Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

AY: 2024-25

Class:	**SE**	**Semester:**	**IV**
Course Code:	**CSL402**	**Course Name:**	**Database Management System Lab**

Name of Student:	**Shruti Gauchandra**
Roll No. :	**16**
Experiment No.:	**10**
Title of the Experiment:	**Query to lock and unlock a table for transaction and concurrency control**
Date of Performance:	**13/03/25**
Date of Submission:	**20/03/25**

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Performance	5	
Understanding	5	
Journal work and timely submission	10	
Total	20	

Performance Indicator	Exceed Expectations (EE)	Meet Expectations (ME)	Below Expectations (BE)
Performance	4-5	2-3	1
Understanding	4-5	2-3	1
Journal work and timely submission	8-10	5-8	1-4

Checked by

Name of Faculty : Ms. Neha Raut

Signature :

Date:

Experiment No 10

Aim :- Write a query to lock and unlock a table for transaction and concurrency control.

Objective:- To learn locking of tables for transaction processing and concurrency control.

Theory:

A lock is a mechanism associated with a table used to restrict the unauthorized access of the data in a table. MySQL allows a client session to acquire a table lock explicitly to cooperate with other sessions to access the table's data. MySQL also allows table locking to prevent unauthorized modification into the same table during a specific period.

Table Locking in MySQL is mainly used to solve concurrency problems. It will be used while running a transaction, i.e., first read a value from a table (database) and then write it into the table(database).

MySQL provides two types of locks onto the table, which are:

READ LOCK: This lock allows a user to only read the data from a table.

WRITELOCK: This lock allows a user to do both reading and writing into a table.

The following is the syntax that allows us to acquire a table lock explicitly:

LOCK TABLES table_name [READ I WRITE];

The following is the syntax that allows us to release a lock for a table in MySQL:UNLOCK TABLES;

Conclusion: Locking and unlocking of tables is achieved and verified using insert command in the same table of a database system.

1. Explain Transaction and Concurrency control techniques using locks.

Ans.

1. **A transaction is a logical unit of database processing that consists of one or more operations, such as reading or writing database items. Transactions are required to satisfy the ACID properties:**

- **Atomicity: Ensures that all operations within a transaction are completed; if not, the transaction is aborted.**

- **Consistency: Ensures the database remains in a consistent state before and after the transaction.**

- **Isolation: Ensures that concurrent execution of transactions results in a system state that would be obtained if transactions were executed serially.**

- **Durability: Ensures that once a transaction commits, its effects are permanently stored in the database.**

2. Concurrency Control Using Locks

Concurrency control is the process of managing simultaneous operations on the database without conflicting with one another. One of the primary techniques used for concurrency control is locking.

a. Binary Locks

- **Each data item can be in one of two states: locked or unlocked.**
- **A transaction must acquire a lock on an item before accessing it and release the lock afterward.**
- **Limitation: Does not distinguish between read and write operations.**

b. Shared and Exclusive Locks

- **Shared Lock (S-lock): Allows multiple transactions to read a data item but not modify it.**
- **Exclusive Lock (X-lock): Allows a transaction to both read and write a data item. No other transaction can access the item while it is exclusively locked.**
- **The compatibility of locks is governed by the following table:**

	Shared Lock	Exclusive Lock
Shared	**Yes**	**No**
Exclusive	**No**	**No**

c. Two-Phase Locking Protocol (2PL)

- **A protocol that ensures serializability by dividing the execution of a transaction into two phases:**
    1. **Growing Phase: The transaction may acquire locks but not release any.**

2. **Shrinking Phase: The transaction may release locks but not acquire any new ones.**

- **Strict Two-Phase Locking is a variation where all exclusive locks are held until the transaction commits or aborts, preventing cascading rollbacks.**

d. Deadlock Management

- **Deadlock occurs when two or more transactions wait indefinitely for each other to release locks.**

- **Techniques for handling deadlocks include:**

    - **Deadlock Prevention: Using protocols like wait-die or wound-wait based on transaction timestamps.**

    - **Deadlock Detection: Constructing a wait-for graph and checking for cycles.**

    - **Deadlock Recovery: Aborting one or more transactions to break the cycle.**