Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Tech–IT(SE)/SEM-1/MSE-102/2009-10

2009

DATABASE MANAGEMENT SYSTEM

Time Allotted : 3 Hours   Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions.   5 × 14 = 70

1. a) Write down the definition of DBMS.   2

   b) What are the main functions of a database manager ?   3

   c) List five major functions of Database Administrator.   3

   d) Explain the terms candidate key. Primary key, Foreign key and Super key.   4

   e) Write the differences between procedural ad non-procedural DML.   2

2. a) Explain Armstrong's axioms (reflexivity, augmentation, transitivity, union and decomposition).   4

   b) For a given Relation $R = \{ A, B, C, D, E, F, H, I, J \}$ and set of functional dependencies $F = \{ ABD \rightarrow E, AB \rightarrow G, B \rightarrow F, C \rightarrow J, \quad CJ \rightarrow I, G \rightarrow H \}$, find the irreducible set and candidate keys.   4

   c) Consider the relation $R (A, B, C, D, E)$ with the set of $F \{ A \rightarrow C, B \rightarrow C, C \rightarrow D, DC \rightarrow C, CE \rightarrow A \}$. Suppose the relation has been decomposed by relations $R_1 (A, D)$, $R_2 (A, B)$, $R_3 (B, E)$, $R_4 (C, D, E)$, $R_5 (A, E)$. Is this decomposition lossy or lossless ? Justify your answer.   6

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3. a) A database schema named TRAIN_INFO (train_no. date, train, train_name. from., to, miles), the functional dependency diagram is given below :

Dia.

Decompose it up to Boyce-Codd Normal Form (BCNF).

7

b) If D be the set of all functional and multivalued dependencies then write down the rules to compute the $D +$ (closure of D). 4

c) Define MVD with suitable example. 3

4. a) What is a trigger ? 1 + 4

Instead of allowing negative a/c balances, a bank deals with overdrafts by setting the a/c balance to zero, and creating a loan in the amount of the overdraft (An overdraft is an event when a customer's withdrawal amount exceeds the current a/c balance of the customer). The bank gives this loan a loan number identical to the a/c number of the overdrawn a/c. Write the trigger in SQL for the above event.

b) Define BCNF. How does it differ from 3NF ? Why is it considered a stronger than 3NF ? 1 + 2 + 2

c) Draw a functional dependency diagram (FD diagram) that is in 3NF but not in BCNF. Decompose that FD diagram into BCNF. 2 + 2

5. a) Draw an E-R diagram for the following :   5

   Assume in a university, there are multiple libraries and each library has multiple student members. Students can become members to multiple libraries by paying appropriate membership fee. Each library has the own set of books. Within the library these books are identified by a unique number. Student can borrow multiple books from subscribed library. Students can order books using inter-library loan. This can be useful if a student wishes to borrow books from a library where he is not a member. The student orders the books through a library where he is a member.

   b) Describe the ACID properties in DBMS. Give examples of multivalued and derived attributes.   2 + 2

   c) What do you mean by serializability ? Consider two transactions T_1 and T_2. Such that,   1 + 4

   T_1 : $R_1(A)$ $W_1(A)$ $R_1(B)$ $W_1(B)$

   T_2 : $R_2(A)$ $W_2(A)$ $R_2(C)$ $W_2(C)$

   Let schedule S :
   $R_1(A)$ $W_1(A)$ $R_2(A)$ $W_2(A)$ $R_1(B)$ $W_1(B)$ $R_2(C)$ $W_2(C)$.

   Find out whether the given schedule S is conflict serializable or not.

6. Consider the following scheme of a relational database :

   PROJECT (Project #, Project_Name, Project_Manager)

   EMPLOYEE (Emp #, EmpName)

   ASSIGNED_To (Project #, Emp #)

   i) Get Emp # of employees working on project "P353"

   ii) Get details of employees (both number and name) working on project "P353"

iii) Obtain details of employees working on the Database project

iv) Gather details of employees working on both "P353" and "P354"

v) Find the employee numbers of employees, who do not work on project "P453"

vi) Get the employee number of employees who work on all project

vii) List the employee numbers of employees other than 107 who work on at least one project that employee 107 works on.

Solve the above quaries using SQL or relational algebra or relational calculus. 7 × 2

7. a) What is the difference between Primary Index, Secondary Index and Clustering Index ? 3

b) Explain how Multilevel indexing can reduce record access time. 2

c) Why we need query optimization ? 2

d) What is metadata ? What do you mean by data dictionary ? Why is this data dictionary required in RDBMS ? 1 + 1 + 1

e) Define the concepts of Generalization, Specialization and Aggregation. 4

8. Write short notes on any *two* of the following : 2 × 7

a) Two phase locking

b) Insertio, Updation and Deletion anomalies

c) Canonical cover

d) Concurrency control.

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