53 (CS 401) DBMS

2016

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)* Explain the steps involved in the query processing. 10

   (b) Explain the functions of a Database administrator. 5

   (c) Differentiate between Two-tier and three tier architectures of database. 5

2. *(a)* Given Relational schema $R(A,B,C,D)$ and set of functional dependencies

$$F_c = \{ D \rightarrow A, \quad C \rightarrow CD, \quad BA \rightarrow C \}$$

where F_c is minimal cover. 10

(i) Decompose R into a set of relational schemas in Third Normal form.

(ii) Is your decomposition in part *(i)* also in Boyce code normal form ? Explain your answer.

(b) Let $R = (A,B,C,D,E)$ and Functional dependencies

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

List the candidate keys for R. 5

(c) Explain about $2NF$ and $4NF$. 5

3. *(a)* During its execution, a transaction passes through several steps, until it finally commits or aborts. List all possible sequences of steps through which a transaction may pass. 5

(b) What is a recoverable schedule ? Why is recoverability of schedules desireable ? 5

(c) Explain the term serial schedule and serializable schedule (conflict and view) with example. 10

4. (a) Explain two phase Locking protocol with help of example. 5

(b) In multiple-Granularity, what is the difference between implicit and explicit Locking ? 5

(c) Explain about aggregate functions of Structured Query Language (SQL). 5

(d) Define query optimization and explain its significance for DBMS. 5

5. (a) Compare wait-die deadlock prevention with wait-wound scheme. 5

(b) Define super keys, candidate keys and primary keys with example. 5

(c) Explain the distinction between disjoint and overlapping constraints. 5

(d) Explain the distinction between total and partial participation constraints. 5

6. (a) Consider the following relationals :

Student (s_no, s_name, major, Level, age)

Class (cname, time, room_no, Fid)

Enrolled (s_no, cname)

Faculty (Fid, fname, dept_id)

The meaning of these relation is straightforward : For example enrolled has one record per student-class pair such that the student is enrolled in the class. Write the following queries in SQL.

(i) Find the names of all juniors (Level=JR) who are enrolled in a class taught by John.

(ii) Find the names of all classes that either meet in the room number R120 or have five or more students enrolled.

(iii) Print the level and the average age of students for that level, for each level.

(iv) Find the names of all students who are enrolled in two classes that meet at the same time.

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(b) A company database needs to store information about employees (identified by ssn, with salary, and phone number as attributes), Departments (identified by dno, with dname and budget as attributes), and children of employees (with name and age as attributes). Employees work in departments each department is managed by an employee ; a child must be identified uniquely by name when the parent (who is an employee ; assume that only one parent works to the company) is known. We are not interested in information about a child once the parent leaves the company.

Draw an Entity-Relationship diagram that capture this information.

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7. *(a)* Let the following relation schemes be given

$$R = (A, B, C)$$

$$S = (D, E, F)$$

Let relations $r(R)$ and $s(S)$ be given. Give an expression in the tuple relational calculus that is equivalent to each of the following :

(i) $\pi_{A,B}(r)$

(ii) $6_B = 20 \wedge c = 9(r)$

(iii) $\pi_{A,F}(6c = D(r \times s))$

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(b) Consider the Library database. Write the following queries in Relational Algebra.

Member (memb_no, name, age)

Book (isbn, title, authors, publishers)

Borrowed (memb_no, isbn, date)

(i) Print the names of members who have borrowed any book published by 'McGraw-Hill'.

(ii) For each publisher, print the names of members who have borrowed more than five books of that publisher.

(iii) Print the details of books that have borrowed on date 'March 20, 2017'.

4+4+3=11
