially large number of) past loans for each customer's account.

- (c) [5 marks] EasyDVD wants to simplify its pricing structure, so that there are a small number of categories of movies, where each category has a set rental fee and loan period. How would you modify the diagram to allow this?
- (d) [5 marks] EasyDVD wants to add a new *subscription service* in addition to the existing ad hoc rental service. In a subscription service, customers maintain an ordered lists of movies they would like to rent, and whenever they return a movie, the next movie on the list is sent out. For the subscription service, customers pay a fixed monthly fee rather than individual rental fees on each movie, and each rental is open-ended – i.e. there is no due date and no fine. How would you modify the class diagram to facilitate this service?

3. **[Sequence Diagrams – 20 marks]** Sketch a UML Sequence Diagram for the process of renting a DVD for the EasyDVD service described at the start of the previous question (i.e. the regular rental, *not* the subscription service). Be sure to show the customer logging into her account and selecting a DVD to rent, and show how the system sets up a new loan with the appropriate dates set, using the Date class to calculate these.

4. **[Goal Modeling – 20 marks]**. Sketch a goal model to represent the following information elicited from Fred about his preferences for watching movies at home. *Fred's main concerns are that watching movies should be easy and enjoyable. By easy, he means that it should be convenient, low cost, and involve minimal waiting. By enjoyable, he means the movie should have a high picture quality, and it should play reliably. He has experienced two ways of watching movies: DVDs and downloads. He finds downloads to be very cheap, while DVDs are not. For DVDs, he first has to rent the DVD, then play it. He can rent DVDs from his corner store, which is very convenient, or from a mail order service, which is very inconvenient, and involves a long wait. For downloads, he has to first download the movie, then stream it to his TV. Downloading is slightly inconvenient, as he has to wait a little while. He finds that playing DVDs gives him high quality picture and a reliable playback, while streaming downloads to his TV is neither high quality nor reliable. Your goal model can use any suitable notation, but must distinguish softgoals from hardgoals, and different types of goal contribution link must be clearly labeled. State any assumptions.*

[scratch paper]