Code: CT13   **Subject: DATABASE MANAGEMENT SYSTEMS**

ALCCS - NEW SCHEME

Time: 3 Hours   **AUGUST 2013**   **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:
- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1   a. What do you mean by physical and logical data independence?

  b. How redundancy is controlled in DBMS?

  c. List four significant differences between a file-processing system and a DBMS.

  d. What are different categories of data models?

  e. Differentiate between DDL and DML.

  f. What are constraints on generalization and specialization?

  g. Define the concept of primary and foreign key constraints. Why are primary and foreign keys used?   **(7 × 4)**

Q.2   a. Define a transaction and its desirable ACID properties. Explain the problem of dirty read by giving an example.   **(6)**

  b. Define the terms data redundancy, data integrity, data independence and data constraints.   **(8)**

  c. Differentiate between a strong entity set and a weak entity set.   **(4)**

Q.3   Consider the employee database, where the primary keys are underlined. Give an expression in SQL for each of the following queries:

  employee (<u>employee-name</u>, street, city)
  works (<u>employee-name</u>, company-name, salary)
  company (<u>company-name</u>, city)
  manages (<u>employee-name</u>, manager-name)

  (i) Find the names of all employees who work for First Bank Corporation.
  (ii) Find the names and cities of residence of all employees who work for First Bank Corporation.

(iii) Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than $10,000.
(iv) Find all employees in the database who live in the same cities as the companies for which they work.
(v) Find all employees in the database who live in the same cities and on the same streets as do their managers.
(vi) Find all employees in the database who do not work for First Bank Corporation.
(vii) Find all employees in the database who earn more than each employee of Small Bank Corporation.
(viii)Assume that the companies may be located in several cities. Find all companies located in every city in which Small Bank Corporation is located.
(ix) Find all employees who each more than the average salary of all employees of their company.   **(18)**

Q.4   a. Consider a relational database about hotels, customers (guests) and their bookings that is maintained by an online hotel booking company. The database consists of the following tables (where the primary keys are underlined):

Hotel (hId, hName, hAddress, hCity)
Guest(gId, gName, gAddress, gCity)
Room(hid, roomNo, type, price)
Booking(gId, hId, roomNo, fromDate, year, noOfDays)

Where, hId and gId are identifiers for the hotels and the guests, and the Booking relation indicates that a guest booked a hotel room for a specified number of days (noOfDays) starting from Date of a given year. For instance, a tuple < g12345, h5555, 220, Jan05, 2005, 8> in Booking indicates that guest g12345 booked room 220 of the h5555 hotel for 8 days starting on Jan 5, 2005.

(i)   Write a relational algebra expression that returns the ids of the hotels located in Vancouver which were not booked at all in the year 2005.
(ii)   Write a relational algebra expression that returns the ids of the guests who have booked at least one room of type ”suite” in every hotel located in Vancouver.
(iii) Write a Tuple Relational Calculus (TRC) query that finds the ids and names of the hotels for which every one of our guests had made a booking during the year 2004.   **(10)**

   b. Distinguish between RDBMS and DBMS.   **(8)**

Q.5   a. Consider the following schema:

Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)

sid is the key for Suppliers, pid is the key for Parts, and sid and pid together form the key for Catalog.
Write an expression in SQL for each of the following queries:

(i)   Find the sids of suppliers who supply some red or green part.
(ii) Find the sids of suppliers who supply every red part.
(iii) Find the sids of suppliers who supply only red part.
(iv) Find the sids of suppliers who supply some red part and some green part.   **(8)**

b. Explain the two tier architecture of DBMS.   **(4)**

c. What are the responsibilities of a Database Administrator (DBA)?   **(6)**

Q.6   a. Consider the following relation for published books:

BOOK(Book_title, Author_name, Book_type, List_price, Author_affil, Publisher)

Author_affil refers to the affiliation of author. Suppose the following dependencies exist:

Book_title $\rightarrow$ Publisher, Book_type
Book_type $\rightarrow$ List_price
Author_name $\rightarrow$ Author_affil

(i)   What normal form is the relation in? Explain your answer.
(ii) Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.   **(9)**

b. What is the primary goal of normalization? How are the concepts of functional dependency and multi valued dependency associated with normalization? Give an example for the same.   **(9)**

Q.7   a. What are the key properties of long duration transactions? How does the concurrency protocol affect long duration transactions?   **(9)**

b. How checkpoints are used in database recovery?   **(9)**