

University of Toronto

Midterm Test

Department: Computer Science
Instructor: Jennifer Campbell
Date and Time: 6:10pm, Thursday March 10, 2005

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 _____ /30

3 _____ /20

Total _____ /70

1. [Short Questions; 20 marks total]

(a) [Eliciting Requirements – 5 marks] Name one traditional (non-collaborative) requirements elicitation technique and one collaborative requirements elicitation technique. Describe the techniques, and discuss their advantages and disadvantages.

A traditional requirements elicitation technique is the one-on-one interview. Interviews are a great method of uncovering facts, as well as opinions, feelings and goals. The interviewer can follow-up on interesting leads and adapt the questions based on information the respondent has mentioned. A disadvantage of interviews is that it may be difficult to compare the responses of the different respondents. This is due to the large amount of information that can be gathered and because of the varying backgrounds of the respondents.

A collaborative requirements elicitation technique is focus groups, which can be thought of as group interviews. This technique may result in more natural interactions than the one-on-one interview, because participants can have discussions with each other, not just with the interviewer. A problem with focus groups is that they tend to have ad hoc membership, so the groups may be unnatural. Some participants may feel uncomfortable speaking in front of other members of the group.

(b) [Systems Theory – 5 marks] In systems thinking, a system may be described as a “soft system” or as a “hard system”. Explain each type of system, and give an example of each.

Soft systems are systems that are difficult to define precisely, because the system depends on the viewpoint of the person describing it. If it is difficult or impossible to come to agreement on the boundaries of the system and its behavior, then the system is considered to be soft. All human activity systems are soft systems. For example, a banking system is a soft system.

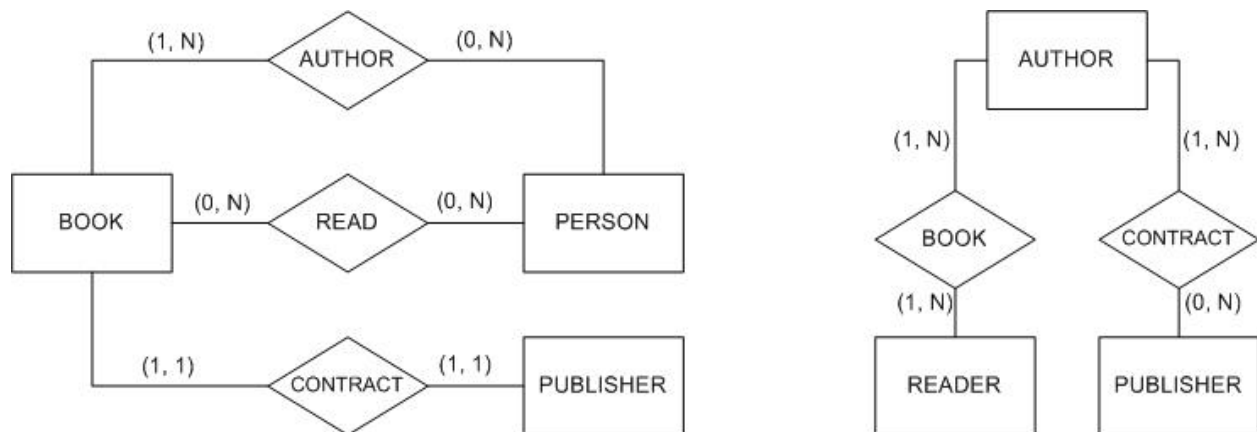
Hard systems are well-defined and there is agreement on where the boundaries to the system are, and what the purpose of the system is. The key difference between soft and hard systems is the amount of consensus that can be reached. The mechanical operation of a car is an example of a hard system.

(c) **[Modeling Requirements – 5 marks]** Two principles of modeling are abstraction and projection. Explain these two principles, and give an example of each.

Abstraction is a way of generalizing in order to find commonalities between different concepts. It allows us to find similarities between concepts by ignoring some details. For example, given two groups of students, CS undergrads and CS grads, we can classify these students as being simply CS students.

