Faculty of Arts and Science
University of Toronto

Midterm Test

Department:	Computer Science
Instructor:	John Mylopoulos
Date and Time:	6:10pm Monday, March 1, 2004

Conditions: Open book
Duration: 50 minutes

This test counts for 20% of your final grade

Name: _____
                    (Please underline last name)

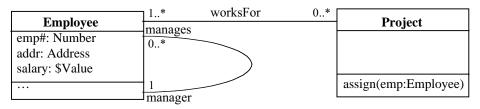**Student Number:** _____

Question Marks

1. _____/20

2. _____/30

3._____/20

4. _____/30

Total _____/100

1. [Short Questions; 20 marks total]

[Class diagrams] Here is a class diagram that represents employees in an organization, and the projects they work for.

(a) [Class diagrams – 4 marks] Specify a constraint in CL that says: "Every employee earns less than his/her manager"

Forall y[includes(self.manager.salary, y) implies self.salary < y]

(b) [Class diagrams – 6 marks] Specify pre/post-conditions for the operation assign(emp;Employee) in CL that make sure that an employee is not assigned to a project he is currently working for; also if an employee is assigned to a new project and he is already working for at least 3 other projects, then her salary is increased by 10%.
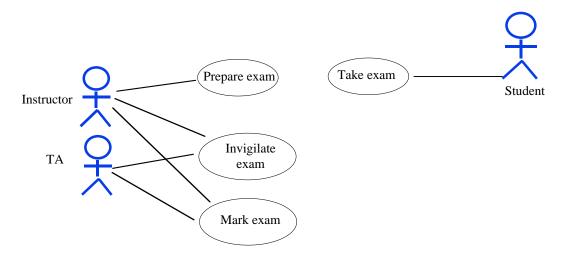
pre: not includes(emp.worksFor,self)
post: includes(emp.worksFor,self) and [size(emp.worksFor) ≥ 4
                                                      implies emp.salary = emp.salary@pre * 1.1

will also accept

pre: not includes(emp.worksFor,self)
post: size(emp.worksFor) ≥ 4 implies emp.salary = emp.salary@pre * 1.1

1. [Short Questions; continued]

(c) [Use Case Diagrams – 5 marks] Draw a use case diagram for exams for undergraduate Computer Science courses such as this. Make sure your diagram captures *all* users and uses of an exam.
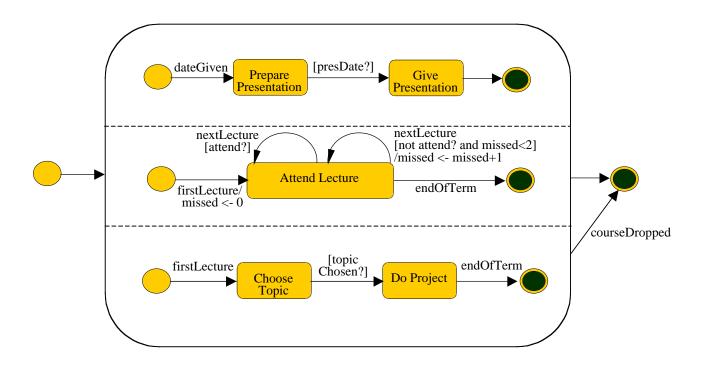

(d) [Decision table – 5 marks] Suppose an instructor follows the following rules in assigning final marks to each student taking her course: If a calculated final mark is below 50, then the instructor reviews all the marks for the student and assigns a mark based on the review; otherwise, if a calculated final mark "fm" ends in –9, the instructor assigns the mark fm+1; otherwise the instructor assigns the calculated mark as is.

Draw a decision table that captures all the rules of this decision process. Make sure your table is complete, i.e., covers all conditions and outcomes.

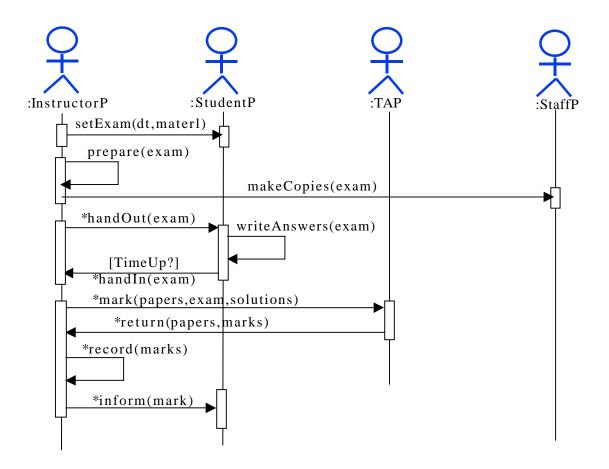|			
Mark ends in –9	*	T	F
Mark below 50	T	F	F
Add a mark!		X	
Review and assign!	X		
Leave mark as is!			X

2. [State diagrams; 30 marks] Give a state diagram that describes the process of passing a graduate course as a set of concurrent activities. The process has as follows: To pass, a student has to attend all but two lectures, present to the class a paper she read, and complete a course project, due on the last day of the term. To give her presentation, the student is given a date by the instructor, prepares her presentation, and gives it on the assigned day. At any time, the student can drop the course.

Make sure to define events, conditions, actions for transitions in your diagram, where appropriate.

3. [Sequence Diagrams; 20 marks] To give an exam, an instructor first notifies the students of the exam date and the material to be covered. She then prepares the exam paper (with sample solutions), gets it copied to produce enough copies for the class, and hands it out to students on the designated time and location. The students write their answers to exam questions and hand in their papers to the instructor. The instructor then gives the exam papers to the TAs, along with sample solutions to each question, and gets them to mark it. She then records all marks and returns the papers to the students.

Draw a sequence diagram that represents this process. Make sure to show when is each actor participating in the process. Also, show the operation that is carried out during each interaction, and what its arguments are.

4. [Class Diagrams, 30 marks] Consider the world of libraries. A library has books, videos, and CDs that it loans to its users. All library material has a id# and a title. In addition, books have one or more authors, videos have one producer and one or more actors, while CDs have one or more entertainers. The library maintains one or more copies of each library item (book, video or CD).

Copies of all library material can be loaned to users. Reference-only material is loaned for 2hrs and can't be removed from the library. Other material can be loaned for 2 weeks. For every loan, the library records the user, the loan date and time, and the return date and time. For users, the library maintains their name, address and phone number.

Draw a class diagram (or two, if this is more convenient) for the description above. Make sure to show attributes, multiplicities and aggregations/compositions, where appropriate. No need to show any operations.