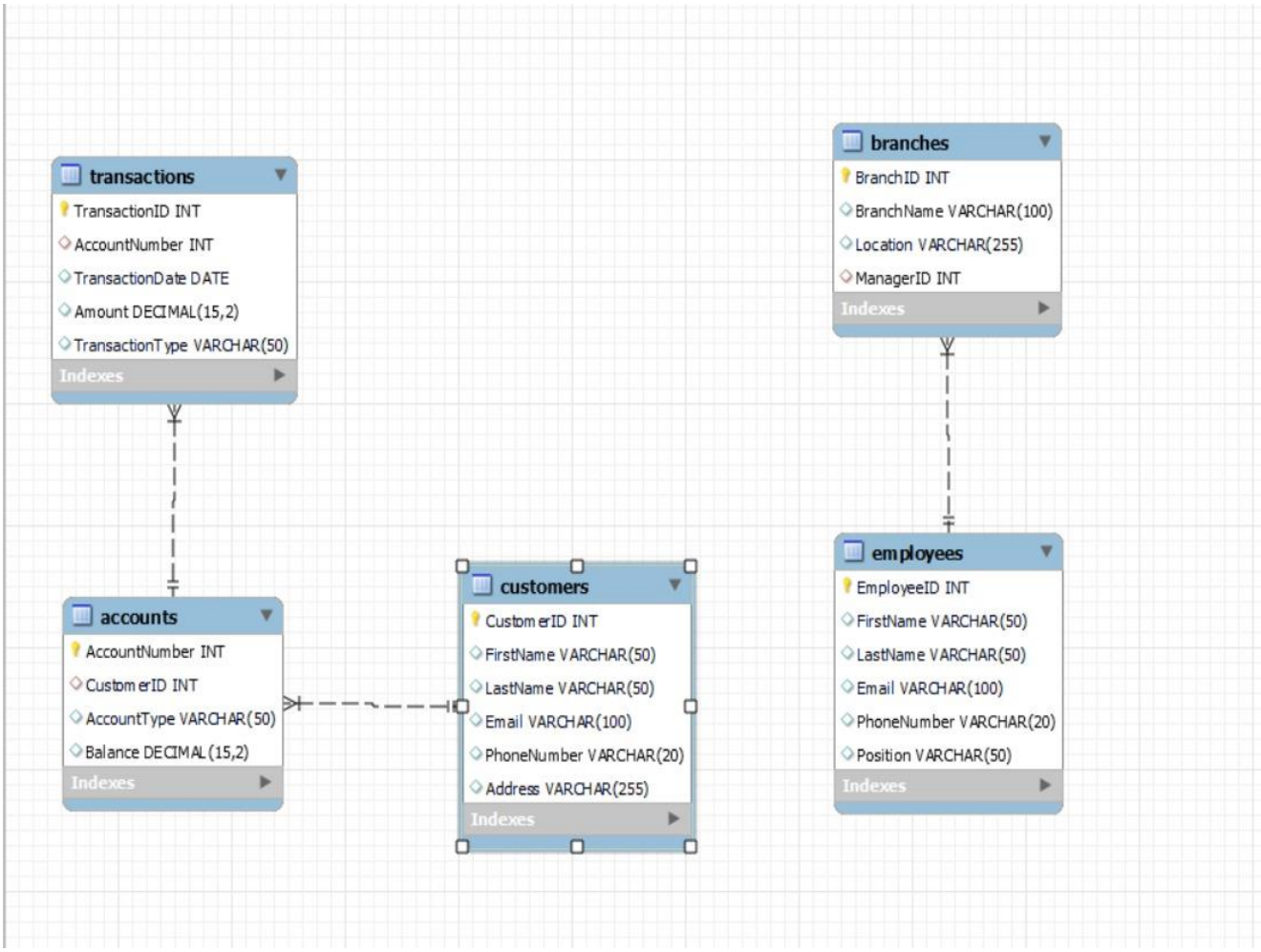
BANK MANAGEMENT SYSTEM

1.INTRODUCTION:

A Bank Database Management System (DBMS) is a specialized software application designed to handle various banking operations, manage customer information, and ensure the secure and efficient handling of financial transactions. This system plays a crucial role in modern banking by centralizing and organizing vast amounts of data, enabling banks to provide seamless services to their customers while maintaining data integrity, security, and regulatory compliance. Bank Database Management System is a fundamental tool for modern financial institutions, enabling them to provide secure, efficient, and customer-centric services in today's dynamic banking landscape. Our database has five modules. First module is consists of customers of the bank. Second module is consists of accounts of the customers. Third module is consists of transaction of the bank customers. Fourth module is of employees working for bank. And last fifth module is branches of the banks.