Projection separates the aspects of the model into multiple viewpoints. For example, a model of a building may have an interior, exterior, north or south “view of” the building. The views are not independent of each other.

(d) **[Entity-Relationship Diagrams – 5 marks]** The following two alternative Entity-Relationship models have been proposed as the basis for a database to hold information about books and their authors, readers, and publishers:



Give two examples of situations that can be represented in the first model, but not in the second.

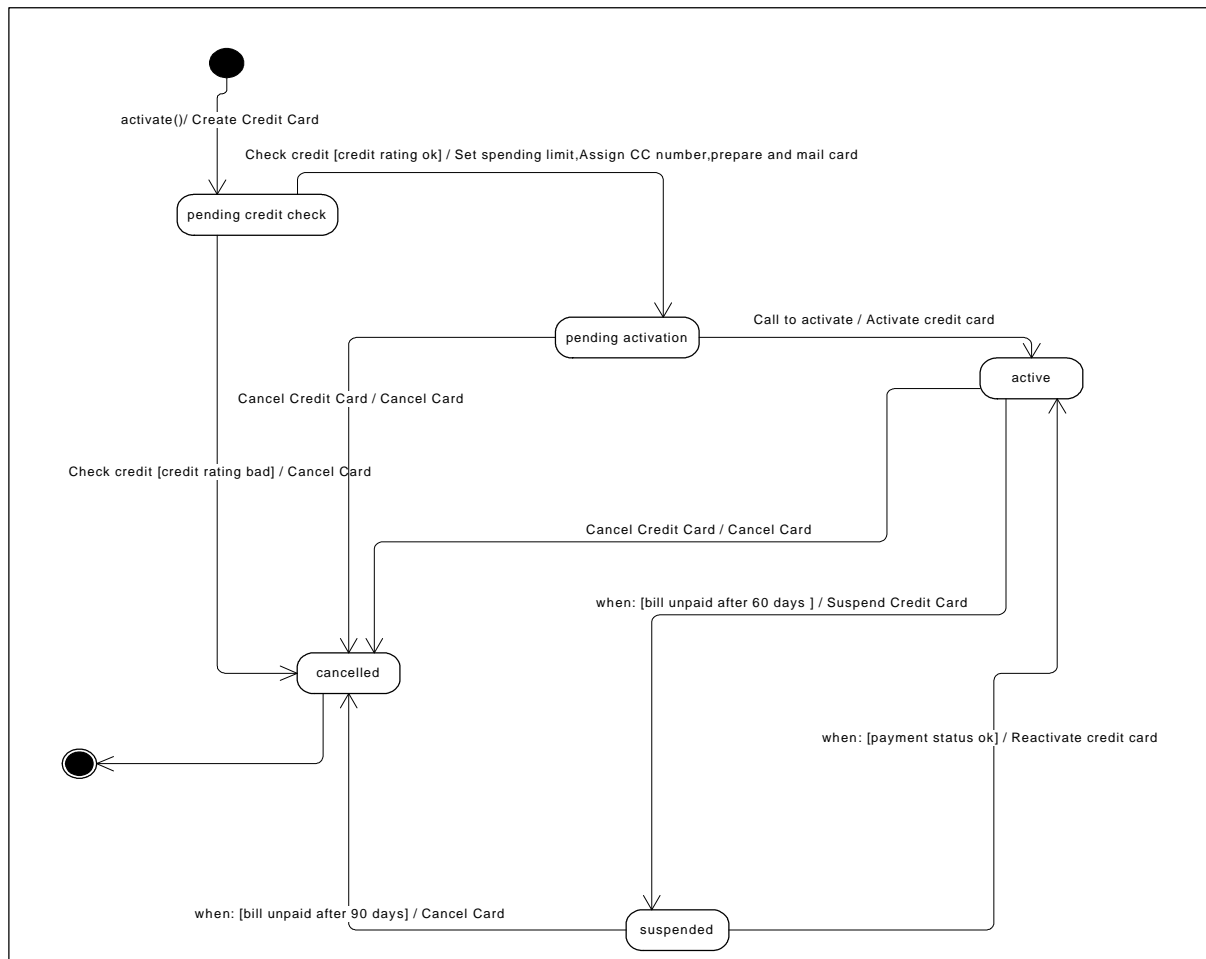
Multiple books by an author may be published by the same publisher.

