

# **Subject: Introduction to Databases**

**Subject code: CSE 3151**

## **Theory Assignment 2**

**Last date: 15-05-2025**

This assignment is designed to give you practice with the concepts of

- Designing relational database schema using decomposition and normalization techniques
- Expressing queries using formal relational query languages
- Transaction management

1. Consider the following relational schemas

- a. **Employee** (ename, ecity, state)
- b. **Works** (ename, company name, salary)
- c. **Company** (company name, city)
- d. **Manages**(ename, managename)

Write the expressions to solve the following queries using **Relational Algebra, Tuple Relational Calculus, and Domain relational Calculus**.

- a. Write the expressions to find the name of the employees getting salary more than 60,000 and working in TCS and WIPRO.
  - b. Write the expressions to find the salary and name of the employees working in any company placed in DELHI.
  - c. Write the expression to find the salary of the employees living in city MUMBAI and working under the manager JOHN.
2. Consider the following three relations in a relational database.  
Employee(eId,Name), Brand(bId,bName), Own(eId,bId)  
Write the relational algebra expression that will return the set of eIds who own all the brands. Write the equivalent tuple relational calculus and domain relational calculus query.
3. Check whether the given schedules are conflict serializable or not-

a. S1: r1(x)r1(y)r2(x)r2(y)w2(y)w1(x)

b. S2: r1(x)r2(x)r2(y)w2(y)r1(y)w1(x)

Let  $ri(z)$  and  $wi(z)$  denote read and write operations respectively on a data item  $z$  by a transaction  $T_i$ . Consider the following two schedules.

4. Check whether the given schedule below is conflict serializable or not justify your answer and show the precedence graph.

$T_1$	$T_5$
read(A) $A := A - 50$ write(A)	
	read(B) $B := B - 10$ write(B)
read(B) $B := B + 50$ write(B)	
	read(A) $A := A + 10$ write(A)

5. Check whether the given schedule S is conflict serializable and recoverable or not.

T1	T2	T3	T4
	READ(X)		
		WRITE(X) COMMIT	
WRITE(X) COMMIT			
	WRITE(Y) READ(Z) COMMIT		
			READ(X) READ(Y) COMMIT

**Schedule S**

6. Consider a schedule of transaction T1 and T2:

T1	RA			RC		WD		WB	Commit	
T2		RB	WB		RD		WC			Commit

Here, RX stands for “Read(X)” and WX stands for “Write(X)”. Which one of the following schedules is conflict equivalent to the above schedule?

(A)

T1	RA	RC	WD				WB		Commit	
T2				RB	WB	RD		WC		Commit

(B)

T1				RA	RC	WD	WB		Commit	
T2	RB	WB	RD					WC		Commit

7. Consider the following two transactions:

**T1:**    **read(A);**  
         **read(B);**  
         **if A = 0 then B := B + 1;**  
         **write(B).**

**T2:**    **read(B);**  
         **read(A);**  
         **if B = 0 then A := A + 1;**  
         **write(A).**

Add lock and unlock instructions to transactions T1 and T2, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

8. Check whether the given schedule below can complete all its operations in the given order using timestamp based protocol or not.

T1	T2
READ(A)	
	READ(A)
WRITE (A)	
	WRITE(A)

9. Consider  $T_0$  and  $T_1$  be a two transaction.  $T_0$  transfer 50rs from account A to account B and  $T_1$  withdraw 100rs from account C. Both transaction are commit successfully. Write down the system log corresponding to  $T_0$  and  $T_1$  to handle any failures. (**Note: Initial Balance in Account A = 1000, Account B = 2000 and Account C = 700**)
10. Write down Two major differences between immediate and deferred database modification.

\*\*\*\*\*End\*\*\*\*\*