53 (CS 401) DBMS

2018

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)* Define query processing and query optimization. What do you mean by query evaluation plan ? 5

   (b) List *four* significant differences between a file processing system and a DBMS. 4

   (c) What are the functions of a database administrator ? 8

   (d) What is a foreign key constraint ? Why are such constraints important ? What is referential integrity ? 3

2. Design a Database for an airline. The database must keep track of customers and their reservations, flights and their status, seat assignments on individual flights, and the schedule and routing of future flights. Your design should include an E-R diagram, a set of relational schemas, and a list of constraints including primary key and foreign key constraints. 20

3. *(a)* What are some variations of two-phase locking protocol ? Why is strict or rigorous two-phase locking often preferred ? 5

(b) Discuss the problems of deadlock and starvation, and the different approaches to dealing with these problems. 10

(c) Discuss how each of the following construct is used in SQL. 5

(i) Inner join and outer join.

(ii) Aggregate function and grouping.

4. *(a)* Define functional dependencies. How are primary keys related to FDs ? 3

(b) Consider the relational schema R(A,B,C) which has FD $B \rightarrow C$, if A is a candidate key for R. Is it possible for R to be in BCNF ? If so, under what conditions ? If not, explain why not. 5

(c) Consider the relational schema R(ABCDEGH) and the FD set $F = \{AB \rightarrow C,\ AC \rightarrow B,\ AD \rightarrow E,\ B \rightarrow D,\ BC \rightarrow A,\ E \rightarrow G\}$

(i) Compute all candidate keys.

(ii) Is R in BCNF, if not decompose it into collection of BCNF relations ?

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5. Consider the following schema :

Suppliers (Sid : integer, Sname : string, address : string)

Parts (Pid : integer, Pname : string, color : string)

Catalog (Sid : integer, Pid : integer, cost)

The key field are underlined and the domain of each field is listed after the field name. The catalog relation lists the prices charged for parts by suppliers. Write the following queries in

(i) Relational algebra and

(ii) Tuple relational calculus.

(a) Find the Sid of suppliers who supply some red or green part. 3+3=6

(b) Find the Sid of suppliers who supply some red part or staying at '221 Avenue Park'. 3+3=6

(c) Find the Sid of suppliers, who supply every part. 4+4=8

6. (a) What are the ACID properties of a Transaction ? Explain it. 5

(b) Define the following terms : 6

Total participation, Partial participation, Specialization, Generalization, relation degree and relation instance.

(c) Explain the query processing steps in details. 5

(d) When are two schedules conflict equivalent ? What is a conflict serializable schedule ? Explain with example. 4

7. Consider the following relational schema where primary keys are underlined. 20

Branch (branch_name, branch_city, assets)

Customer (customer_name, customer_street, customer_city)

Load (loan_number, branch_name, amount)

Borrower (customer_name, Loan_number)

Account (account_number, branch_name, balance)

Depositor (customer_name, account_number)

Write the following queries in SQL.

(a) Find the all customers who have a loan, an account or both.

(b) Find the all customers who have an account at all branches located in New Delhi city.

(c) Find all the branches whose average balance is greater than Rs.75000.

(d) Find all the customer's name and address whose name ended with a character 'R'.

(e) Find the names of all branches that have greater assets than some branches in New Delhi.
