Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/IT/New/SEM-6/IT-601/2013

2013

DATABASE MANAGEMENT SYSTEMS

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.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The relation $R = (A, B, C)$ and set of dependencies $F = \{ A \rightarrow B, B \rightarrow C \}$. R is decomposed into two different ways $R1 = (A, B)$, $R2 = (B, C)$. This is

a) lossless join decomposition

b) dependency preserving

c) both (a) & (b)

d) none of these.

ii) The employee salary should not be greater than Rs. 20,000. This is

a) integrity constraint

b) referential constraint

c) over-defined constraint

d) feasible constraint.

iii) The operation on certain relation *X*, produces *Y* such that *Y* contains only selected attributes of *X*, such operation is

a) Projection b) Selection

c) Union d) Difference.

iv) The command used to delete the records from a table is

a) Truncate b) Drop

c) Select d) All of these.

v) Aggregation is

a) specialization b) generalization

c) abstraction d) all of these.

vi) Prime attributes are part of

a) primary domain b) multivalued domain

c) candidate key d) none of these.

vii) There is a conflict in a schedule if

a) two transactions work on the same data item

b) the operations are from different transactions

c) at least one of the operations is write

d) all of these.

viii) Time stamp is used for

a) Serialization b) Deadlock control

c) Transaction log d) both (b) & (c).

ix) Which is the false statement ?

a) A database is ordered collection of data

b) A database is systematic compilation of records in a computer

c) DBMS manages the database

d) Data helps in making decisions.

x) DML language is used to

a) define schema b) define internal level

c) access data d) all of these.

xi) ..... is the attribute or group of attributes that uniquely identify occurrence of each entity.

a) Foreign key b) Super key

c) Primary key d) All of these.

xii) ..... is the information about data.

a) Data b) Meta-data

c) Entity d) Relations.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Explain the terms "lossless decomposition" and "dependency preservation".

3. a) What are entity integrity and referential integrity constraint ?

   b) Explain the difference among primary key, candidate key and super key. 2 + 3

4. Find the closure of attribute set (AG) + for the following :

   $R = \{ A, B, C, G, H, I \}$

   $F = \{ A \rightarrow B,$

   $A \rightarrow C$

   $CG \rightarrow H$

   $CG \rightarrow I$

   $B \rightarrow H \}$

5. What is a database cursor ? What is the difference between cursor and trigger ?

6. a) List four significant differences between a file management system and a DBMS.

   b) What are the different types of Data Models ? 3 + 2

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Describe the three-level architecture of DBMS. Explain the difference between physical & logical data independence. Describe the basic components of DBMS. 3 + 3 + 5

   b) Answer the following queries in relational algebra using the given database scheme : 2 × 2 = 4

   EMP (Eno, Ename, Eadd, Bdate, Super_no)

   DEPT (Dno, Dname, Mgno)

   PROJECT(Pno, Pname, Dno, Plocation)

   WORKS_NO(Eno, Dno, Hours)

   i) List the employee no, name, address of all employees working in the 'Research' Department.

   ii) For all projects in 'Kolkata' print the project no, location, controlling department number and its manager's name, address and birthday.

8. a) Describe in detail, the various anomalies that can occur in various normal forms up to 4th normal form. 9

b) Create the student database schema : $4 \times 1\frac{1}{2}$

STUDENT (Name, Roll, Class, Department)

COURSE (Cname, Cnumber, Credit,_Hours, Department)

SECTION (Section_id, Cnumber, Semester, Year, Instruction)

GRADE (Roll, Section_id, Grade)

PREREQUISITE (Cnumber, Pnumber)

Specify the following queries in SQL on the database schema :

i) Change the class of student 'Pritam' from '1' to '2'.

ii) Insert a new course <'Bio-tech', 'CS4390', '3', 'CS'>

iii) Retrieve the names of all students in the department 'CS'.

iv) Delete the record for the student whose name is 'Chandan' and whose student roll no. is 17.

9. a) Define the concept of aggregation with example.

b) What is weak entity set ? When is it required ?

c) Define outer join with suitable example (in basic relational format).

d) Write the features of network model. Compare network model and relational model. 3 + (1 + 1) + 5 + 5

10. a) Why is higher normal form not always desirable ?

    b) Give an example with explanation where the database is in 1NF but not in 2NF.

    c) Why is BCNF stricter than 3NF ?

    d) How are spurious tuples generated ? Explain with example.

    e) Write an algorithm to find the $\alpha+$ for a given set of attributes of a relation *r*. 2 + 3 + 2 + 3 + 5

11. Suppose you are given a relation *R* with four attributes *A, B, C, D*. For each of the following sets of FDs, assuming those are the only dependencies that hold for *R*, do the following :

    a) Identify the candidate key(s) for *R*.

    b) Identify the best normal form that *R* satisfies (1NF, 2NF, 3NF or BCNF).

    c) If *R* is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

        i) $C \rightarrow D,\ C \rightarrow A,\ B \rightarrow C$

        ii) $B \rightarrow C,\ D \rightarrow A$

        iii) $ABC \rightarrow D,\ D \rightarrow A$

        iv) $A \rightarrow B,\ BC \rightarrow D,\ A \rightarrow C$

        v) $AB \rightarrow C,\ AB \rightarrow D,\ C \rightarrow A,\ D \rightarrow B$. 3 + 8 + 4

12. Write short notes on any *three* of the following : 3 × 5

a) Serializable

b) Two-phase protocol

c) Natural join

d) Transition state

e) Time stamp protocol.