



UNIVERSITY of LIMERICK

O L L S C O I L L U I M N I G H

COLLEGE of INFORMATICS and ELECTRONICS

Department of Computer Science & Information Systems

EXAMINATION

May 2006

Academic Year:	2005/06	Semester:	2
Module Title:	Database Systems	Module Code:	CS4416
	Development of IS 2		CS5122
Duration of Examination:	2.5 hours	Percent of Total Marks:	70
Lecturer:	Sonia Zheleva	Paper marked out of :	100
Number of Questions:	5	Number of Pages:	8

INSTRUCTIONS / REQUIREMENTS:

ANSWER ALL QUESTIONS

WRITE INTELLIGIBLY

HAND IN THE QUESTION PAPER TOGETHER WITH YOUR ANSWER BOOK

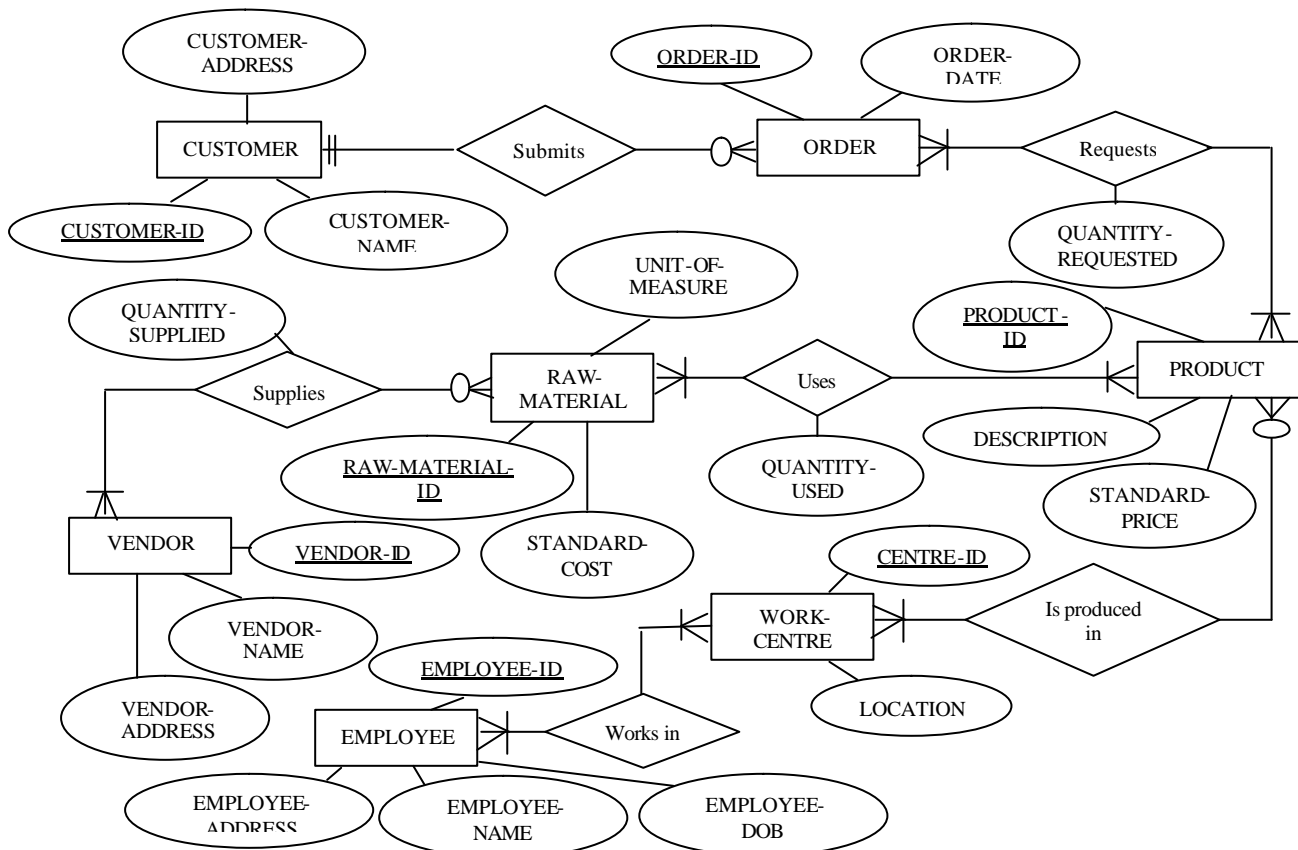
QUESTION ONE (max 12 MARKS)

Multiple choice questions

QUESTION TWO (23 MARKS)

Presented below is a conceptual data model for typical business environment

Transform this Entity-Relationship diagram into a **set of relations** in 3NF. Name each relation and list in parentheses its attributes. Use the required notation to represent the different types of keys where necessary. (23)



QUESTION THREE (21 MARKS)

The relation below concerns Invoice information.