2. RE DIAGRAM:


transactions
TransactionID INT
AccountNumber INT
TransactionDate DATE
Amount DECIMAL(15,2)
TransactionType VARCHAR(50)
Indexes
branches
BranchID INT
BranchName VARCHAR(100)
Location VARCHAR(255)
ManagerID INT
Indexes
accounts
AccountNumber INT
CustomerID INT
AccountType VARCHAR(50)
Balance DECIMAL(15,2)
Indexes
customers
CustomerID INT
FirstName VARCHAR(50)
LastName VARCHAR(50)
Email VARCHAR(100)
PhoneNumber VARCHAR(20)
Address VARCHAR(255)
Indexes
employees
EmployeeID INT
FirstName VARCHAR(50)
LastName VARCHAR(50)
Email VARCHAR(100)
PhoneNumber VARCHAR(20)
Position VARCHAR(50)
Indexes

3. Database Design

Databases: **Bank Database**

Tables:

a) Customers

b) Accounts

c) Transactions

d) Employees

e) Branches

4. Creating Table

a) Customers:

```
MariaDB [bankDB]> CREATE TABLE Customers (
    ->     CustomerID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50),
    ->     Email VARCHAR(100),
    ->     PhoneNumber VARCHAR(20),
    -> Address VARCHAR(255)
    -> );
Query OK, 0 rows affected (0.066 sec)
```

b) Accounts:

```
MariaDB [bankDB]> CREATE TABLE Accounts (
    ->     AccountNumber INT PRIMARY KEY,
    ->     CustomerID INT,
    ->     AccountType VARCHAR(50),
    ->     Balance DECIMAL(15, 2),
    ->     FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID)
    -> );
Query OK, 0 rows affected (0.424 sec)
```

c) Transactions:

```
MariaDB [bankDB]> CREATE TABLE Transactions (
    ->     TransactionID INT PRIMARY KEY,
    ->     AccountNumber INT,
    ->     TransactionDate DATE,
    ->     Amount DECIMAL(15, 2),
    ->     TransactionType VARCHAR(50),
    ->     FOREIGN KEY (AccountNumber) REFERENCES Accounts(AccountNumber)
    -> );
Query OK, 0 rows affected (0.173 sec)
```

d) Employees:

```
MariaDB [bankDB]> CREATE TABLE Employees (
    ->     EmployeeID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50),
    ->     Email VARCHAR(100),
    ->     PhoneNumber VARCHAR(20),
    ->     Position VARCHAR(50)
    -> );
Query OK, 0 rows affected (0.091 sec)
```

e) Branches:

```
MariaDB [bankDB]> CREATE TABLE Branches (
    ->     BranchID INT PRIMARY KEY,
    ->     BranchName VARCHAR(100),
    ->     Location VARCHAR(255),
    ->     ManagerID INT,
    ->     FOREIGN KEY (ManagerID) REFERENCES Employees(EmployeeID)
    -> );
Query OK, 0 rows affected (0.173 sec)
```

5. Tables in database:

```
MariaDB [bankDB]> show tables;
+------------------+
| Tables_in_bankdb |
+------------------+
| accounts         |
| branches         |
| customers        |
| employees        |
| transactions     |
+------------------+
5 rows in set (0.054 sec)
```