A person may read multiple books by the same author.

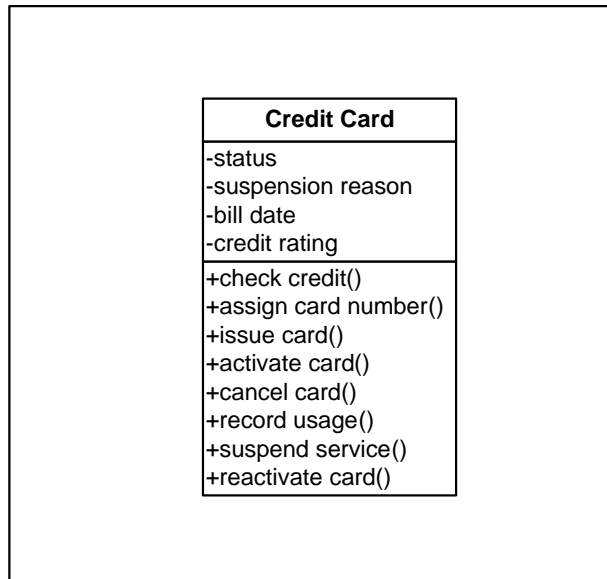
2. [State Diagram, Class Diagram, and SCR Table – 30 marks]

A client applies for a credit card. The card is created with a status of pending, awaiting a client credit check. If the client’s credit is satisfactory, the upper spending limit for the card is established, the card number is assigned, and the card information is mailed to the customer. If the credit is unsatisfactory, the card is cancelled. Upon receipt of the card, the customer calls the credit card company to activate the card. Once the card is active, the customer then uses the credit card to make purchases. If the cost of a purchase item is less than or equal to the remaining balance and the card is active, the purchase goes through; otherwise the purchase is rejected. If no payments are received on the outstanding balance for 60 days, the card is suspended. Subsequently, if the minimum amount due is paid within 30 days, the card is reactivated., otherwise, the card is cancelled. At anytime the customer may call and cancel their credit card.

(a) Draw a State Diagram for the states that a credit card can be in, using the description provided. Label the transitions with the events and actions. [15 marks]



(b) Draw the **UML Class** for a credit card using the description provided. [5 marks]

