(b) Give a simple SQL "CREATE TABLE" statement with referential integrity.

(c) What is the difference between 1st Normal Form and 2nd normal form ?

(d) What is a data dictionary (also called a system catalogue) ? Describe some of the information that it can contain. How is this information organized in a relational database ? Give an example.

2.5×4

Third Semester Examination – 2006

RELATIONAL DATA BASE MANAGEMENT SYSTEM

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five questions from the remaining.

The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2×10

   (a) What reasons does Codd give for adopting the relational model ?

   (b) What is a trigger ?

P.T.O.

(c) Assume that R (A,B) and S (B,C) are relations. Convert the following relational algebra expression to a corresponding SQL statement : $\pi AB\,(\sigma_{C=3}(R\,|X|\,S)\,(|X|$ is the natural join).

(d) Describe an example of referential integrity.

(e) Do database systems provide physical program–data independence ? Explain why ?

(f) What is normalization of relation ? What is a key attribute in a relation ?

(g) What is the difference between a DBMS's physical structure and its logical structure ?

(h) What is the difference between a schema and a sub schema ?

(i) Assume you have 2000 records to store. You are going to store them using a hash organization where we will hash on the key. Each record is 500 bytes long and each block is 1024 bytes. Find the max size of blocks that would have to be accessed to retrieve one record (given the key) in this file, assume there will only be one collision of all 2000 records for this question.

(j) Consider the following Relational Schema

COURSE(cno.,cname)

STUDENT(rollno, sname, age year)

REGISTERED_FOR(cno, rollno)

Write an SQL query to print the age and year of the youngest student in each year ?

2. (a) Let R = (A, B, C) and let r_1 and r_2 both be relation on scheme R. Give an

expression in SQL and QBE, that is equivalent to each of the queries below :   5

- $r_1 \cup r_2$
- $r_1 \cap r_2$
- $r_1 - r_2$
- $\pi_A(r_1)$

(b) Explain how **B⁺-trees** overcome the disadvantage of sequential files ?   5

3. (a) What is highest normal form of each of the following relations ?   5

- $R_1(A, B, C)$ with $A \rightarrow B$, $A \rightarrow C$ and $C \rightarrow B$
- $R_2(A, B, C, D)$ with $A \rightarrow BC$, and $CD \rightarrow B$

(b) State the major difference, advantages and disadvantages of the three record based data models: Network, Hierarchical and Relational.   5

4. (a) Consider a university database for the scheduling of classrooms for final exams. This database could be modeled as the single entity set *EXAM*, with attributes *course*, *section*, *room*, and *time*. Alternatively, one or more additional entity sets could be defined, along with relationship sets to replace some of the attributes of the *EXAM* entity set as follows :

- *COURSE* with *name, department, c-number.*
- *SECTION* with *s-number, enrollment,* as a dependent weak entity set on *COURSE.*
- *ROOM* with *building, r-number,* and *capacity.*

For these two design alternatives : **Show ER diagram** illustrating the use of all three additional entity sets.   5

(b) State Armstrong's axioms. Show that Armstrong's axioms are complete ? 5

5. (a) What do you mean by join dependency ? Find the dependency basis of $X = AD$ with respect to the dependencies $M = (A \to BC, C \to \to DE, AE \to \to BF, BD \to \to CF)$. 5

(b) What are the major components of the relational model ? What is simple relational database ? What are two models in which you can use SQL? 5

6. (a) What is strict 2-phase locking ? What are the characteristics of schedules using strict 2-phase locking ? 5

(b) Define (i) Primary key, (ii) Foreign key, and (iii) secondary key, Suppose relation R (A, B, C, D, E) has functional dependencies :

$AB \to C$

$D \to A$

$AE \to B$

$CD \to E$

$BE \to D$

Find all the candidate keys of R. 5

7. (a) What do you mean by multi-valued dependency ? Discuss the inference rules for multi-valued dependencies. 5

(b) SQL allows attributes to have a special value NULL. However, it is desirable not to have NULL values in a relation. Why ? Give two examples of the interpretation of the null values. 5

8. (a) What is the difference between the SELECT operator (π) in relational algebra and the SELECT keyword in SQL ?