6. Data definition language (DDL):

1. Creating tables:

a) Customers:

```
MariaDB [bankDB]> desc customers;
+-------------+--------------+------+-----+---------+-------+
| Field       | Type         | Null | Key | Default | Extra |
+-------------+--------------+------+-----+---------+-------+
| CustomerID  | int(11)      | NO   | PRI | NULL    |       |
| FirstName   | varchar(50)  | YES  |     | NULL    |       |
| LastName    | varchar(50)  | YES  |     | NULL    |       |
| Email       | varchar(100) | YES  |     | NULL    |       |
| PhoneNumber | varchar(20)  | YES  |     | NULL    |       |
| Address     | varchar(255) | YES  |     | NULL    |       |
+-------------+--------------+------+-----+---------+-------+
6 rows in set (0.529 sec)
```

b) Accounts:

```
MariaDB [bankDB]> desc accounts;
+---------------+---------------+------+-----+---------+-------+
| Field         | Type          | Null | Key | Default | Extra |
+---------------+---------------+------+-----+---------+-------+
| AccountNumber | int(11)       | NO   | PRI | NULL    |       |
| CustomerID    | int(11)       | YES  | MUL | NULL    |       |
| AccountType   | varchar(50)   | YES  |     | NULL    |       |
| Balance       | decimal(15,2) | YES  |     | NULL    |       |
+---------------+---------------+------+-----+---------+-------+
4 rows in set (0.039 sec)
```

c) Transactions:

```
MariaDB [bankDB]> desc transactions;
+-----------------+---------------+------+-----+---------+-------+
| Field           | Type          | Null | Key | Default | Extra |
+-----------------+---------------+------+-----+---------+-------+
| TransactionID   | int(11)       | NO   | PRI | NULL    |       |
| AccountNumber   | int(11)       | YES  | MUL | NULL    |       |
| TransactionDate | date          | YES  |     | NULL    |       |
| Amount          | decimal(15,2) | YES  |     | NULL    |       |
| TransactionType | varchar(50)   | YES  |     | NULL    |       |
+-----------------+---------------+------+-----+---------+-------+
5 rows in set (0.034 sec)
```

d) Employees:

```
MariaDB [bankDB]> desc employees;
+-------------+--------------+------+-----+---------+-------+
| Field       | Type         | Null | Key | Default | Extra |
+-------------+--------------+------+-----+---------+-------+
| EmployeeID  | int(11)      | NO   | PRI | NULL    |       |
| FirstName   | varchar(50)  | YES  |     | NULL    |       |
| LastName    | varchar(50)  | YES  |     | NULL    |       |
| Email       | varchar(100) | YES  |     | NULL    |       |
| PhoneNumber | varchar(20)  | YES  |     | NULL    |       |
| Position    | varchar(50)  | YES  |     | NULL    |       |
+-------------+--------------+------+-----+---------+-------+
6 rows in set (0.031 sec)
```

e) Branches:

```
MariaDB [bankDB]> desc branches;
+------------+--------------+------+-----+---------+-------+
| Field      | Type         | Null | Key | Default | Extra |
+------------+--------------+------+-----+---------+-------+
| BranchID   | int(11)      | NO   | PRI | NULL    |       |
| BranchName | varchar(100) | YES  |     | NULL    |       |
| Location   | varchar(255) | YES  |     | NULL    |       |
| ManagerID  | int(11)      | YES  | MUL | NULL    |       |
+------------+--------------+------+-----+---------+-------+
4 rows in set (0.035 sec)

MariaDB [bankDB]>
```

2. Alter table:

a) Alter table Add column:

```
MariaDB [bankDB]> ALTER TABLE Customers
    -> ADD DateOfBirth DATE;
Query OK, 0 rows affected (0.474 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

b) Alter table modify column:

```
MariaDB [bankDB]> ALTER TABLE Customers
    -> MODIFY PhoneNumber VARCHAR(15);
Query OK, 0 rows affected (0.262 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [bankDB]>
```

c) Alter table rename column:

```
MariaDB [bankDB]> Alter table customers change PhoneNumber ContactNumber int;
Query OK, 0 rows affected (0.136 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [bankDB]>
```

d) Alter table drop column:

```
MariaDB [bankDB]> Alter table customers drop contactnumber;
Query OK, 0 rows affected (0.165 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [bankDB]>
```

e) Rename table:

```
MariaDB [bankDB]> alter table customers rename B_customers;
Query OK, 0 rows affected (0.453 sec)

MariaDB [bankDB]>
```

f) Truncate table:

```
MariaDB [bankDB]> truncate table transactions;
Query OK, 0 rows affected (0.173 sec)

MariaDB [bankDB]>
```

g) Drop table:

