Experiment No.10
Implementation and demonstration of Transaction and Concurrency control techniques using locks
Date of Performance:
Date of Submission:

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.

WRITE LOCK: 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:

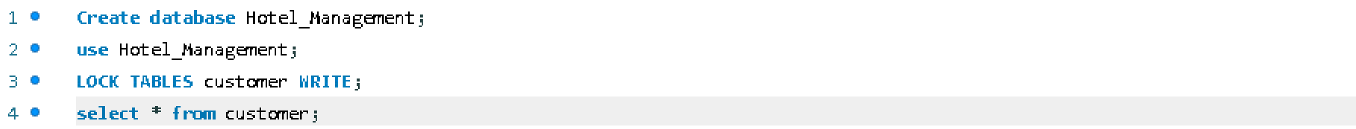
LOCK TABLES table_name [READ | WRITE];

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

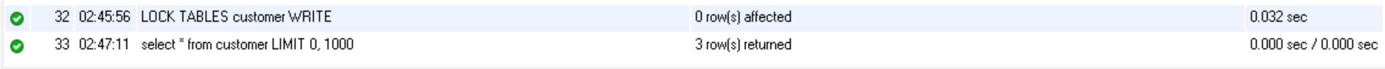
UNLOCK TABLES;

Implementation:

LOCK:-

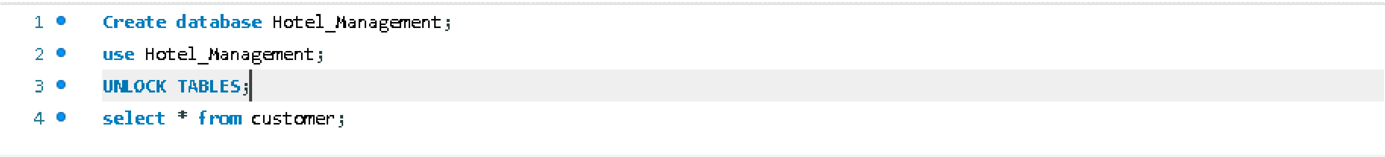


```
Create database Hotel_Management;
use Hotel_Management;
LOCK TABLES customer WRITE;
select * from customer;
```

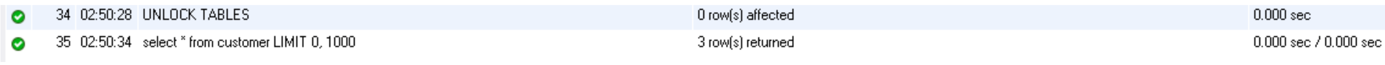


```
32  02:45:56  LOCK TABLES customer WRITE                 0 row(s) affected    0.032 sec
33  02:47:11  select * from customer LIMIT 0, 1000       3 row(s) returned    0.000 sec / 0.000 sec
```

UNLOCK:-



```
Create database Hotel_Management;
use Hotel_Management;
UNLOCK TABLES;
select * from customer;
```



```
34  02:50:28  UNLOCK TABLES                              0 row(s) affected    0.000 sec
35  02:50:34  select * from customer LIMIT 0, 1000       3 row(s) returned    0.000 sec / 0.000 sec
```

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.**

here's a brief explanation of transactions and concurrency control techniques using locks:

1. Transaction:

- A transaction is a logical unit of work that consists of one or more database operations, such as INSERT, UPDATE, DELETE, or SELECT.

- Transactions ensure that all operations within them are executed atomically, meaning they either all succeed or all fail, maintaining data consistency.

- The ACID properties (Atomicity, Consistency, Isolation, Durability) define the characteristics of a transaction, ensuring reliability and data integrity.

2. Concurrency Control Techniques Using Locks:

- Locking: Locks are used to control access to shared resources (e.g., database records) to prevent conflicts and maintain data consistency in a multi-user environment.

- Types of Locks:

- **Shared Locks (Read Locks): Allow multiple transactions to read data simultaneously but prevent write operations until all shared locks are released.

- Exclusive Locks (Write Locks)**: Prevent other transactions from reading or writing to a resource until the exclusive lock is released.

- Concurrency Control Protocols:

- Two-Phase Locking (2PL): Transactions acquire locks in two phases (growing phase and shrinking phase) and hold them until the end of the transaction. This ensures serializability but may lead to deadlocks.

- Timestamp Ordering: Assigns a unique timestamp to each transaction and uses these timestamps to order conflicting operations, ensuring serializability without explicit locking. Conflicts are resolved by comparing transaction timestamps.

- Optimistic Concurrency Control (OCC): Transactions operate without acquiring locks initially. Conflicts are detected at commit time, and if conflicts occur, the transaction is rolled back and retried.

- Multi-Version Concurrency Control (MVCC): Maintains multiple versions of a data item to allow concurrent read and write operations without blocking. Each transaction sees a consistent snapshot of the database at its start time.

These concurrency control techniques using locks ensure that transactions execute safely and efficiently in a multi-user database environment, preventing data inconsistencies and ACID properties. Different techniques may be suitable depending on the specific requirements and characteristics of the application.