UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2001/2002

September 2001

CIT503 – Databases and E-Commerce Rapid Application Development

CSI512 – Database Management Systems

Duration : 3 hours

INSTRUCTION TO CANDIDATE:

- Please ensure that this examination paper contains **FOUR** questions in **SIX** printed pages before you start the examination.
- Answer **ALL** questions.
- You may choose to answer either in Bahasa Malaysia or English.
- Please start your answer for each question on a new page.

ENGLISH VERSION OF THE QUESTION PAPER

1. (a) Among the weaknesses of the file processing system are data redundancy and data isolation. Elaborate both in details and explain how the database system would overcome them.

(6 marks)

(b) Data dictionary is a component of DBMS. Explain the significance and the advantages of data dictionary.

(4 marks)

(c) Explain the tasks of a query processor. State the four modules that assist the query processor.

(4 marks)

(d) What is logical and physical data independence? Explain the importance of both types of data independence to the database design.

(4 marks)

2. (a) State the role of DBA in every phase of the DDLC.

(4 marks)

(b) Part of the database schema of a bank is given below:

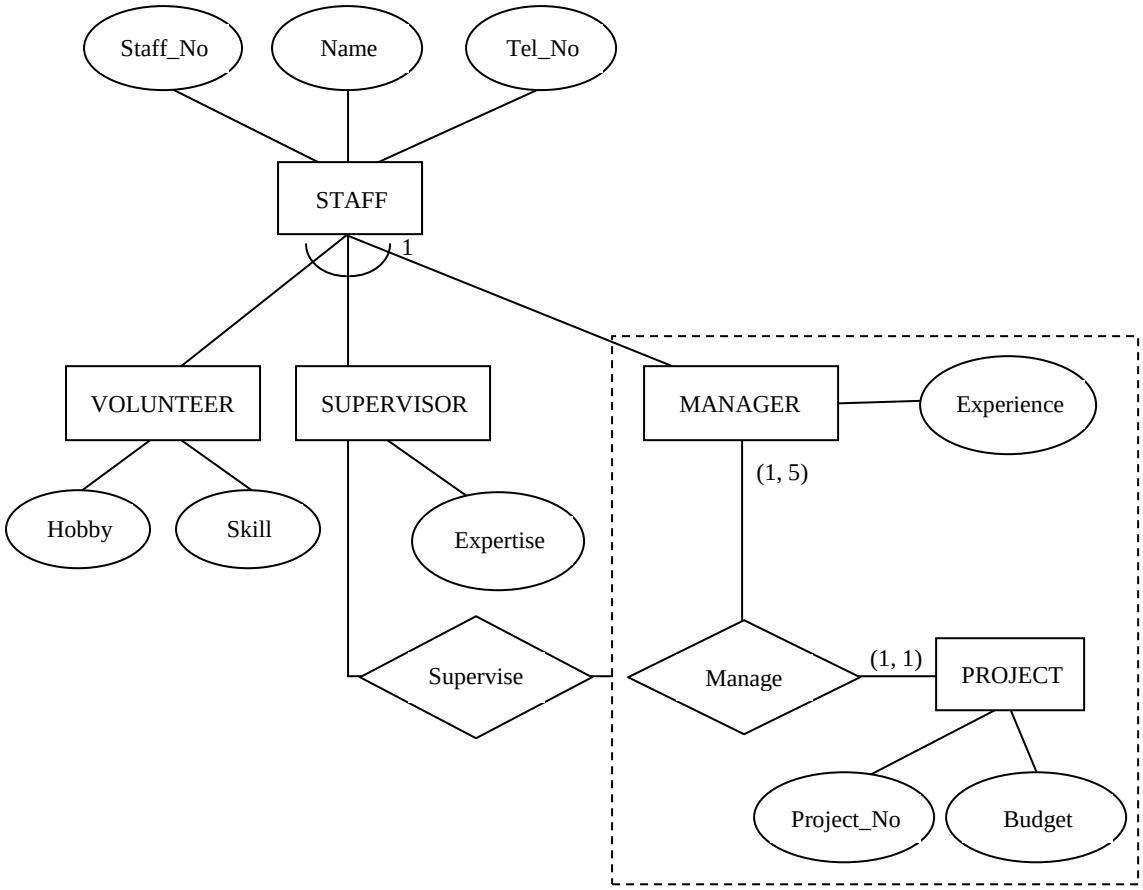
CUSTOMER (CustomerNo, IdentityCardNo, Name, TelNo)
ACCOUNT (AccountNo, Remainder)
TRANSACTION (CustomerNo, AccountNo, DateOfTransaction)

Identify the primary key for each of the relations in the above schema and then identify and explain the difference between the following types of keys:

(i) foreign key
(ii) candidate key
(iii) composite key
(iv) alternative key

(5 marks)

(c) Map the following E-R diagram to a relational schema.