```
MariaDB [bankDB]> drop table branches;
Query OK, 0 rows affected (0.049 sec)

MariaDB [bankDB]>
```

7. Data manipulation language (DML):

a) Insert into Table:

```
MariaDB [bankDB]> insert into B_customers(CustomerID, FirstName, LastName, Email, Address, DateOfBirth) values(1, 'John', 'Doe', 'john.doe@gmail.com','123 Main St, City
, Country', '1980-01-15');
Query OK, 1 row affected (0.046 sec)

MariaDB [bankDB]>
```

b) Update into table:

```
MariaDB [bankDB]> update B_customers set customerID=4 where firstname='john';
Query OK, 1 row affected (0.013 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MariaDB [bankDB]>
```

c) Delete into table:

```
MariaDB [bankDB]> delete from B_customers where customerID=4;
Query OK, 1 row affected (0.067 sec)

MariaDB [bankDB]>
```

8. Data query language (DQL)

a) Select query:

```
MariaDB [bankDB]> select * from B_customers;
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
| CustomerID | FirstName   | LastName | Email                     | Address                     | DateOfBirth |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
|          1 | John        | Doe      | john.doe@gmail.com        | 123 Main St, City, Country  | 1980-01-15  |
|          2 | Jane        | Smith    | jane.smith@example.com    | 456 Elm St, City, Country   | 1985-05-20  |
|          3 | Michael     | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country | 1976-11-10  |
|          4 | Emily       | Brown    | emily.brown@example.com   | 101 Pine St, City, Country  | 1990-07-25  |
|          5 | David       | Lee      | david.lee@example.com     | 202 Maple St, City, Country | 1982-03-30  |
|          6 | Sarah       | White    | sarah.white@example.com   | 303 Cedar St, City, Country | 1988-09-05  |
|          7 | Brian       | Miller   | brian.miller@example.com  | 404 Birch St, City, Country | 1975-06-14  |
|          8 | Linda       | Taylor   | linda.taylor@example.com  | 505 Spruce St, City, Country | 1972-12-03 |
|          9 | Christopher | Anderson | chris.anderson@example.com | 606 Fir St, City, Country  | 1987-04-18  |
|         10 | Amanda      | Martinez | amanda.martinez@example.com | 707 Pine St, City, Country | 1984-08-12  |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
10 rows in set (0.002 sec)
```

b) Order by query ASC:

```
MariaDB [bankDB]> select * from B_customers order by firstname ASC;
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
| CustomerID | FirstName   | LastName | Email                     | Address                     | DateOfBirth |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
|         10 | Amanda      | Martinez | amanda.martinez@example.com | 707 Pine St, City, Country | 1984-08-12  |
|          7 | Brian       | Miller   | brian.miller@example.com  | 404 Birch St, City, Country | 1975-06-14  |
|          9 | Christopher | Anderson | chris.anderson@example.com | 606 Fir St, City, Country  | 1987-04-18  |
|          5 | David       | Lee      | david.lee@example.com     | 202 Maple St, City, Country | 1982-03-30  |
|          4 | Emily       | Brown    | emily.brown@example.com   | 101 Pine St, City, Country  | 1990-07-25  |
|          2 | Jane        | Smith    | jane.smith@example.com    | 456 Elm St, City, Country   | 1985-05-20  |
|          1 | John        | Doe      | john.doe@gmail.com        | 123 Main St, City, Country  | 1980-01-15  |
|          8 | Linda       | Taylor   | linda.taylor@example.com  | 505 Spruce St, City, Country | 1972-12-03 |
|          3 | Michael     | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country | 1976-11-10  |
|          6 | Sarah       | White    | sarah.white@example.com   | 303 Cedar St, City, Country | 1988-09-05  |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
10 rows in set (0.064 sec)
```

c) Order by query DESC:

