MCS-023

MCA (Revised)

Term-End Examination

June, 2007

MCS-023 : DATABASE MANAGEMENT SYSTEMS

Time : 3 hours *Maximum Marks : 100*
(Weightage 75%)

Note : *Question number 1 is* ***compulsory****. Attempt any* ***three*** *questions from the rest.*

1. (a) Discuss the main characteristics of the database approach and how it differs from traditional file system. *10*

(b) Design an ER diagram for the following set of requirements for a university database that is used to keep track of student's transcripts. Also show generalization and specialization features in the ER diagram. *10*

(i) The university keeps track of each student's name, student's number, social security number, current address, phone number, permanent address, birthdate, sex, class, degree. Both social security number and student number have unique values for each student.

(ii) Each department is described by a name, department code, office number, office phone and college. Both name and code have unique values for each department.

(iii) Each course has a course name, description, course number, number of semester hours and offering department. The value of course number is unique.

(iv) Each section has an instructor, semester, year, course and section number. The section number distinguishes sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ... upto the number of sections taught during each semester.

(v) A grade report has a student, section, letter grade and numeric grade (0, 1, 2, 3 or 4).

Also show specialization, generalization features in your ER diagram.

(c) Consider the following database schema : *10*

EMPLOYEE (Fname, Minit, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN)

DEPARTMENT (Dname, Dnumber, MgrSSN, Mgrstartdate)

DEPT_LOCATIONS (Dnumber, Dlocation)

PROJECT (Pname, Pnumber, Plocation, Dname)

WORKS_ON (ESSN, Pnumber, Hours)

DEPENDENT (ESSN, Dependent-name, Sex, Bdate, Relationship)

Specify the following queries using the relational operators :

(i) Retrieve the name of all employees in department 5 who work more than 10 hours per week on the 'Product Y' project.

(ii) List the names of all employees who have a dependent with the same first name as themselves.

(iii) Retrieve the names of all employees who work on every project.

(iv) Retrieve the average salary of all female employees.

(v) List the last names of all department managers who have no dependent.

(d) Express the above queries using SQL for the same database. *10*

2. (a) Discuss 3NF and Boyce-Codd normal form with the help of an example for each. *10*

(b) Consider the relation R (A, B, C, D) with the following dependencies : *5*

$AB \rightarrow C$, $CD \rightarrow E$, $DE \rightarrow B$

Is AB a candidate key of this relation ? Explain your answer.

(c) What is the dependency preservation property for a decomposition ? Why is it important ? What is the lossless join property of a decomposition ? Why is it important ? *5*

3. (a) What is the two phase locking protocol ? How does it guarantee serializability ? Explain. *5*

(b) Discuss the problems of deadlock and starvation, and the different approaches to dealing with these problems. *5*

(c) What is the system log used for ? What are the typical kinds of entries in a system log ? What are checkpoints, and why are they important ? What are transaction commit points and why are they important ? *10*

4. (a) What are the main reasons and potential advantages of distributed database ? *5*

(b) Why is data replication useful in DDBMSs ? What typical units of data are replicated ? *5*

(c) What are the differences among primary, secondary and clustering indexes ? How do these differences affect the way in which these indexes are implemented ? Which of these indexes are dense and which are not ? *10*

5. Write short notes on : *5×4=20*

(i) Wait die and wound wait protocol

(ii) Difference between a B-tree and a B^+-tree

(iii) Concurrency

(iv) Difference between Physical data independence and Logical data independence

(v) Various types of integrity constraints