SPRING END SEMESTER EXAMINATION-2015

4th Semester B.Tech & B.Tech Dual Degree

DATABASE MANAGEMENT SYSTEM (CS-2004)

(Regular-2013 Admitted Batch)

Full Marks: 60 **Time: 3 Hours**

Answer any SIX questions including Question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer all the following questions. [2 × 10

(a) Define relation Schema, instance, arity and cardinality of a relation with example.

(b) Is the query "select ename, dno from EMP group by dno;" for a relation schema EMP (eno, ename, dno) execute successfully. Justify your answer.

(c) Show that the FD X -> YZ can be inferred from the FD Set {X -> Y, Y -> Z}.

(d) Define referential integrity and self referential integrity constraints with suitable example. How this constraint can be imposed on relations?

(e) How outer-join is different from natural join? Give example to support your example.

(f) Find the candidate keys of the relation R (A, B, C, D, E) having the functional dependencies

F = {AB -> E, C -> B, D -> A, B -> C, A -> D}.

(g) Define a transaction in database systems. What do you mean by concurrency in transactions?

(h) What do you mean by Primary Index? Explain with an example.

(i) When a transaction is said to be conflict serializable? Provide an appropriate example.

(j) Find an equivalent relation algebra expression for the expression $\exists (P(X))$ using universal quantifier. Justify your answer.

2. (a) Consider the following specification for faculty information system. The objective of this system is to record information about faculty members. The faculty is identified by its faculty id, faculty name, address and salary. Each faculty works for a department of college. The department is identified by department number, department name and department location. Each department is headed by one of the faculty member. Each department is responsible for offering courses taught by faculty members of department. The course is identified by course number, course name and course credit. The number of hours the faculty has taken the course is also recorded. Each faculty has dependents where each dependent is identified by dependent id, dependent name, birth date. [4+2

(i) Draw an ER Diagram for the above specification. The participation constraints should be mentioned clearly in your ER Diagram. State clearly any additional assumptions you make.

(ii) Map then ER diagram to relations and specify the primary key and foreign keys.

(b) Define Generalization. What are the different constraints on Generalization? Explain with suitable example. [2

3. Consider the following relation schemas: [2 × 4

For given relations Employee(empno, name, office, age)
Books(isbn, title, author, publisher)
Borrow(empno, isbn, date)

Write following queries in Relational algebra

(a) Find the names of employees who have borrowed a book published by TMH.

(b) Find the names of employees who have borrowed all books published by TMH.

Write following queries in tuple relational calculus.

(c) Find names of employees who have not borrowed any book.

(d) Find names of employees who have borrowed book published by both TMH and PEARSON publishers.

4. (a) Define functional dependency. List all FD's satisfied by the following relation. [3

A	B	C
a1	b1	c1
a1	b1	c2
a1	b2	c2
a1	b2	c1

(b) Consider a schema R (A, B, C, D) and functional dependencies {A -> B, C -> D}. The relation R is decomposed into R1 (A, B) and R2 (C, D). Then answer the following questions with proper justification. [5

i. Check whether the above decomposition is dependency preserving decomposition.

ii. Check whether the above decomposition is lossless join decomposition.

5. (a) Consider the universal relation R (A,B,C,D,E,F,G,H,I,K) and the set of functional dependencies F = {AB -> C, A -> DE, B -> F, F -> GH, D -> IK}. [4

i. What is the key for R?

ii. Decompose R into 2NF and then to 3NF relations.

(b) When two given FD Sets are said to be equivalent? Given relation R (A, B, C, D) having functional dependencies F = {A -> BC, B -> CA, C -> A, C -> D}. Find a minimal cover of F satisfying relation R. [4

6. (a) What do you mean by ACID property? How Two-Phase locking protocol guarantee serializability in a transaction? Provide suitable example to justify your answer. [4

(b) Consider the following schedule S1 and S2. [4

S1: r1(X); r2(Z); r1(Z); r3(X); r3(Y); w1(X); w3(Y); r2(Y); w2(Z); w2(Y);

S2: r1(X); r2(Z); r3(X); r1(Z); r2(Y); r3(Y); w1(X); w2(Z); w3(Y); w2(Y);

i. Which of the above schedule is serializable? Justify your answer.

ii. If any schedule is serializable, then find out its equivalent serial schedule.

7. (a) What is a data model? Discuss briefly the different types of data model. [4

(b) The transactions can suffer from following problems when they run concurrently. [4

Explain each of the following problems with suitable examples.

i. Lost Update Problem

ii. Dirty Read Problem

8. Write short notes on (any two). [4 × 2

(a) B-Tree

(b) Three level architecture of DBMS

(c) Different category of Data Integrity Constraints

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