Question Paper

Exam Date & Time: 08-Jul-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH (COMPUTER AND COMMUNICATION ENGINEERING) END SEMESTER MAKE UP EXAMINATIONS, JULY 2023

DATABASE SYSTEMS [ICT 2271]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Consider the following Employee table: Employee(Emp-id, Emp_name, Salary, Emp_dept, Manager_Id) (5)

A) Write the SQL queries to perform the following:

i) Find the 3rd highest salary in each department.

ii) Find all the Employees who are also managers.

B) Compare and contrast SQL with NoSQL. (3)

C) Given a relation R = {A, B, C, D, E, H} and having the following FDs (2)

F = {{A → BC}, {CD → E}, {E → C}, {D → AEH}, {ABH → BD}, {DH → BC}}.

Find the key for relation R and also find the minimal cover.

2) The schedule given in Figure Q. No. 2A suffers from deadlock. Demonstrate the use of strict 2P locking and rigorous locking protocol to remove deadlock. (5)

A)

S_2	
T_1	T_2
lock-X(A)	
read(A)	
write(A)	
	lock-X(B)
	read(B)
lock-S(B)	lock-X(A)
read(B)	read(A)
unlock(B)	write(A)
unlock(A)	
	unlock(A)
	unlock(B)

Figure Q. No.2A

B) Given a relation DB(Patno, PatName, appNo, time, doctor) with functional dependencies F = { Patno-->PatName; {Patno, appNo--> Time, doctor}; Time --> appNo}. Find the candidate keys and normalize the relation up to the highest possible normal form. (3)

C) Two transactions concurrently attempt to update the same data item. How does a Timestamp based concurrency control protocol ensure data consistency in this scenario? (2)

3) A) Write an algorithm for testing Non-additive join property of decomposition. Check the following decomposition is lossless or lossy decom; R2 (A1, A3, A4); R3 (A4, A5) with FD1: A1--> A3, A5; FD2: A5--> A1, A4; FD3: A3, A4--> A2. Show each the step. (5)

B) Write a suitable PL/SQL block that does the following operation after a new row is inserted into the employees table. It retrieves the new employee's manager ID and department name, and sends them a welcome email using a custom "send_email" function. The function prototype is send_email(manager's mail id, employee's mail id, employee's name, welcome message:string). It should then updates the department's total salary budget by summing up the salaries of all employees in the department and updating the total_salary_budget field in the departments table. Note: Do not write send_email function. (3)

Employee (Emp_id, Emp_name, salary, Emp_dept_id, email_id)

Department(Dept_id, total_salary_budget, Manager_id).

C) Suppose the Figure Q.No. 3C represents the precedence graph for a schedule S. List all the possible conflict serializable schedules for S? (2)

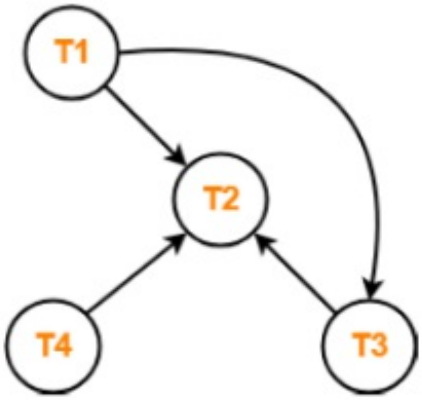

Figure Q. No. 3C

4) A) Consider a system which stores the information about the books. Each book maintained under this system has an ISBN, title, price and year information. The book is published by particular publisher. The system stores URL, phone, address and name of the publisher. System also stores information about the author such as name, address and url. Author can write any number of books. System maintains customer information along with book information they have purchased. Customer information like email-id, name, address and phone are stored. System has few warehouses to stock books. Warehouse has information like code, address, and phone. Each warehouse can store few copies of the book. Draw an ER-Diagram describing the above scenario. Further reduce the ER diagram into a database schema. (5)

B) Consider the schedule S: r1(A),r2(A),w1(A),w2(A),r2(B),w2(B) (3)

Discuss the issues seen in this schedule.

C) Suppose we have a large e-commerce database with tables for customers, orders, products, and sales. We want to create a materialized view that summarizes the total sales revenue for each product category, updated daily. Describe the steps involved to create and maintain this materialized view. (2)

5)		Consider the schedule S : W1(A), W2(B), R3(A), R4(B), W5(A), R2(A), W3(B), R1(B), W4(A), R5(B).	(5)
	A)	Prove or disprove that S is either conflict serializable or view serializable or both?	
	B)	Write a SQL query to find all the employee whose salary is more than the average salary of all employees from his/her department. Employee (Emp_id, Emp_name, salary, Emp_dept_id, email_id).	(3)
	C)	Consider a university database and assume that of the many entities "Professors" and "Courses" are the two entities in the ER diagram. Professors have attributes like Name, Contact Information, and Area of Expertise, while Courses have attributes like Course Code, Course Title, and Credit Hours. Identify the type of generalization relation between the two. Justify your answer.	(2)

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