INVOICE (INV-No, INV-DATE, CUSTOMER-No, CUST-NAME, CUST-ADDRESS, SWPACK-ID, SWPACK-DESCR, UNIT-PRICE, SWPACK-QTY)

For a given invoice (identified by the invoice No), there will be an invoice date and a single customer. The customer No, name and address appear on the invoice. Also, there may be several different software packages appearing on the invoice. For each software package that appears, the package ID, package description, unit price and quantity are displayed.

- 3.1 Draw the **Dependencies diagram** for the above relation (5.5)
- 3.2 List all **functional dependencies** in the relation. (5.5)
- 3.3 Identify the **candidate key**. (1.0)
- 3.4 Convert the relation into a set of **3NF** relations. (8.0)
- 3.5 Are the relations you have developed in part 3.4 in **Boyce-Codd Normal Form**? Explain your reason. (1.0)

QUESTION FOUR (34 MARKS)

The shorthand representation for Lee's Video Club database appears below.

DIRECTOR (DIRNUM, DIRNAME, DIRBORN, DIRDIED)

MOVIE (MVNUM, MVTITLE, YEARMADE, MVTYPE, AWARD, DIRNUM)

STAR (STARNUM, STARNAME, BIRTHPLACE, STARBORN, STARDIED)

MVSTAR (MVNUM, STARNUM)

MEMBER (MMBNUM, MMBNAME, MMBADDR, JOINDATE, NUMRENT, BONUS)

TAPE (TAPENUM, MVNUM, PURDATE, TIMESRENTED, MMBNUM)

Lee has started her video rental store, called Lee's Video Club, some years ago. She refers to each of her customers as "members".

- For each member she assigns a number and keeps data for name, address, number of rentals the member has made, number of bonus units the member is currently qualified for, and the date the member joined the club.
- Lee gathers and organizes facts on movies, directors, and movie stars:
 - For a movie she assigns movie number, and stores its title, type, year it was produced, and the number of Academy Awards it won.
 - Similarly, she assigns numbers to the directors and keeps their names, year of birth, and if appropriately – year of death.
 - Actors and actresses are also assigned numbers in a STAR file, and their name, birthplace, year born, and if appropriately – year died, are kept as a data.
 - The table MVSTAR she uses simply to relate stars to the movies in which they appeared.
- Finally, Lee keeps information about the videotapes the club owns. They are assigned a number when purchased, and Lee stores information about the purchase date, the movie number the tape refers to, the number of times the tape has been rented, and the member's number who currently is renting the tape.

Write SQL commands to perform the following operations:

- 4.1 List the numbers and names of all members who have rented more tapes than average. (4.0)
- 4.2 For each director who won at least one 'Comedy' award, list the director's number and the total number of awards won by movies of type 'Comedy' that s/he has directed. (7.0)
- 4.3 List the numbers and names of any pairs of movies that are of the same type and have the same director. (6.0)
- 4.4 Remove the TAPE table from the Movies database. (1.0)
- 4.5 Define a view called SMALLMMB. It consists of the member's number, name, address, number of rentals, and number of bonus units for all members who have rented less than 20 tapes.
- 4.5.1 Write the view definition for SMALLMMB. (5.5)
- 4.5.2 Write an SQL query to retrieve the number and name of all members in SMALLMMB who have earned bonus units (BONUS is greater than 0). (2.5)
- 4.5.3 Convert the query from part 4.5.2 to a query that will actually be executed. (3.5)
- 4.6 User Sanders is no longer to be able to retrieve data from the MEMBER table. Provide the SQL command necessary to revoke this privilege. (3.0)
- 4.7 The index called MOVIND3 is no longer necessary. Provide the SQL command to delete it. (1.5)

QUESTION FIVE (10 MARKS)

- 5.1 **List and briefly** discuss (in 1-2 sentences) **two concerns** that you would have if you accept a job as a Database Administrator and discover that the database users are entering one common password to log on to the database each day they arrive for work, and also learn that they leave their workstations connected to the database all day, even when they are away from their machines for an extended period of time. (4)
- 5.2 For each of the situations described below, state which **one** of the security measures - authentication schemes, authorization rules, or encryption, is most appropriate: (3)
- 5.2.1 A national brokerage firm uses an electronic funds transfer system (EFTS) to transmit sensitive financial data between locations.
- 5.2.2 A manufacturing firm uses a simple password system to protect its database but finds it needs a more comprehensive system to grant different privileges to different users.
- 5.2.3 A university has experienced considerable difficulty with unauthorized users who access files and databases by appropriating passwords from legitimate users.
- 5.3 List three common situations for which denormalization may be considered when other physical design techniques are not sufficient to achieve speed processing expectations. (3)