```
MariaDB [bankDB]> select * from B_customers order by firstname DESC;
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
| CustomerID | FirstName   | LastName | Email                     | Address                     | DateOfBirth |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
|          6 | Sarah       | White    | sarah.white@example.com   | 303 Cedar St, City, Country | 1988-09-05  |
|          3 | Michael     | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country | 1976-11-10  |
|          8 | Linda       | Taylor   | linda.taylor@example.com  | 505 Spruce St, City, Country | 1972-12-03 |
|          1 | John        | Doe      | john.doe@gmail.com        | 123 Main St, City, Country  | 1980-01-15  |
|          2 | Jane        | Smith    | jane.smith@example.com    | 456 Elm St, City, Country   | 1985-05-20  |
|          4 | Emily       | Brown    | emily.brown@example.com   | 101 Pine St, City, Country  | 1990-07-25  |
|          5 | David       | Lee      | david.lee@example.com     | 202 Maple St, City, Country | 1982-03-30  |
|          9 | Christopher | Anderson | chris.anderson@example.com | 606 Fir St, City, Country  | 1987-04-18  |
|          7 | Brian       | Miller   | brian.miller@example.com  | 404 Birch St, City, Country | 1975-06-14  |
|         10 | Amanda      | Martinez | amanda.martinez@example.com | 707 Pine St, City, Country | 1984-08-12  |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
10 rows in set (0.059 sec)
```

d) Order by column:

```
MariaDB [bankDB]> select * from B_customers order by dateofbirth,firstname;
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
| CustomerID | FirstName   | LastName | Email                     | Address                     | DateOfBirth |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
|          8 | Linda       | Taylor   | linda.taylor@example.com  | 505 Spruce St, City, Country | 1972-12-03  |
|          7 | Brian       | Miller   | brian.miller@example.com  | 404 Birch St, City, Country | 1975-06-14  |
|          3 | Michael     | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country | 1976-11-10  |
|          1 | John        | Doe      | john.doe@gmail.com        | 123 Main St, City, Country  | 1980-01-15  |
|          5 | David       | Lee      | david.lee@example.com     | 202 Maple St, City, Country | 1982-03-30  |
|         10 | Amanda      | Martinez | amanda.martinez@example.com | 707 Pine St, City, Country | 1984-08-12  |
|          2 | Jane        | Smith    | jane.smith@example.com    | 456 Elm St, City, Country   | 1985-05-20  |
|          9 | Christopher | Anderson | chris.anderson@example.com | 606 Fir St, City, Country  | 1987-04-18  |
|          6 | Sarah       | White    | sarah.white@example.com   | 303 Cedar St, City, Country | 1988-09-05  |
|          4 | Emily       | Brown    | emily.brown@example.com   | 101 Pine St, City, Country  | 1990-07-25  |
+------------+-------------+----------+---------------------------+-----------------------------+-------------+
10 rows in set (0.065 sec)
```

e) Limit query:

```
MariaDB [bankDB]> select * from B_customers limit 5;
+------------+-----------+----------+---------------------------+-----------------------------+-------------+
| CustomerID | FirstName | LastName | Email                     | Address                     | DateOfBirth |
+------------+-----------+----------+---------------------------+-----------------------------+-------------+
|          1 | John      | Doe      | john.doe@gmail.com        | 123 Main St, City, Country  | 1980-01-15  |
|          2 | Jane      | Smith    | jane.smith@example.com    | 456 Elm St, City, Country   | 1985-05-20  |
|          3 | Michael   | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country | 1976-11-10  |
|          4 | Emily     | Brown    | emily.brown@example.com   | 101 Pine St, City, Country  | 1990-07-25  |
|          5 | David     | Lee      | david.lee@example.com     | 202 Maple St, City, Country | 1982-03-30  |
+------------+-----------+----------+---------------------------+-----------------------------+-------------+
5 rows in set (0.060 sec)
```

f) Select query with specific column:

```
MariaDB [bankDB]> select firstname, B_customers.lastname from B_customers;
+-------------+----------+
| firstname   | lastname |
+-------------+----------+
| John        | Doe      |
| Jane        | Smith    |
| Michael     | Johnson  |
| Emily       | Brown    |
| David       | Lee      |
| Sarah       | White    |
| Brian       | Miller   |
| Linda       | Taylor   |
| Christopher | Anderson |
| Amanda      | Martinez |
+-------------+----------+
10 rows in set (0.066 sec)
```

g) Select query with column name change:

