The Open University of Sri Lanka

Master of Arts in Teacher Education
Final Examination 2009

CSE1175: Database Management Systems

Duration: 2 Hours

Date: 12.07.2009 Time: 10.00 am – 12.00 noon

Answer **FOUR** questions **ONLY**

(01)

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA(Hons) MSc, etc.) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department which they come from. A module is co-ordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: some modules require pre-requisite modules and some degree programs have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance (i.e. modules taken and examination results). Construct the ER – diagram.

(02)

(i) Discuss each of the following terms:

a) Data b) Attribute c) Record d) Table

(ii) What is *data redundancy* and which characteristics of the file system can lead to it?

(iii) What is *data independence* and why is it important?

(iv) What is a *DBMS* and what are its functions?

(v) What are *connectivities* and what role do they play in database design?

In an organization, there are employees (e_1, e_2, ..., e_n), departments (d_1,d_2, ..., d_n) and projects (p_1, p_2, ..., p_n). By considering the relationships *manges,works_for* and *works_on* between employees,departments and projects, explain the *three types of relationships* associated among data. State clearly any assumptions you make.

(03)

(i) "*Within the broad key classification, several specialized keys can be Defined.*" Discuss what you mean by the following:

(a) Primary Key (b) Foreign Key

(ii) Consider the following set of requirements for a University Database.

(a) The university consists of several faculties and only one dean administrates each faculty.

(b) Each faculty consists of several departments and these departments offer courses.

(c) Each department has students who take courses.

(d) Lecturers are attached to departments and for a course, combined teaching is allowed.

Identify the *entities* and draw the *conceptual schema*(ER diagram) for this databas application. Show clearly the *attributes* and *relationship types* among entities. State clearly any assumptions you make, if necessary.

(04)

(i) Give examples for the following;

(a) Simple and Composite attributes
(b) Derived attribute
(c) Recursive relationship

(ii) What is a *Weak entity* and how is it represented in an ER diagram? Give an example.

(iii) What are *Multi-valued attributes*? What two courses of action are available to a designer when a multi-valued attribute is encountered? Which course of action is the best and when?

(iv) "*Controlled Redundancy makes the relational database work.*" Explain using an illustrated example.

(v) Using a suitable example, explain what is meant by *referential Integrity.*

(05) The following is a brief statement of some facts and policies adopted by the Company.

A relational database is to be designed for a medium sized Company dealing with industrial applications of computers. The Company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software. The Company employs various experts, consultants and supporting staff. All personnel are employed on long-term basis, i.e. there is no short-term or temporary staff. Although the Company is somehow structured for administrative purposes (that is, it is divided into departments headed by department managers) all projects are carried out in an inter-disciplinary way. For each project a project team is selected, grouping employees from different departments, and a Project Manager (also an employee of the Company) is appointed who is entirely and exclusively responsible for the control of the project, quite independently of the Company's hierarchy. Construct the ER –diagram and the Relational schema.

(06)

(i) Use the scenario described by "*An employee can work on many projects and a project can have many employees*" as the basis for an entity relationship diagram presentation.

We need to keep track of each employee's name, employee number, job classification, amount of Rupees paid per hour for a particular job classification, number of hours worked by an employee on a particular project, project number and the project name.
Describe the *ERD* by considering the *attributes* of each entity and the *relationship type*. State any assumptions you make.

(iii) Map the above ERD and obtain the *Relational schema.*

(iv) *Normalize* the relations. State clearly the normal forms you apply.

(v) Study the tables obtained (3NF) and make a change to improve the table structure. Obtain new relations. State clearly the effects of the change you make.