The Open University of Sri Lanka
B.Sc. Degree Programme: Level 05

Final Examination - 2007

CSU3278: Database Management Systems: Paper II

Duration: 2½ Hours

Date: **09.06 2007**   Time: 10.00am – 12.30pm

Answer **FOUR** questions **ONLY**

(01)

(a) A *Database Processing System* consists of three key technology components

  - A Database Application
  - A Database Management System
  - A Database

Describe the role and functions of each of these components and support your answer with examples.

(b) What role does a *foreign key* play in implementing a *relationship*?

(c) Explain the origin of the *primary key* for a *composite entity*. Next, explain how the parts of the *primary key* serve as *foreign keys*.

(d) The following is a skeleton relational schema for an educational registration system. Establish an *Entity Relationship (ER) model* for this structure.

```
Department (dept-no, dept-name, .....)
StaffMember (staff-no, staff-name, dept-no, .....)
Course (course-no, course-name, .....)
Student (student-no, student-name, .....)
Allocation (staff-no, course-no, .....)
Registration (student-no, course-no, .....)
```

The attributes underlined indicates the key fields

(02)

ABC Express is a mail order company specializing in supplying men's, women's and children's wear clothing. The company has tied up with some specialized textil/ manufacturers to supply the clothing. These are based on the designs provided by the ABC Express, over which they have marketing rights. Each specific item is supplied by just one manufacturer, but most manufacturers supply many different items of clothing. Each item is allocated a unique code by the mail order company. Customers send in orders to the mail order company. Each order

can contain one or more items of different categories. The mail order company orders stock from the manufacturers using a clothing requisition and stores them at their warehouse. After the clothing is checked for quality and user requirements, the same is sent to the dispatch department for packing and dispatch to customers.

(i) Identify major *entities*.

(ii) List down various *attributes* you feel ABC Express needs to store about the entities

(iii) Develop an *ER diagram* to model the data thus identified.

(iv) Obtain *relations* from the ER diagram.

(03)

(a) Draw an *ER diagram* to model the following scenario. Indicate all appropriate constraints.

A course is made up of one or more sections and has many Teaching Assistants (TAs). A course has a unique name and a single instructor. Sections have numbers that are unique only within a course. A TA cannot be shared by two or more courses or two or more sections of the same course. Every TA must serve for a section of some course.

(b) List and briefly describe the three steps of *normalization*.

ABC films Ltd. distributes and exhibits films produced in Sri Lanka. They have sub distributors appointed to handle various regions of the country, through which they distribute and exhibit the movies at cinema halls. ABC films Ltd., receives a weekly report of collections from the distributors and consolidates it into an output shown below:

Collection for week: 01/01/98 to 07/01/98

Film No.	Film Name	Distributor Name	Cinema Name	City/ Town	Collection in Rupees
35	One Shot	Vision Films	Roxy	Colombo	5,54,788
35	One Shot	Vision Films	Savoy	Colombo	4,67,999
35	One Shot	SL Movies	Majestic	Kandy	3,45,125
42	Anjalika	Blaze Films	Metro	Matara	10,76,646

(i) Normalize the above report into 3NF through 1NF and 2NF

(ii) Draw a *functional dependency diagram* for the normalized form.

(04)

(a) What is *generalization* and what is its value?

(b) In the context of ER modeling, explain what are entity *supertypes* and *subtypes*.

(c) "*Most business firms employ people with a wide range of skills and special qualifications*"

Suppose an aviation business employs Pilots, Mechanics and Accountants. Each of the above categories has its own skills and qualifications. For example, Pilots will have special requirements such as minimum flight hours, training flight checks etc., that are not required either for Mechanics or Accountants.

(i) What would be the consequences, if we have only a single EMPLOYEE entity to store data of Pilots, Mechanics and Accountants?

(ii) Obtain a *generalization hierarchy* for the above problem. Make assumptions as required.

(d) Persons in an University can be either Teachers or Students. It is required to keep track of the PERSON_ID, NAME and ADDRESS for each employee. In addition, for each teacher, the organization keeps that person's DATE_HIRED.

The STUDY_PROGRAM of each STUDENT is also kept. In addition, each teacher teaches one or more courses. Each course is identified by the course code and the course name. The date a teacher was appointed for a particular course is also stored.

Derive a suitable *relational model* for the above scenario. Be sure to state any reasonable assumptions that you are making.

(05)

Consider the following database table:

	EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE
▶	101	De Silva	Cyril	W	June 21, 1992	502
	102	Fernando	Basil		March 12, 1997	501
	103	Perera	Nimal	R	November 02, 1999	500
	104	Peiris	Kamal	S	July 01, 1999	501
	105	Pathum	Alwis	L	December 23, 1997	502
	106	Perera	Yasas		January 25, 1994	500
	107	Pathirana	Nayana	S	August 30, 1990	500
	108	Soysa	Sahan	I	October 11, 1996	501
	109	Pilapitiya	Layan	W	May 19, 1993	501

The structure of the above table is as follows:

Attribute Name	Data Declaration
EMP_NUM	CHAR(3)
EMP_LNAME	CHAR(15)
EMP_FNAME	CHAR(15)
EMP_INITIAL	CHAR(1)
EMP_HIREDATE	DATE
JOB_CODE	CHAR(3)

Given this information, answer the following questions:

(i) Write SQL code that will create the above table structure.

(ii) Having created the table structure in part (i), write SQL code that will enter the first two data rows into the table.

(iii) Assuming that the remaining data have been entered, write SQL code that will list all attributes for job code 502.

(iv) Write SQL code that will save the above table.

(v) Write SQL code to change the job code to 501 for the person whose employee number is 106.

(06)

Using the *Chen methodology*, create an *ER diagram* for a medical clinic, using at least the following business rules:

- A patient can make many appointments with one or more doctors in the clinic and a doctor can accept appointments with many patients. However, each appointment is made with only one doctor and each appointment references a single patient.

- Emergency cases do not require an appointment. However, an emergency is entered into the appointment book as "unscheduled" for appointment management purposes.

- If kept, an appointment yields a visit with the doctor specified in the appointment. The visit yields a diagnosis and when appropriate, the treatment.

- Each visit updates the patient's records to provide a medical history.

- Each patient visit creates a bill. Each patient visit is billed by one doctor and each doctor can bill many patients.

- Each bill must be paid. However, a bill may be paid in many installments and a payment may cover more than one bill.

- A patient can pay the bill directly or the bill may be the basis for a claim submitted to an insurance company.

- If the bill is paid by an insurance company, the deductible is submitted to the patient for payment.