EASTERN UNIVERSITY, SRILANKA

SECOND EXAMINATION IN SCIENCE - 2004/2005

SECOND SEMESTER (Oct./Nov.,2006)

CS203 – Database Design

Answer all questions **Time: 2Hours**

Q1.

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

(b) We need to store information about a company. Specifically:

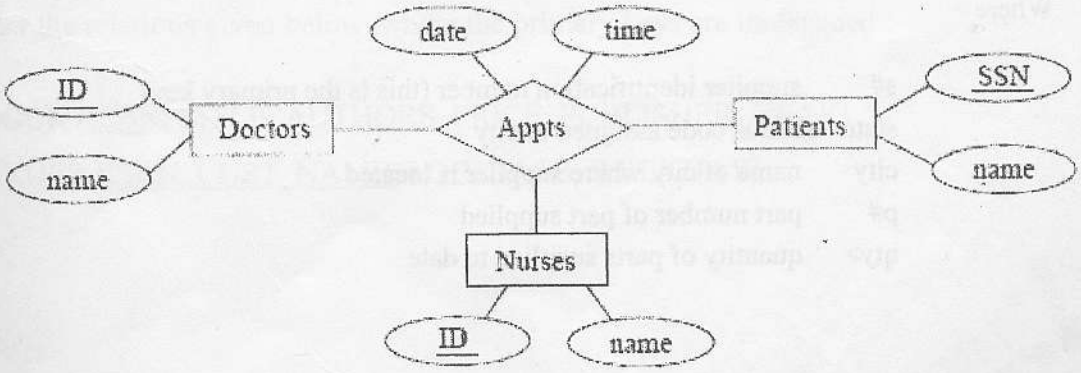
- About employees, identified by **ssn,** with **salary** and **phone** as attributes;
- About departments , identified by **dno** , with **dname** and **budget** as attributes;
- About children of employees , with **name** and **age** as attributes

Every employee belongs to a department; each department is managed by an employee. A child is uniquely identified by its name once its parent is known (assume that only one parent is working with the company).

Give the E-R diagram for the above setting.

- ✓ Specify all the candidate keys for every strong entity
- ✓ Highlight the weak entities, if any, and their discriminators.
- ✓ Indicate the cardinalities for every relationship.

(c) Consider the following entity – relationship diagram representing appointments that include one doctor, one nurse, and one patient:



Translate the E-R diagram to a relational schema .Underline key attributes for the relations derived from entity sets only.

Suppose that each doctor, nurse, and patient can be scheduled for at most one appointment at a given date and time. For the relation you derived corresponding to the relationship set in the E-R diagram list all of possible minimal keys.

Q2.

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

- functional dependency
- full functional dependency
- normalization: first, second, third normal forms

(b) Consider the following relation **Suplier_Part** for a company:

s#	status	city	p#	qty
s1	20	London	p1	300
s1	20	London	p2	200
s1	20	London	p3	400
s1	20	London	p4	200
s1	20	London	p5	100
s1	20	London	p6	100
s2	10	Paris	p1	300
s2	10	Paris	p2	400
s3	10	Paris	p2	200
s4	20	London	p2	200
s4	20	London	p4	300
s4	20	London	p5	400

Following is the description of the functional dependencies in **Suplier_Part.**

A company obtains parts from a number of suppliers. Each supplier is located in one city. A city can have more than one supplier located there and each city has a status code associated with it. Each supplier may provide many parts. The company creates a simple relational table **Suplier_Part** to store this information that can be expressed in relational notation as:

Suplier_Part (s#, status, city, p#, qty)

Where

s#	supplier identification number (this is the primary key)
status	status code assigned to city
city	name of city where supplier is located
p#	part number of part supplied
qty>	quantity of parts supplied to date

Draw a diagram for the functional dependencies in the relation.

Decompose **Suplier_Part** into a set of third normal relations.

Q3.

(a) Describe briefly each of the relational algebra operations:

- Projection
- Selection
- Cartesian product
- Union
- Division

(b) Consider the following relational schema , that keeps track of suppliers , products and shopping catalog information:

SUPPLIER(sid, sname, address)

PRODUCT(pid, pname, color, unit-price)

CATALOG(sid, pid, shipping-time)

Express the following queries in relational algebra:

(i.) Find the ***pid(s)*** of all products that have color='red'

(ii.) Find the ***sid(s)*** of suppliers that can ship a 'red' product.

(iii.) Find the names of suppliers that can ship a product named after the supplier. Eg., list supplier Mr. "Mercedes" , if he can ship "Mercedes " cars.

(iv.) Find the ***sid(s)*** of suppliers that can ship all the existing products.

(v.) Find the ***pid(s)*** of the most expensive product(s) , that is, with the highest unit price.

Q4.

(a) Describe briefly the use of Structured Query Language (SQL) as a data definition language (DDL) and data Manipulation Language (DML).

(b) Consider the relations given below ,where the primary keys are underlined :

BOOK (ISBN, TITLE, AUTHORS, PRICE, PUBLISHER, YEAR)

ORDER (ISBN, CUST_NAME, LOC, DATE, WEEKDAY)

Write statements in SQL to do each of the following (State any assumptions you would like to make)

(i). Find the books published by *ACM*.

(ii). Find ISBN of the books whose price is at least 5% less than the average price of the books *ACM*.

(iii). Find ISBN and price for all books ordered from Atlanta with a price over $50.

(iv). Print all books published by *ACM* in the ascending order of price and descending order of year.

(v). Find the average price of books by each publisher.

(vi). Find the average book price of all publishers that have published more than 1000 books.

(vii). Find title of the books ordered on Mondays.