EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
SECOND EXAMINATION IN SCIENCE – 2012/2013
SECOND SEMESTER (October/November, 2015)
CS 203- DATABASE DESIGN
(Proper & Repeat)

Answer all questions   **Time: 2 Hours**

Q1.

a) Define clearly the term *Database Management System (DBMS)*.

b) Briefly describe three advantages of using a Database Management System comparing to the usual approaches of an office.

c) Give three organizations in Batticaloa where the use of a database management system is necessary. Justify your answer.

d) *Data Definition Language* (DDL) and *Data Manipulation Language* (DML) are two types of languages used in DBMS. Briefly describe them.

e) Describe each of the following with a suitable example:

  i. Primary key;

  ii. Super key;

  iii. Foreign key.

Q2. An *Entity Relationship (ER)* model describes a database in an abstract way, primarily in terms of entities, relationships and attributes.

    a) Define each of the following:

        i)   Simple attributes;

        ii)   Composite attributes;

        iii) Multi-valued attributes;

        iv) Derived attributes.

    b) Consider the following scenario:

Sri Lankan Travel Agency officials decided, all information related to travels should be organized using a DBMS, and you have been hired to design the database. You have to organize the information about all the travel details maintained at the agency.

Airports have a name and a unique ID. There are Sri Lankan and foreign airports. Flights go only non-stop between Sri Lankan and foreign airports. Flights have an ID, are operated by an airline on a specific date. The arrival/departure time at the airports should also be stored. A travel package consists of an outgoing flight, a return flight, and an accommodation in hotel. A travel package has an ID, a price, and information about the availability of the corresponding hotel and flights. A travel package can be booked. A booking has an ID, a date, contact information, and the names of one or more travelers. A hotel has a name, an ID, and a number of beds. A facility is offered by hotels. It has a unique name. A facility belongs to one or more of the following classes: *sports*, *nightlife*, *culture* and *recreation*. Hotels are located in a town. A town is located in a region. A region is located in at least one country. Towns, regions and countries are identified by their name. A foreign airport serves a specific region.

Identify possible *entities* from the above description and draw an *ER diagram* for the *Sri Lankan Travel Agency* database. State clearly the assumptions if you made any.

3. Designing a system that satisfies the needs of an organization can be extremely complex and needs a different approach from that of file-based systems.

    a) State clearly, what is meant by *normalization*.

    b) State five benefits of database normalization.

    c) Define *first*, *second* and *third* normal forms.

    d) The following table shows a snapshot of data that refer to the orders for delivery of items of a local bakery. The bakery has been carrying out these processes for years, but now wishes to computerize their functions.

Order No	Account No	Customer	Address	Date	Item	Quantity	Item Price	Total Cost
24	13	Ravi	Eravur	12/6/2015	Butter bun	20	15.00	
					Pastry	13	20.00	
					Cup cake	45	15.00	1235.00
35	16	Ram	Kiran	19/6/2015	Butter bun	20	15.00	
					Pastry	120	20.00	2700.00
38	13	Ravi	Eravur	30/7/2015	Cream bun	100	18.00	
					Pastry	20	20.00	
					Cup cake	130	15.00	
					Chocolate cake	30	50.00	5650.00
40	23	Ragavan	Trinco	10/7/2015	Cup cake	15	15.00	
					Danish cake	50	20.00	1225.00
42	16	Ram	Kiran	12/7/2015	Cup cake	20	15.00	
					Rich cake	3	50.00	450.00

Describe the process of normalizing the above table into tables of *third normal form*. State clearly any assumptions you made.

Q4. SQL is a programming language designed for managing data in DBMS.

a) Define in your own words what *relational algebra* is.

b) List down the SQL statements that can be used for data definition.

c) Describe the advantages of View in SQL.

d) Convert the following relational algebra expressions to SQL:

   i) $A \bowtie B$;

   ii) $A \neq B$.

e) Consider the database given below:

   Suppliers (supplierId, supplierName, address)

   Parts (partsId, partsName, color)

   Catalog (supplierId, partsId, cost)

   Write expression in *relational algebra* to retrieve each of the following:

   i) Find the supplier Ids of suppliers who supply some brown part or are a Trincomalee.

   ii) Find the supplier Ids of suppliers who supply some black part and som green part.

   iii) Find the supplier Ids of suppliers who supply every red or green part.