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Lab – 9

```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases
    -> ;
+--------------------+
| Database           |
+--------------------+
| demo               |
| flipkart           |
| hitendra_demo      |
| information_schema |
| lab                |
| mysql              |
| performance_schema |
| sys                |
| we                 |
| zomato             |
+--------------------+
10 rows in set (0.11 sec)
```

```
mysql> create table customers(
    -> customerID int primary key comment 'unique identifier for the customer',
    -> firstname varchar(50) comment 'first name of the customer',
    -> lastname varchar(50) comment 'last name of the customer'
    -> -- other columns..
    -> );
Query OK, 0 rows affected (0.07 sec)

mysql>
```

```
mysql> create table orders(
    -> orderID int primary key,
    -> customerID int,
    -> orderdate date,
    -> -- other columns...
    -> foreign key (customerID) references customers(customerID)
    -> );
Query OK, 0 rows affected (0.03 sec)
```

```
mysql> create index idx_customer_lastname on customers(lastname);
Query OK, 0 rows affected (0.07 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

```
mysql> create tablespace yourtablespace;
Query OK, 0 rows affected (0.03 sec)
```

```
mysql> set global innodb_buffer_pool_size = 4294967296; -- 4GB in bytes
Query OK, 0 rows affected (0.01 sec)
```

Lab – 10

Q. Identify and explore different query optimization methods

1. Working with database indexes

```
mysql> create index idx_customer_lastname_new on customers(lastname);
Query OK, 0 rows affected, 1 warning (0.07 sec)
Records: 0  Duplicates: 0  Warnings: 1

mysql> show index from customers;
+-----------+------------+---------------------------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+---------+------------+
| Table     | Non_unique | Key_name                  | Seq_in_index | Column_name | Collation | Cardinality | Sub_part | Packed | Null | Index_type | Comment | Index_comment | Visible | Expression |
+-----------+------------+---------------------------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+---------+------------+
| customers |          0 | PRIMARY                   |            1 | customerID  | A         |           0 | NULL     | NULL   |      | BTREE      |         |               | YES     | NULL       |
| customers |          1 | idx_customer_lastname     |            1 | lastname    | A         |           0 | NULL     | NULL   | YES  | BTREE      |         |               | YES     | NULL       |
| customers |          1 | idx_customer_lastname_new |            1 | lastname    | A         |           0 | NULL     | NULL   | YES  | BTREE      |         |               | YES     | NULL       |
+-----------+------------+---------------------------+--------------+-------------+-----------+-------------+----------+--------+------+------------+---------+---------------+---------+------------+
3 rows in set (0.03 sec)

mysql> drop index idx_customer_lastname on customers;
Query OK, 0 rows affected (0.01 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

2. Normalize database

3NF (Third Normal Form): All columns are functionally dependent only on the primary key. No transitive dependencies.

```
mysql> create table customers(
    -> customerID int primary key,
    -> customername varchar(50)
    -> );
Query OK, 0 rows affected (0.03 sec)

mysql> create table products(
    -> productID int primary key,
    -> productname varchar(50)
    -> );
Query OK, 0 rows affected (0.01 sec)

mysql> create table orders(
    -> orderID int primary key,
    -> customerID int,
    -> orderdate date,
    -> foreign key (customerID) references customers(customerID)
    -> );
Query OK, 0 rows affected (0.02 sec)

mysql> create table orderdetails(
    -> orderID int,
    -> productID int,
    -> quantity int,
    -> primary key (orderID,profuctID),
    -> foreign key(orderID) references orders(orderID),
    -> foreign key(productID) references products(productID)
    -> );
ERROR 1072 (42000): Key column 'profuctID' doesn't exist in table
mysql> create table orderdetails(
    -> orderID int,
    -> productID int,
    -> quantity int,
    -> primary key (orderID,productID),
    -> foreign key(orderID) references orders(orderID),
    -> foreign key(productID) references products(productID)
    -> );
Query OK, 0 rows affected (0.02 sec)

mysql>
```

3. Adjust MySQL configuration parameter (e.g. buffer size,query cache size,etc.)

```
mysql> set global innodb_buffer_pool_size = 4294967296; -- 4GB in bytes
Query OK, 0 rows affected (0.04 sec)
```

max_connections: Limit the maximum number of simultaneous client connections

```
mysql> set global max_connections = 100;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

table_open_cache: Set the number of open tables allowed in the table cache.

```
mysql> set global table_open_cache = 2000;
Query OK, 0 rows affected (0.00 sec)
```

4. Identify and rewrite slow queries

```
mysql> select * from orders;
+----------+---------+------------+
| order_id | user_id | order_date |
+----------+---------+------------+
| B-25601  |       1 | 01-04-2018 |
| B-26011  |       1 | 12-02-2019 |
| B-26074  |       1 | 21-03-2019 |
| B-25602  |       2 | 01-04-2018 |
| B-26012  |       2 | 13-02-2019 |
| B-26075  |       2 | 21-03-2019 |
| B-25603  |       3 | 03-04-2018 |
| B-26013  |       3 | 13-02-2019 |
| B-26076  |       3 | 21-03-2019 |
| B-25604  |       4 | 03-04-2018 |
| B-26014  |       4 | 13-02-2019 |
| B-26077  |       4 | 22-03-2019 |
| B-25605  |       5 | 05-04-2018 |
| B-26015  |       5 | 14-02-2019 |
| B-26078  |       5 | 22-03-2019 |
| B-25606  |       6 | 06-04-2018 |
| B-26016  |       6 | 14-02-2019 |
| B-26079  |       6 | 22-03-2019 |
| B-25607  |       7 | 06-04-2018 |
| B-26017  |       7 | 14-02-2019 |
```

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```
mysql> select * from orders where user_id=3;
+-----------+-----------+------------+
| order_id  | user_id   | order_date |
+-----------+-----------+------------+
| B-25603   |         3 | 03-04-2018 |
| B-26013   |         3 | 13-02-2019 |
| B-26076   |         3 | 21-03-2019 |
+-----------+-----------+------------+
3 rows in set (0.00 sec)
```