



University of Sri Jayewardenepura

B.Sc. (General) Degree Second Year

Second Semester Terminal Course Unit Examination – December 2013

CSC 209 2.0 Database Management Systems

(Time: 2 hours)

Answer all questions.

Question 1

- (a) Conceptual modeling, Logical modeling and Physical modeling are the three major phases involved in database design process. Briefly describe the activities involved in each of these phases.
- (b) Total participation and Partial participation are the participation constraints you can have in an ER model. Define each of these participation constraints.
- (c) Referential integrity ensures that relationships between tables remain consistent. How do you represent referential integrity in a relational model?
- (d) Insertion, deletion, and update anomalies can occur when relations are not normalized properly. Briefly describe what these anomalies are.

(25 Marks)

Question 2

Suppose you have given the relational schema $R(A, B, C, D, E, F, G)$ together with the set of functional dependencies, $F = [BCD \rightarrow A, BC \rightarrow E, A \rightarrow F, F \rightarrow G, C \rightarrow D, A \rightarrow G]$.

- (a) Decompose R into 3NF relations. Clearly show the steps involved.
- (b) Does this decomposition also in BCNF?

(25 Marks)

Question 3

Consider the ER model given in Figure 1. This model represents the manufacturing, selling and buying of spare parts.

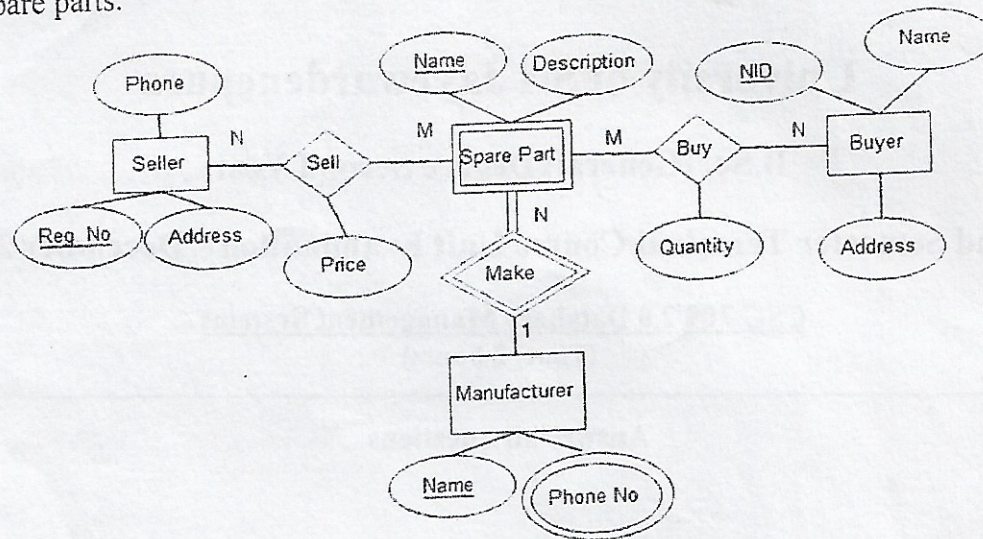


Figure 1

Answer the following questions using this model.

- Can a manufacturer have multiple phone numbers? If not, what do you need to do to allow this?
- If we delete a manufacturer that makes spare parts from the database, what happens to the spare parts that the manufacture makes? Justify your argument.
- Modify the model so that you can incorporate the following.
 - Each buyer has one or many accounts. Each account has an account number and a bank id. There are two types of accounts, saving and checking. The saving account has an interest rate. A checking account has number of free transactions. An account belongs to a certain bank. A bank has a bank id, name and address.
 - A manufacturing company can contract with several sellers, and a seller can have contracts with several manufacturing companies.

You must clearly show on your diagram multiplicities and constraints (overlap, disjoint, total, partial) involved. State any assumptions if used.

- Transform the ER model given in Figure 1 with the modifications done in (c) to its relational model.

(25 Marks)

Question 4

"Labour-LB" is a company that provides skill laborers to its customers who need labor forces. A fraction of the database created to store details of labor transactions is given below.

Laborer(Laborer_NID: integer, Name: string, DOB: date, Type: string, Rate:double, RegisteredDate:date)

Customer(Customer_NID: integer, Name: string, Address: string, PhoneNo: integer)

Hired(Laborer_NID: integer, Customer_NID: integer, DateHired: date, DateReleased:date)

The relation Laborer stores information about the laborers currently registered with the company. These include laborer national Id, name, date of birth, type of labor (mason, carpenter, plumber etc.), daily pay rate and registered date. The Customer relation stores the details about customers who hired laborers from the company. These include customer national Id, name, address and phone number. The relation Hired stores the date on which a customer hired and released a particular laborer. The primary keys are underlined.

(b) Formulate the following queries in SQL.

- (i) Retrieve the total number of carpenters that are registered with the company on 5th May 2013.
- (ii) For each laborer type, list the laborer type and total number hired on 5th May 2013.
- (iii) List the types of labor which are not yet hired.
- (iv) For each customer who has hired at least two laborers, list the names and addresses of the customers.

(c) Formulate the query in (a) (i) in Relational Algebra.

(25 Marks)

***** END OF THE PAPER *****