**53 (CS 401) DBMS**

**2018**

# DATABASE MANAGEMENT SYSTEM

Paper : CS 401

*Full Marks : 100*

Time : Three hours

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

*Answer **any five** questions.*

1. (A) Design a database for an airline. The database must keep track of customers and their reservations, flights and their status, seat assignments on individual flights and the schedule and routing of future flights.

Your design should include an E-R diagram and list of constraints, including primary key and mapping cardinality constraints. 12

(B) Define the following kinds of constraints, and give example of each : Key constraints, Participation constraints. What is weak entity, explain it ? 8

2. Consider the following database.

Employee (emp_name, street, city)

Works (emp_name, comp_name, salary)

Company (comp_name, city)

Primary keys are underlined. Give an expression in relational algebra and tuple relational calculus to express each of the following queries :

*(i)* Find the names of all employees who live in city "Kolkata".

*(ii)* Find the names of all employees whose salary is greater than Rs. 50,000 but less than 60,000.

*(iii)* Find the names of all employees who live in Kolkata and whose salary is less than Rs. 100,000. 20

3. (A) Discuss how each of the following constructs is used in SQL, and discuss the various options for each construct.

*(i)* Nested queries

*(ii)* Inner join and outer join

*(iii)* Aggregate functions and grouping. 10



(B) Differentiate between Data Manipulation Language (DML) and Data Definition Language (DDL). 5

(C) Discuss UNION, INTERSECTION AND SET DIFFERENCE operation used in SQL with examples. 5

4. (A) What are ACID properties? Illustrate them through examples. 10

(B) Define functional dependencies. How are primary keys related to functional dependencies? 5

(C) If two schedules are conflict equivalence, are they also view equivalent? Justify your answer. 5

5. (A) What are locking protocol? Describe strict and rigorous two-phase locking protocol. What are recoverable and cascadeless schedules? 10

(B) Describe and compare deadlock detection and deadlock prevention schemes. 10

6. (A) Define multiple granularity. What are implicit and explicit locking? 5

(B) Define 1NF, 2NF, 3NF and BCNF. When is a decomposition said to be dependency preservation? Why is this property useful? 10

(C) Consider the following relation schema and set of functional dependencies : 5

$R\ (A, B, C, D, E, F, G)$

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

Find candidate keys for $R$.

7. (A) Explain query processing steps in details. What is query optimization? 10

(B) What are the responsibilities of a DBA? Explain it in details. 10