53 (CS 401) DBMS

2014

DATABASE MANAGEMENT SYSTEMS

Paper : CS 401

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(A)* A Car Insurance Company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time, and has an associated due date, and the date when the payment was received.

   (i) Draw an *E-R* diagram for above scenario. 8

   (ii) Convert the Drawn *E-R* diagram to relational schema. 8

(B) Explain the concept of Specialization and Generalization with example. 4

2. (A) Consider the following relation schema $r(A, B, C, D, E)$ and F is the set of functional dependencies.

$F = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$

List the candidate keys for R. 4

(B) Compare between Boyce-Codd Normal Form (BCNF) and Third Normal Form (3NF). Which is the strongest one ? Prove that BCNF decomposition is not a dependency preserving decomposition. 10

(C) Explain below concepts.

(i) Multivalued dependencies

(ii) Fourth Normal Form (4NF)

(iii) Armstrongs axioms. 6

3. *(A)* Branch (Branch_name, branch_city, Assets)

Customer (Customer_name, Customer_street, Customer_city)

Loan (Loan_number, branch_name, amount)

Borrower (Customer_name, Loan_number)

Account (account_number, branch_name, balance)

Depositor (Customer_name, account_number)

Fig-1

Consider the Bank database of *Fig. 1* where primary keys are underlined. Construct the following SQL queries for this relational database.

(i) Find all customers of the bank who have an account but not a loan.

(ii) Find the names of all branches with customers who have an account in the bank and who live in "Harrison".

(iii) Find all customers who have an account at all the branches located in "Brooklyn".

(iv) Find out the total sum of all loan amounts in the bank.

(v) Find the names of all branches that have assets greater than those of at least one branch located in "Brooklyn". 15

(B) Explain about Data-manipulation language (DML) and Data-Definition language (DDL). 5

4. (A) Consider the following relational schema for a library.

Member (mem_no, name, DOB)

Books (ISbn, title, author, publisher)

Borrowed (mem_No, ISbn, date)

Write the following queries in

(a) Relational Algebra

(b) Tuple Relational calculus

(i) Find all names of members who have borrowed any book published by "Mc Graw-Hill".

(ii) Find name of the authors of Book "Database Management Systems".

(iii) Find title of all books which were borrowed on date 3rd april 2014. 12

(B) Let, $R = (A, B, C)$ and let r_1 and r_2 both be relations on schema R. Give an expression in Domain Relational Calculus that is equivalent to each of the following.

(i) $\pi_A (r_1)$

(ii) $\sigma_B = 17 (r_1)$ 8

5. (A) Define procedural and Non procedural query language with example. 4

(B) Explain about different functions of a Database administrator (DBA). 8

(C) Construct a 'B^+ tree for the following set of key values :

2, 3, 5, 7, 11, 17, 19, 23, 29, 31

Assume that the tree is initially empty and values are added in sequence. Construct B^+ trees for the case where the number of pointers that will fit in one node is four (4). 8

6. *(A)* Briefly explain the following with the help of example (SQL)

(i) Natural join

(ii) Left outer join

(iii) Right outer join

(iv) View. 8

(B) What are the reasons for having variable length records ? 4

(C) Explain about Static Hashing and Dynamic hashing. 8

7. *(A)* List the ACID properties. Explain the usefulness of each. 6

(B) What are the various steps involved in the generation of query evaluation plans for an expression. Elaborate using suitable example. 8

(C) Explain :

(i) Recoverable schedule

(ii) Cascadeless schedule. 6

8. *(A)* What do you mean by two phase locking protocol ? 3

(B) Define Deadlock. What are the necessary *four* conditions for a deadlock to occur ? Discuss the different methods that can be used for deadlock prevention. 8

(C) Consider the following two transactions given two bank accounts having a balance A and B.

Transaction T_1 = Transfer Rs. 100 from A to B.

Transaction T_2 = Find the multiple of A and B.

Add lock and unlock instructions (shared OR Exclusive) to transaction T_1 and T_2 so that they observed the serializable schedule. Make a valid schedule. 9
