UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science & Information Systems

EXAMINATION

SEPTEMBER 2003

INSTRUCTIONAL OFFERING (SUBJECT):	**Database Systems**
SUBJECT CODE:	**CS4416**
DURATION:	**2.5 hours**
TOTAL MARKS:	**100**
NUMBER OF PAGES:	**8**
EXAMINER:	**S. Zheleva**

INSTRUCTIONS / REQUIREMENTS:

ANSWER ALL QUESTIONS

WRITE INTELLIGIBLY

HAND IN THE QUESTION PAPER TOGETHER WITH YOUR ANSWER BOOK

QUESTION ONE (20 MARKS max)

Multiple choice questions

QUESTION TWO (12 MARKS)

Prepare an **Object-oriented model** for the following situation, using a proper notation.

An Accessible Transport company provides services for persons with mobility difficulties. A database is kept for all services provided.

For each service a record is kept for service number, description and date details. Each service consist of (or is assembled from) a number of transport operations.

For each transport operation a record is kept for operation number, origin, destination and start time details. Each transport operation could be one of only two types: passenger and load.

- For passenger type of transport operation, a record is maintained with details for passenger name, address, need of assistant on board, and need of wheelchair on board. One method required for this type of transport operation is "Perform Safety Check".

- For the load type of operation, a record is maintained containing weight and description details.

QUESTION THREE (20 MARKS)

The shorthand representation for the CompuSystem Associates database appears below. Use this representation to answer the questions that follow:

COMPUTER (COMPID, MFGNAME, MFGMPDEL, PROCTYPE)

EMPLOYEE (EMPNUM, EMPNAME, EMPPHONE)

PC (TAGNUM, COMPID, EMPNUM, LOCATION)

PACKAGE (PACKID, PACKNAME, PACKVER, PACKTYPE, PACKCOST)

SOFTWARE (PACKID, TAGNUM, INSTDATE, SOFTCOST)

For each computer CompuSystem Associates needs to store the manufacturer's name and model, the processor type, and the computer ID.

For each employee, it needs to store the employee's number, name, and phone number.

For each PC, the corporation needs to store the PC's inventory tag number, computer ID, location, and the number of the employee who is primary user of the PC.

For software package, CompuSystem Associates needs to store the package's ID, name, version, type, and current cost.

For each software package installed on a PC, the corporation needs to store the software package's ID and cost, inventory tag number, and the software installation date.

3.1 Change the version of package SS11 to null.

(3)

3.2 Increase the length of EMPNAME to 40.

(3)

3.3 Write the view definition for SOFTVAL. This view consists of the tag number and software value of each PC. The software value is the total cost of software currently installed on the PC.

(5)

3.4 Give SQL commands to grant user Thomas the ability to change the structure of the PACKAGE table.

(2)

3.5 User Watkins is no longer to be able to retrieve data from the EMPLOYEE table. Give the SQL command necessary to revoke this privilege.

(2)

3.6 Delete all packages of type Database whose cost is over 400.00 (3)

3.7 Using the system catalog, list the name of all indexes associated with the EMPLOYEE table. (2)

QUESTION FOUR (16 MARKS)

4.1. Analyze the situations described below and fill in the authorization tables for a hospital (Y or N) based on the following assumptions:

- Nurses may read, but not insert, modify, or delete patient charges' records. They may not access physician or employee records. They may read patient records, but may not update them.
- Persons in admissions may read and/or update patient records.
- Nurses, physicians, and administrators may read patient records, but may not update these records.

N.B. Update includes Insert, Modify, and Delete operations.

(Copy the following tables in your answer book and fill in the details, according to the above descriptions).

Authorizations for Nurses (8)

Relation	Patient records	Patient Charges records	Physician records	Employee records
Read				
Insert				
Modify				
Delete				

Authorizations for Patient Records (8)

	Nurses	Physicians	Admissions	Administrator
Read				
Insert				
Modify				
Delete				

QUESTION FIVE (4 MARKS)

5.1 Define Database Recovery. (1)

5.2 For each of the situations described below, state which one of the following recovery procedures is most appropriate: (3)

- Backward recovery
- Forward recovery from the latest checkpoint
- Forward recovery using backup copy

5.2.1 A phone disconnection occurs while a user is entering a transaction.

5.2.2 A disk module is dropped and is damaged so that it cannot be used.

5.2.3 A lightning storm causes a power failure.

QUESTION SIX (10 MARKS)

6.1. What is a relation? (1)

6.2. State the important properties of relations (5)

6.3 List four typical problems that may arise when merging two relations to form a single one. (4)

QUESTION SEVEN (18 MARKS)

7.1 Define normalization. (2)

7.2 Analyze the following cases and provide an answer for each one of them: (2)

7.2.1 The primary key of the relation JOB is the attribute JOB_NUMBER. The two other attributes of JOB relation are CONTRACTOR_NAME and CONTRACTOR_ADDRESS. The following functional dependency exists:
CONTRACTOR_NAME $\longrightarrow$ CONTRACTOR_ADDRESS.

In what normal form is this relation?

7.2.2 The relation COURSE has a multivalued dependency. What normal form this relation **cannot** be in?

7.3 The relation below concerns order information.

ORDER(ORDER-No, ORDER-DATE, PRODUCT-No, PRODUCT-NAME, DESCRIPTION, UNIT-PRICE, QUANTITY, VENDOR-NAME, VENDOIR-ADDRESS)

For a given order (identified by the ORDER-No) there will be an order date and a single vendor. The vendor name and address appear on the order. For each product that appears the product-No, description, unit price and quantity are shown.

7.3.1 Present **all** functional dependencies in the relation, each on separate line. (5)

7.3.2 Identify and state the **candidate** key. (1)

7.3.3 Convert the relation into a set of relations that **all** are in **third normal form**. (8)