Question Paper

Exam Date & Time: 24-Jun-2024 (02:30 PM - 05:30 PM)



DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY MAKE UP EXAMINATION, JUNE 2024

DATABASE MANAGEMENT SYSTEMS [ICT 2225]

Marks: 50

Des

Section Duration: 180 mins

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Answer all the questions.

1A) Check whether the following schedule is a conflict serializable or view serializable. If it is serializable mention the serial (5) order of the same. Show all the steps properly.

R1(X) R2(Y) R3(Y) W3(Z) W2(Y) W1(X) R1(Y) W3(X) R2(X) W2(X)

1B) Consider the following example of a log of three transactions, where deferred database modification scheme is used. If (3) a crash occurs just after step 9, what are the steps taken to recover from this crash?

#steps	Details of log
1.	$\langle \texttt{T0,start} \rangle$
2.	$\langle \texttt{T0,X,300,800} \rangle$
3.	$\langle \texttt{T1,start} angle$
4.	$\langle \texttt{T1,Y,500,600} \rangle$
5.	$\langle T1, Z, 800, 200 \rangle$
6.	$\langle \texttt{T0,Commit} \rangle$
7.	$\langle \texttt{T2,start} \rangle$
8.	$\langle \texttt{T2,P,500,700} \rangle$
9.	$\langle \texttt{T2,Commit} \rangle$

1C)

Illustrate how DBMS effectively organizes and manages data, drawing parallels to a structured library system. (2)

2A) Consider the following database schema for managing e-learning platform data:
 Users (<u>user_id: varchar(20)</u>, username: varchar(50), email: varchar(100), role: varchar(20))
 Courses (<u>course_id: int,</u> course_name: varchar(100), instructor_id: varchar(20), category: varchar(50))
 Enrollments (<u>user_id: varchar(20), course_id: int</u>, enrollment_date: date)

Modules (<u>module_id: int, course_id: int</u>, module_name: varchar(100), content: text) Assessments (<u>assessment_id: int, module_id: int</u>, assessment_name: varchar(100), deadline: date)

Solve the following by writing **nested subquery concepts**:

1.

(5)

- i. List the instructors who have created courses with the highest average number of enrolled users per course.
- ii. Find the users who have enrolled in all courses within a specific category.
- iii. Find the users who have enrolled in courses from more than one instructor.
- iv. Produce a list of courses that have not been enrolled in by any user.
- v. List the instructors who have created courses in all categories.
- 2B) Consider a school database schema:
 - Student (StudentID, Name, Age, Grade)
 - Course (CourseID, Name, Instructor)
 - Enrolment (EnrolmentID, StudentID, CourseID, EnrollmentDate)
 - Instructor (InstructorID, Name, Department)

Department (DepartmentID, Name, Location)

- i. Create a view containing the course names starting with "M" and the names of students enrolled in those courses.
- ii. Develop a separate query on the created view to obtain the total number of students enrolled in each course.
- 2C) Consider you have two groups of people: one group consists of all the students studying in the Department of ECE, and (2) the other group consists of students who took courses during the even semester of 2023. Develop a SQL query demonstrating the applicability of Exists keyword, to combine these two groups to see if there are any students who are in both groups and display the name of the students in the output.
- 3A) What do you mean by Minimal cover set? Give the algorithm to find Minimal cover F for a Functional dependency set (5)
 E. Consider the relation R (A, B, C, V, Z) and the functional dependencies F = {A -> BC; AC-> Z; Z-> BV; AB-> Z}. Find the minimal cover of F.
- 3B) Illustrate the difference between set comparison and set membership. (3)
 3C) Consider the schema constructs given here (2)
 CUSTOMER (custid, cname, city)
 ORDERS (orderno, odate, custid, ordamt)
 Using Nested Query concept, write a SQL query that displays the total number of orders that each customer has ordered..
- 4A) Consider a banking application scenario:

Banks offer multiple types of accounts, including savings, checking, and loans.

Customers can open multiple accounts at the same bank.

Each account has a unique account number.

Customers perform transactions on their accounts, such as deposits, withdrawals, and transfers.

Banks have multiple branches, each with its own unique branch code.

Each account is associated with a specific branch.

Employees are assigned to work at specific branches and may serve multiple customers.

- i. List the entities along with their associated attributes with clearly indication of primary keys and describe their relationships, including cardinalities.
- ii. Create an ER diagram that visualizes these entities and their relationships.
- 4B) What are the issues seen in the following ER diagram. Suggest a solution for the same using extended ER notations.

(3)

(5)

(3)



4C)	Suppose that the relation R (A, B, C, D, E) is decomposed into R1(A, B, C) and R2(A, D, E). Verify if this decomposition is lossless or lossy decomposition if the following set of functional dependencies hold, $F(A-BC; CD-E; B-D; E-A)$.	(2)
5A)	Given a relation R(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 upto the highest possible normal form.	(5)
5B)	Illustrate with an example how the Dirty Read problem is handled in Two phase Lock based protocol, Time stamp- based protocol and Validation based protocol.	(3)
5C)	Examine whether Cascading roll backs happens in the below given schedule S generated using Two phase locking protocol? justify your answer.	(2)
	S: X1(A) W1(A) X2(C) W2(C) S1(B) R1(B) UN1(A) UN1(B) X2(A) UN2(A)	

(Note: UN is Unlock operation).

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