MCS-023

MCA (Revised)

Term-End Examination

December, 2008

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) Consider "Library Management System" which keeps the following tables.

Book (isbn_no, book_title, author, publisher, edition, year)

Book_Access (access_no, isbn_no, date_of_purchase)

Member (m_name, m_id, m_address, m_phone)

Issue_Return (access_no, mid, expected_return_date, actual_return_date)

Specify the following Queries in SQL.

(i) Find m_id & m_name of the members who have got at least one book issued to themselves.

(ii) List the book details for the books which were purchased after January 2007.

(iii) List all the books on title "Software Engineering". This list should be sorted on author's name.

(iv) Find the members who have not got any book issued. 10

(b) Describe the relationship between Data Security and Data Integrity, with the help of a diagram. 5

(c) Justify the statement "BCNF is strong 3NF" with the help of an example. 5

(d) Why is data replication useful in DDBMS ? What are complete and selective replication ? 5

(e) How can system log be used for recovery when multiple concurrent transactions are going on ? Explain with the help of an example. 5

(f) For the relation given below, check whether the given functional dependencies hold or not. Give proper justification. 5

J	K	L
X	1	2
X	1	3
Y	1	4
Y	1	3
Z	2	5
P	4	7

(i) $J \rightarrow K$

(ii) $K \rightarrow J$

(iii) $J, K \rightarrow L$

(g) Draw an E – R diagram for the situation given below :

A company database needs to store information about employee (identified by emp_id, salary and phone as attributes); departments (identified by dno, with dname and budget as attributes); children of employees (with name and age as attributes). Employees work in departments; each department is managed by an employee; a child must be identified uniquely by name when the parent (who is an employee; assume that only one parent works for the company) is known. The company is not interested in information about a child once the parent leaves the company. 5

2. (a) Consider the relation supplier with key S, P#, given below, the functional dependency set governing the given relation is, say,
FD = {SP# → City; S → City}

SUPPLIER	(S	P#	City)
	X	1	Delhi
	X	2	Delhi
	X	3	Delhi
	Y	1	Bombay
	Y	2	Bombay

Keeping in mind the details given, now answer the following questions : 8

(i) Find the highest normal form in which the relation supplier is.

(ii) Normalize the given relation to next higher normal form.

(iii) Briefly discuss the Deletion and Insertion anomalies, which can occur in the above relation.

(b) Explain ANSI SPARC 3 Level Architecture of DBMS, with the details of languages associated at different levels and the type of data independence involved in between different levels. 7

(c) What is the role of views in DBMS ? Can we perform delete, modify or insert operations if the view contains group function ? Justify. 5

3. (a) What is Loss-less Join Decomposition ?
Say Emp_Dept (empno, empname, job, deptno, deptname, deptloc) is a relation and F is a functional dependency set on the relation where

F = {deptno → deptname; deptno → deptloc;
empno → empname; empno → job;
empno → deptno}

If relation Emp_Dept is decomposed into two relations

Emp (empno, empname, job, deptno) and
Dept (deptno, deptname, deptloc)

then check whether the decomposition is loss-less or not. 7

(b) Draw the ER diagram for the situation given below : 5

Hospital consists of many departments each of which has its own set of doctors, nurses and wards. Patients consult doctors for treatment; patients could be out-patients or in-patients. Further a ward has general as well as special rooms for stay.

(c) Draw the precedence graph for the following schedule and check whether the schedule is serializable or not (T_1, T_2, T_3 are transactions participating in a concurrent schedule, given below) : 8

Schedule	T_1	T_2	T_3
T_2 : Read (Z)		Read (Z)	
T_2 : Read (Y)		Read (Y)	
T_2 : Write (Y)		Write (Y)	
T_3 : Read (Y)			Read (Y)
T_3 : Read (Z)			Read (Z)
T_1 : Read (X)	Read (X)		
T_1 : Write (X)	Write (X)		
T_3 : Write (Y)			Write (Y)
T_3 : Write (Z)			Write (Z)
T_2 : Read (X)		Read (X)	
T_1 : Read (Y)	Read (Y)		
T_1 : Write (Y)	Write (Y)		
T_2 : Write (X)		Write (X)	

4. (a) What is the need of index in a Database system ? Mention the categories of indexes available in a DBMS, generally. Which data structure is suitable for creating indexes, and why ? 7

(b) Consider the concurrent schedule of transactions T_1 and T_2 given below :

Schedule	T_1	T_2	SUM
T_1 : Read (SUM)	Read (SUM)		500
T_1 : SUM = SUM – 200	SUM = SUM – 200		
T_2 : Read (SUM)		Read (SUM)	
T_2 : SUM = SUM + 500		SUM = SUM + 500	
T_1 : Write (SUM)	Write (SUM)		
T_2 : Write (SUM)		Write (SUM)	

Referring to the schedule given above answer the following questions : 5

(i) Which property of transaction is violated ?

(ii) Identify the final status of SUM.

(iii) The above schedule contributes to which problem in Database ?

(c) What do you mean by fragmentation in a DDBMS environment ? What is the need of fragmenting a relation ? Explain different types of fragmentations with the help of an example. *8*

5. (a) Compare and contrast the following : *3×4=12*

(i) Relational Algebra and SQL

(ii) Centralized and Distributed DBMS

(iii) Wait-die and Wait-wound protocols

(b) Explain the following with the help of an example : *2×4=8*

(i) Integrity constraints

(ii) Deadlock and its prevention in database systems