ROLL NO. _____

Code: CS33 **Subject: DATABASE MANAGEMENT SYSTEMS**

ALCCS – OLD SCHEME

Time: 3 Hours **FEBRUARY 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. Explain how the following differ: fragmentation transparency, replication transparency and location transparency.

b. Explain the difference between a system crash and a "disaster".

c. Explain the purpose of the checkpoint mechanism How often should checkpoints be performed?

d. Explain the difference between the three storage types—volatile, nonvolatile and stable—in terms of I/O cost.

e. What are the five main functions of a Database Administrator?

f. List five responsibilities of a database management system. For each responsibility, explain the problems that would arise if the responsibility were not discharged.

g. List four significant differences between a file-processing system and a DBMS.**(7×4)**

Q.2 a. A University database contains information about Professors (identified by a social security number) and courses (identified by a course ID). Each of the following situations concerns the relationship set between the teacher and the student. Draw an ER diagram that describes it (assuming that no further constraints hold).

(a) A Professor can teach the same course in several semesters, and each offering must be recorded.
(b) Each Professor teaches exactly one course.
(c) Each Professor teaches at least one course, and some Professors may teach multiple courses.
(d) Each Professor teaches at least one course and some Professors must teach all courses. **(9)**

b. A bank has many branches and a large number of customers. A customer can open different kinds of accounts with the bank. The bank keeps track of the customer with his SSN, name, address and phone number. Age is a factor to check whether

he is a major. There are different types of loans, each identified by a loan number. Customer can take more than one type of loan, and all branches can give loans. Loans have a duration and interest rate. The account holder can enquire about the balance in his account. Draw an ER Diagram for the bank. Mention suitable assumptions made and use them in showing maximum and minimum cardinality ratios**.** **(9)**

Q.3 a. Consider the following relations for a database that keeps track of business trips of salespersons in a sales office
SALESPERSON (SSN, Name, Start_Year, Dept_No)
TRIP (SSN, From_City, To_City, Departure_Date, Return_Date, Trip_ID)
EXPENSE (Trip_ID, Account#, Amount)
Specify the foreign keys for this schema, stating any assumptions you make. **(9)**

b. Database design often involves decisions about the storage of attributes. For example a Social Security Number can be stored as a single attribute or split into three attributes (one for each of the three hyphen-delineated groups of numbers in a Social Security Number—XXX-XX-XXXX). However, Social Security Number is usually stored as single attribute. The decision is usually based on how the database will be used. This exercise asks you to think about specific situations where dividing the SSN is useful **(9)**

Q.4 a. For the following relations
Members (mid, name, design, age)
Books (Bid, Btitle, BAuthor, Bpublisher, Bprice)
Reserves (mid, Bid, date)
Where Bid is book identification, Btitle is Book title, Bpublisher is bookpublisher, Bprice is Book price, mid is Members identification, and Desig is designation.
Now write donw the queries in relational algebra to
(a) List the title of books reserved by Professors older than 45 years
(b) Find ids of members who have not reserved books costing more than Rs. 500.
(c) Find the author and title of books reserved on 27-May-2007.
(d) Find the names of members who have reserved all books **(14)**

b. In a tuple relational calculus query with n tuple variables, what would be the typical minimum number of join conditions? Why? What is the effect of having a smaller number of join conditions**?** **(4)**

Q.5 a. Recent changes in privacy laws have disallowed organizations from using SSN to identify individuals unless certain restrictions are satisfied. As a result, most US universities cannot use SSN as primary key (except for financial data). In practice, StudentID, a unique ID, a unique identifier, assigned to every student, is likely to be used as the primary key rather than SSN since StudentID is usable across all aspects of the system.
(i) Some database designers are reluctant to use generated keys (also known as surrogate keys) as primary keys (such as StudentID) because they are artificial.

Can you propose any natural choices of keys that can be used to store the student record in a UNIVERSITY database?

(ii) Suppose that you were able to guarantee uniqueness of a natural key that included last name. Are you guaranteed that the last name will not change during the lifetime of the database? If the last name can change, what solutions can you propose for creating a primary key that still includes last name but remains unique? **(9)**

b. Describe situations where each of the different isolation levels would be useful for transaction processing. **(9)**

Q.6 a. Given a relation R = {A, B, C, D, E, H} and having the following Functional Dependencies
F = {{A → BC}, {C, D → E}, {E → C}, {D → A, E, H}, {A, B, H → B, D}, {D, H → B, C}}.
Find the key for relation R with Functional Dependency F**.** **(6)**

b. Explain the distinction between total and partial constraints. **(6)**

c. Discuss the relative advantages of centralized and distributed databases. **(6)**

Q.7 Write Short notes on any **THREE** of the following:-

(i) Physical and Logical data independence
(ii) Concept of Aggregation.
(iii) RAID level 1 (mirroring)
(iv) States of a transaction. **(3×6)**