Faculty of Arts and Science
University of Toronto

Midterm Test

Department:	Computer Science
Instructor:	John Mylopoulos
Date and Time:	9:10am, Wednesday February 24, 1999

Conditions:	Closed book
Duration:	50 minutes

This test counts for 20% of the final grade

Name: _____

(Please underline last name)

Student Number: _____

Question Marks

1. _____/30

2. _____/30

3. _____/20

Total _____/80

1. [Short Questions; 30 marks total]

(a) [Feasibility study – 5 marks] What is the *discount rate*? Explain why it is important to use it during cost/benefit analysis.

(b) [Organizations – 5 marks] What is a *business process*? Give an example of a business process for an academic organization such as the University of Toronto.

1. [Short Questions; continued]

(c) [Software lifecycles– 5 marks] Explain briefly the *spiral lifecycle model.*

(d) [Entity-Relationship Model; keys – 5 marks] Suppose someone has defined a database for the Hummingbird Centre in order to keep track of different shows on a day-to-day basis. The main entity of the database with its associated attributes is

```
SHOW(showName,producerName,producerAddress,date,time,ticketsSold)
```

Instances of this entity will take attribute values such as:

```
SHOW("Les Miserables","Mirvish","30 Charles Street,Toronto",
                                        22/11/1998,matinee,3459)
```

Define a key for this entity. Make sure your key does not include extraneous attributes.

· **[Short Questions; continued]**

(e) [Entity-Relationship Model; normal forms – 10 marks] Consider the MEETING relationship with the following key and attributes:

`MEETING(courseName,courseTitle,day,time,buildingName,rm#,address)`

This relationship is already in first normal form (1NF) but is not in 2NF or 3NF. Explain what is the problem and fix it by placing the relationship into 2NF and then in 3NF. You may assume that

- `address` functionally depends on `buildingName`
- `courseTitle` functionally depends on `courseName`

2. [Data Flow Diagrams; 30 marks]

In parts (a) and (b) of this question you are asked to draw level 0 data flow diagrams for the case described below. Do your scratch work on scratch pages provided in the back of this exam book before drawing in your final answers. Data flow diagrams which are impossible to interpret because of all the scratching out and changes are less likely to be treated generously.

The Strontium 90 Health Club Case: The Strontium 90 Gym has a paper method of maintaining its records that it now realizes will not do with its high enrolment and the low cost of modern day technology. Tong Liu has been hired as their system consultant to see what needs to be done to computerise their system. After a series of interviews with key personnel in Strontium 90, he has found out that their paper processing system works as follows.

Prospective members come in in person, either as guests of a member or via promotions in the newspaper. If they decide to join the club, they fill out a membership application. Louisa Beaubody takes their application and places it in a folder which she files by members last name. She also fills out a membership card which she gives to the new member and then creates a member-on-file card. The member-on-file card goes into a cardfile that is kept at the Health Club's entrance. If a member forgets their membership card, all they need to do is show another form of id. The person at the reception desk will check the member-on-file cardbox. If a match is found, the individual is permitted entrance. The member-on-file card also lists the nature of the membership, i.e., whether free exercise clothes, lessons or massages are included in the membership.

At the beginning of every month Louisa Beaubody goes through the files and pulls out those members whose membership is about to expire within two months. She generates an automatic form letter on her electronic typewriter to send to these individuals and encloses a renewal card in her mailing. She also pulls out the files of all the memberships that have expired, pulls out their member-on-file card and throws both in the trash.

(a) [20 marks] Draw a physical data flow diagram for the Strontium 90 Health Club System.

(b) [10 marks] Draw a logical data flow diagram for the Strontium 90 Health Club System.

3. [Entity-Relationship Diagrams, 20 marks]

The Kovac Mazda Dealership keeps track of their sales in a database which stores information on who (among its sales people) sold what model to whom. The database stores for each sales person her name, address and employee#, also her number of car sales so far this year and her salary. The database also stores for each customer her street address, city, postal code and phone number. For each car sold, the database stores the year, model and optional features included in the sale. Finally, for each sale the database stores the date of sale and the price.

Draw an entity relationship diagram which captures the information stored in the Kovac database. Identify clearly the keys and attributes for each entity and relationship in your diagram, as well as cardinalities.

(Scratch paper)

(Scratch paper)