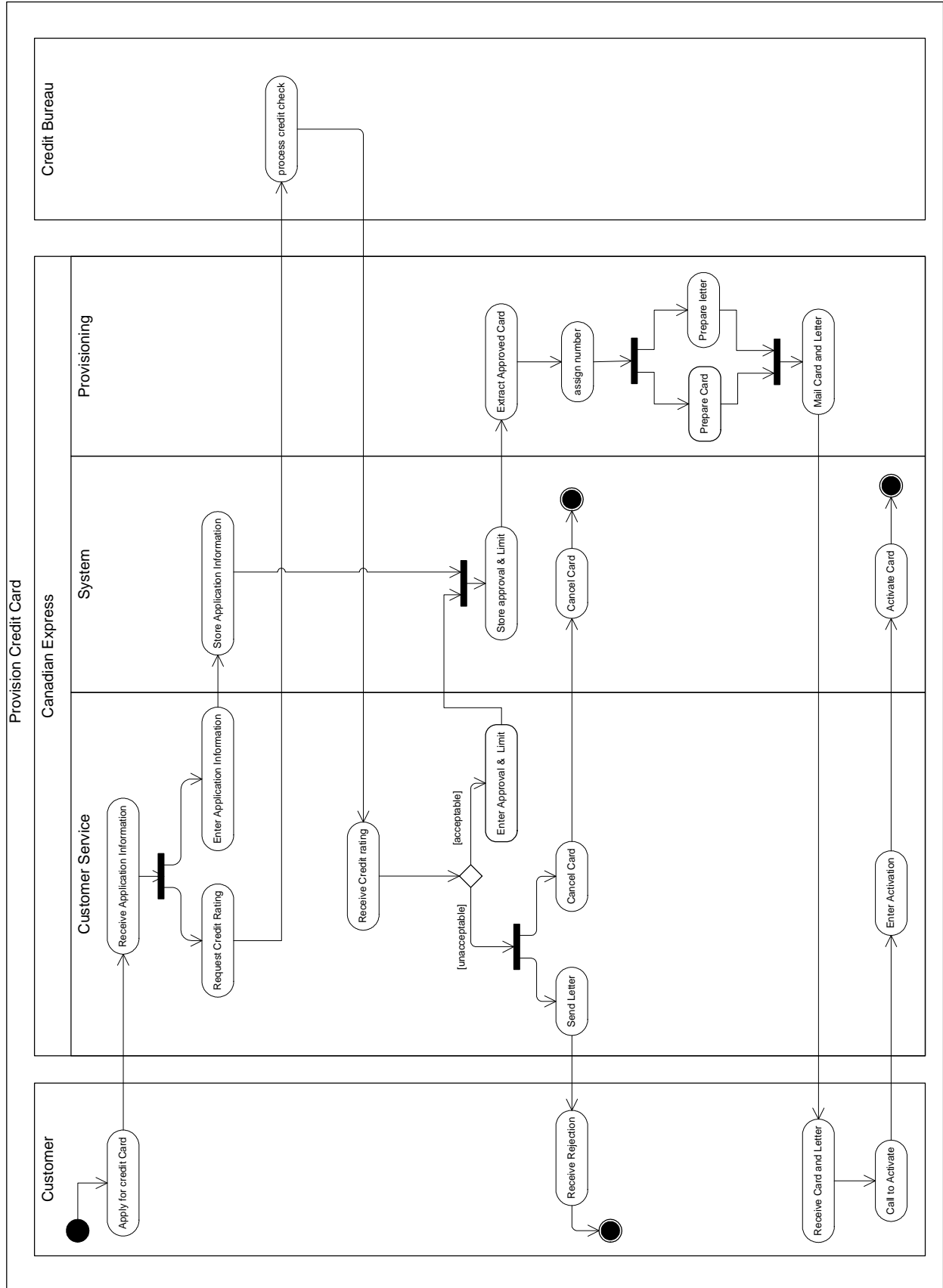


(c) Create a **Mode Class (Transition) Table** for the state transitions of a credit card using the description provided. [10 marks]

Current Mode	Credit Checked	Credit ok	Call to Activate	< 60 days from billing	60 to 90 days from billing	> 90 days from billing	bill paid	Cancel Service Request	New Mode
pending credit check	@T	T							pending activation
	@T	F							cancelled
pending activation			@T						active
								@T	cancelled
active					@T		F		suspended
								@T	cancelled
suspended					T		@T		active
						@T	F		cancelled
								@T	cancelled

3. [Activity Diagrams – 30 marks]

Draw an activity diagram for the credit card application and generation process described below. A customer applies for a Canadian Express credit card. At Canadian Express, the Customer Service Department receives the application, enters the application information into the system, and requests a credit check from the credit bureau for the client. The Customer Service Department receives the client's credit rating from the credit bureau, and if the credit rating is acceptable, it approves the issuance of a credit card - entering the approval and spending limit into the system. If the client's credit rating is unacceptable, it cancels the card request in the system, and sends the customer a rejection letter. The Provisioning Department (the card generation department) at Canadian Express extracts the approved card information from the system and assigns a card number. It prints the card and prepares a welcome letter, and then mails both items together to the customer. Upon receipt, the customer calls the Customer Service Department to activate the card, and the card is activated in the system.



[scratch paper]