```
MariaDB [bankDB]> select firstname AS forename, B_customers.lastname AS surname from B_customers;
+------------+----------+
| forename   | surname  |
+------------+----------+
| John       | Doe      |
| Jane       | Smith    |
| Michael    | Johnson  |
| Emily      | Brown    |
| David      | Lee      |
| Sarah      | White    |
| Brian      | Miller   |
| Linda      | Taylor   |
| Christopher | Anderson |
| Amanda     | Martinez |
+------------+----------+
10 rows in set (0.061 sec)
```

h) Distinct query:

```
MariaDB [bankDB]> select distinct(gender) from B_customers;
+--------+
| gender |
+--------+
| male   |
| female |
+--------+
2 rows in set (0.011 sec)
```

9.Using where clause

a) with comparision operator:

```
MariaDB [bankDB]> select * from B_customers where gender='male';
+------------+------------+----------+--------------------------+---------------------------+------------+--------+
| CustomerID | FirstName  | LastName | Email                    | Address                   | DateOfBirth | gender |
+------------+------------+----------+--------------------------+---------------------------+------------+--------+
|          1 | John       | Doe      | john.doe@gmail.com       | 123 Main St, City, Country | 1980-01-15 | male   |
|          5 | David      | Lee      | david.lee@example.com    | 202 Maple St, City, Country | 1982-03-30 | male   |
|          6 | Sarah      | White    | sarah.white@example.com  | 303 Cedar St, City, Country | 1988-09-05 | male   |
|          7 | Brian      | Miller   | brian.miller@example.com | 404 Birch St, City, Country | 1975-06-14 | male   |
|          9 | Christopher | Anderson | chris.anderson@example.com | 606 Fir St, City, Country | 1987-04-18 | male   |
+------------+------------+----------+--------------------------+---------------------------+------------+--------+
5 rows in set (0.013 sec)

MariaDB [bankDB]> select customerID,firstname,lastname from B_customers where dateofbirth >= 1985;
+------------+------------+----------+
| customerID | firstname  | lastname |
+------------+------------+----------+
|          1 | John       | Doe      |
|          2 | Jane       | Smith    |
|          3 | Michael    | Johnson  |
|          4 | Emily      | Brown    |
|          5 | David      | Lee      |
|          6 | Sarah      | White    |
|          7 | Brian      | Miller   |
|          8 | Linda      | Taylor   |
|          9 | Christopher | Anderson |
|         10 | Amanda     | Martinez |
+------------+------------+----------+
10 rows in set, 1 warning (0.065 sec)

MariaDB [bankDB]> select * from B_customers where dateofbirth<='1990-01-01';
+------------+------------+----------+--------------------------+---------------------------+------------+--------+
| CustomerID | FirstName  | LastName | Email                    | Address                   | DateOfBirth | gender |
+------------+------------+----------+--------------------------+---------------------------+------------+--------+
|          1 | John       | Doe      | john.doe@gmail.com       | 123 Main St, City, Country | 1980-01-15 | male   |
|          2 | Jane       | Smith    | jane.smith@example.com   | 456 Elm St, City, Country | 1985-05-20 | female |
|          3 | Michael    | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country | 1976-11-10 | female |
|          5 | David      | Lee      | david.lee@example.com    | 202 Maple St, City, Country | 1982-03-30 | male   |
|          6 | Sarah      | White    | sarah.white@example.com  | 303 Cedar St, City, Country | 1988-09-05 | male   |
|          7 | Brian      | Miller   | brian.miller@example.com | 404 Birch St, City, Country | 1975-06-14 | male   |
|          8 | Linda      | Taylor   | linda.taylor@example.com | 505 Spruce St, City, Country | 1972-12-03 | female |
|          9 | Christopher | Anderson | chris.anderson@example.com | 606 Fir St, City, Country | 1987-04-18 | male   |
|         10 | Amanda     | Martinez | amanda.martinez@example.com | 707 Pine St, City, Country | 1984-08-12 | female |
+------------+------------+----------+--------------------------+---------------------------+------------+--------+
9 rows in set (0.063 sec)
```

10. Using logical operator

a) Using AND operator

