EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE - 2003/04 (Repeat)

SECOND SEMESTER (June/July, 2005)

CS203 -- Database Design

Answer All Questions

Time Allowed: 2 Hours

Q1

(a) State clearly what an entity-*relationship* (E-R) model model is and describe its role in designing a database.

A hospital has a large number of registered physicians. Attributes of PHYSICIAN include Physician_ID and Specialty. Patients are admitted to the hospital by physicians. Attributes of PATIENT include Patient_ID, and Patient_Name. Any patient who is admitted must have exactly one admitting physician. A physician may optionally admit any number of patients. Once admitted, a given patient must be treated by at least one physician. A particular physician may treat any number of patients, or may not treat any patients. Whenever a patient is treated by a physician, the hospital wishes to record the details of the TREATMENT(Treatment_Detail). Components of Treatment_detail include Date, Time, and Results.

(i) Identify the entities and their attributes involved in the above mentioned hospital functions.

(ii) Identify the possible relationships between the entities.

(iii) Develop an E-R model for the hospital.

(iv) Construct a relational database for the hospital.

[to be continued...]

(b) Design a relational database corresponding to the following E-R diagram:
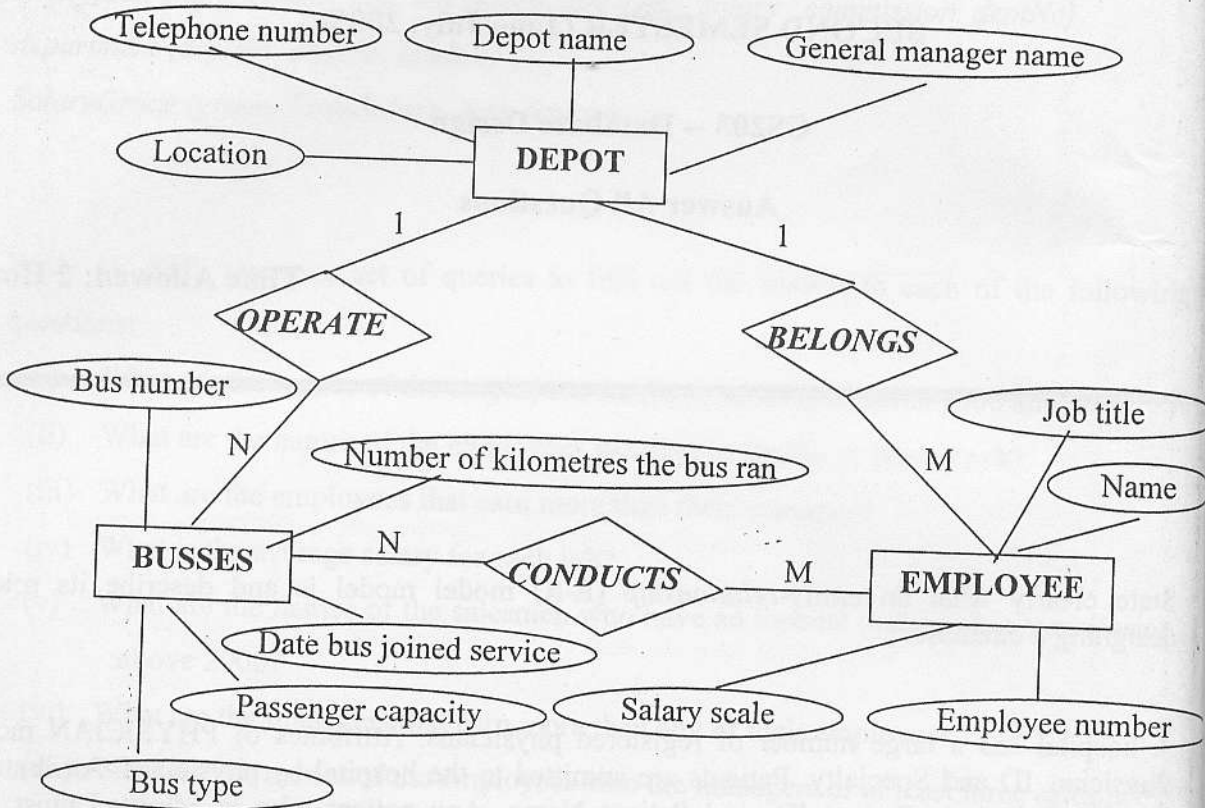
Q2

(a). Define each of the following with regard to database design:

    (i)   functional dependency

    (ii)   full functional dependency

    (iii)   transitive dependency

    (iv)   normalization: first, second, and third normal forms

(b). Briefly describe relational algebra and relational calculus.

State clearly what is meant by *union compatible* relations.

Describe briefly each of the following relational algebra operations:

        Projection

        Selection

        Cartesian product

        Union

        Division

Consider the relational employee database:

employee (employee-name, street, city)

works (employee-name, company-name, salary)

company (company-name, city)

manages (employee-name, manager-name)

Give an expression in relational algebra to perform each of the followings tasks:

(a) Find the names of all employees who work for First Bank Corporation.

(b) Find the names and cities of residence of all employees who work for First Bank Corporation.

(c) Find the names, street address, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000 per annum.

(d) Find the names of all employees in this database who live in the same city as the company for which they work.

(e) Find the names of all employees who live in the same city and on the same street as do their managers.

(f) Find the names of all employees in this database who do not work for First Bank Corporation.

(g) Find the names of all employees who earn more than every employee of Small Bank Corporation.

(h) Assume that companies may be located in several cities. Find all companies located in every city in which Small Bank Corporation is located.

(i) Modify the database such that Jones now lives in Paris.

(j) Delete all tuples in the works relation for employees of Small Bank Corporation.

Q4

.Given the following schema:

employee (emp#, eName, job, manager#, hire-Date, salary ,commission, deptNo)
department (deptNo, dName, loation)
SalaryGrade (grade, Low-Salary, high-Salary)

Write a SQL query or set of queries to find out the answer to each of the following questions:

(i) What are the names of the employees that have salaries between 1000 and 2000?

(ii) What are the names of the employees working in **Dallas** or **New York**?

(iii) What are the employees that earn more than their manager?

(iv) What is the average salary for each job?

(v) What are the names of the salesmen who have an income (salary plus commission) ab
2000?

(vi) What are the managers that earn more than any of their employees?

(vii) What are the names of the employees who are managers of at least three salesmen?

(viii) Who is the lowest paid employee in **Dallas**?

(ix) What are the names of the employees who were hired before their manager?

(x) For how many employees is in the case that the employee and his/her manager work
different towns?

(xi) How many employees have a higher salary than the average salary of all employe
working in the same town?

(xii) Which is the town with the lowest average salary grade?