(6 marks)

(d) A forwarding company PQR is handling its operations from various locations such as airport, bus station and port. Every location, which is known by its address, has certain capacity. Every employee who is known by the employee number is stationed at a certain location and works for a particular department. Every employee must report to his/her superior who is also an employee in the same department. The employee record such as name, birth date, and other relevant particulars are stored in a file. This includes the date when he started working at a particular location. There are two categories of employee, i.e. permanent employee who is paid by monthly wages and temporary employee who is paid by hourly rate. Every department is given a unique name and a fix yearly budget. Besides the normal duties, every department is asked to sponsor at least one and at most two sport organisations. Each sport organisation is known by a unique sponsorship number. Other particulars such as the date of the sponsorship and the allocation are also stored. Every sponsorship is supervised by a trusted employee. An employee cannot be asked to supervise more than one sponsorship. A department will sponsor an organisation, which is not yet sponsored by any other departments.

Identify each entity set, relationship set, attribute and key attribute. Illustrate the cardinality of each relationship. Then model the above scenario using ER/EER diagrams.

(15 marks)

3. Normalisation is one of the steps in the conceptual database design phase.

   (a) Explain the meaning of normalisation process and briefly describe the necessary steps in order to transform a relation from first normal form to DKNF normal form.

   (4 marks)

   (b) Give two reasons why normalisation is important. Explain your answer based on the example of a relation given below.

StudentName	StudentNo	Class	Club	ClubHead	ClubDay
Karim	L001	1A	Archery	Lim	Wednesday
Sally	P201	2B	Sewing	Sally	Monday
Sam	L002	1A	Boxing	Chandra	Monday
Teh	P013	2B	Archery	Lim	Wednesday
Jalil	L215	3C	Sport	Ramli	Saturday

   (4 marks)

   (c) For each of the following relations, state the highest normal form that it satisfies. If it is not in BCNF, illustrate how it is decomposed into a higher normal form (if possible, to BCNF). Underline the primary key. State any assumptions that you made.

      (i) STAFF (StaffNo, ChildName, StaffName, IdentityCardNo, AgeOfChild, ChildSchoolName, Standard, ChildHobby)
      [Illustrate the relationship between a staff and his/her dependents who are still schooling]

      (ii) SALE (CustomerNo, CustomerName, AgentNo, AgentName, AgentDept, PolicyValue, PolicyType, DateExpired)
      [Illustrate the relationship between a customer and the insurance agent who sold a policy to him/her]

(iii) EXAM (PaperCode, PlaceOfExam, StartTime, InvigilatorName, Date, InvigilatorNo)
[Illustrate the relationship between an invigilator and the paper that he/she invigilates]

(iv) PATIENT (PatientNo, DoctorNo, TreatmentType, PatientAddress, DateOfTreatment)
[Illustrate the relationship between a patient and his/her doctor]

(12 marks)

(d) Explain the concept of join dependency and its relation with the fifth normal form (5NF). Consequently, show whether the following instant of a relation is in 5NF.

StaffNo	ProjectNo	NoOfDays
1234	P100	5
3456	K200	7
5678	L300	4
8901	K200	7

(5 marks)

4. (a) (i) What is meant by data manipulation language (DML)? Explain the difference between procedural and non-procedural DML.

(3 marks)

(ii) "Relational algebra and relational calculus is relationally complete". What is meant by the above statement and what is its significance in the context of commercial DBMS?

(2 marks)

(b) Below is part of database schema of a hospital which shows the relationship between doctor patient and treatment. Assume that a patient will see the same doctor only once a day. Date is recorded as ddmmyyyy (day, month and year). Salary is the montyly salary.

Doctor (StaffNo, Name, Expertise, Salary)
Patient (PatientNo, Name, Town, Age)
Treatment (StaffNo, PatientNo, Date, TreatmentType, Payment)

Give SQL expression which corresponds to each of the following queries:

(i) List the name and the type of the treatment for all patients who have been treated between 15 December 1999 and 28 February 2000.

(ii) For each of the expertise type which has more than 2 doctors, list the number of doctor in each of the expertise type.

(iii) List the name and the town for each of the patient who came from the same town in alphabetical order of the town name.

(iv) List the staff number for the doctor who has not treated any patient yet.

(v) Update the database to demonstrate that the salary of Dr. Kadir with the staff number D9999 has been raised by 10%.

(vi) Create a view name RAWAT which lists the name of the doctor, his/her expertise, and the type of treatment that he/she has given, for every doctor who has given some treatment between the month of January 2001 and June 2001.

(12 marks)

(c) Answer the following query in QBE.

(i) List the names of the doctor who has given a treatment which is not the same as his/her expertise.

(ii) List the name of the doctor and the patient who the doctor has treated with the maximum payment.

(4 marks)

(d) Answer the following queries in relational algebra based on the relational schema given below:

FLIGHT (FlightNo, From, Destination)
AIRPORT (Name, City, Country)
STOP (FlightNo, AirportName, City, StopNo)

(i) Obtained the flight number, destination, town and country for the stop number 7.

(ii) List all flight number which arrives from KUALA LUMPUR.

(iii) List all the airport where the plane with the flight number MH1238 make a stop.

(6 marks)