```
MariaDB [bankDB]> SELECT * FROM B_customers where customerID=1 and lastname='doe';
+------------+-----------+----------+-------------------+--------------------------+-------------+--------+
| CustomerID | FirstName | LastName | Email             | Address                  | DateOfBirth | gender |
+------------+-----------+----------+-------------------+--------------------------+-------------+--------+
|          1 | John      | Doe      | john.doe@gmail.com | 123 Main St, City, Country | 1980-01-15  | male   |
+------------+-----------+----------+-------------------+--------------------------+-------------+--------+
1 row in set (0.008 sec)
```

b) Between clause:

```
MariaDB [bankDB]> select * from B_customers where dateofbirth between '1971-01-01' and '1980-01-01';
+------------+-----------+----------+---------------------------+---------------------------+-------------+--------+
| CustomerID | FirstName | LastName | Email                     | Address                   | DateOfBirth | gender |
+------------+-----------+----------+---------------------------+---------------------------+-------------+--------+
|          3 | Michael   | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country    | 1976-11-10  | female |
|          7 | Brian     | Miller   | brian.miller@example.com    | 404 Birch St, City, Country  | 1975-06-14  | male   |
|          8 | Linda     | Taylor   | linda.taylor@example.com    | 505 Spruce St, City, Country | 1972-12-03  | female |
+------------+-----------+----------+---------------------------+---------------------------+-------------+--------+
3 rows in set (0.033 sec)
```

c) IN clause:

```
MariaDB [bankDB]> select * from B_customers where firstname IN('john','jane','Michael','jim');
+------------+-----------+----------+---------------------------+---------------------------+-------------+--------+
| CustomerID | FirstName | LastName | Email                     | Address                   | DateOfBirth | gender |
+------------+-----------+----------+---------------------------+---------------------------+-------------+--------+
|          1 | John      | Doe      | john.doe@gmail.com          | 123 Main St, City, Country | 1980-01-15  | male   |
|          2 | Jane      | Smith    | jane.smith@example.com      | 456 Elm St, City, Country  | 1985-05-20  | female |
|          3 | Michael   | Johnson  | michael.johnson@example.com | 789 Oak St, City, Country  | 1976-11-10  | female |
+------------+-----------+----------+---------------------------+---------------------------+-------------+--------+
3 rows in set (0.093 sec)
```

d) OR operator:

```
MariaDB [bankDB]> select * from accounts where accountType='savings' OR balance>5000;
+---------------+------------+-------------+---------+
| AccountNumber | CustomerID | AccountType | Balance |
+---------------+------------+-------------+---------+
|           101 |          1 | Savings     | 5000.00 |
|           103 |          3 | Savings     | 7000.75 |
|           105 |          5 | Savings     | 8900.60 |
|           107 |          7 | Savings     | 6000.20 |
|           109 |          9 | Savings     | 9800.40 |
+---------------+------------+-------------+---------+
5 rows in set (0.099 sec)
```

11. Aggregate function:

a) Count function:

```
MariaDB [bankDB]> select COUNT(customerID) from B_customers;
+--------------------+
| COUNT(customerID) |
+--------------------+
|                 10 |
+--------------------+
1 row in set (0.023 sec)

MariaDB [bankDB]>
```

b) Average function:

```
MariaDB [bankDB]> select AVG(balance) from accounts;
+--------------+
| AVG(balance) |
+--------------+
|  5020.460000 |
+--------------+
1 row in set (0.006 sec)

MariaDB [bankDB]>
```

c) SUM function:

```
MariaDB [bankDB]> select SUM(balance) from accounts;
+--------------+
| SUM(balance) |
+--------------+
|     50204.60 |
+--------------+
1 row in set (0.091 sec)

MariaDB [bankDB]>
```

12. Group by clause

```
MariaDB [bankDB]> select COUNT(gender), gender from B_customers group by gender;
+---------------+--------+
| COUNT(gender) | gender |
+---------------+--------+
|             5 | female |
|             5 | male   |
+---------------+--------+
2 rows in set (0.093 sec)

MariaDB [bankDB]>
```

13. Like operator

```
MariaDB [bankDB]> select * from B_customers where dateofbirth like '____07%';
+------------+-----------+----------+-----------------------+-------------------------+-------------+--------+
| CustomerID | FirstName | LastName | Email                 | Address                 | DateOfBirth | gender |
+------------+-----------+----------+-----------------------+-------------------------+-------------+--------+
|          4 | Emily     | Brown    | emily.brown@example.com | 101 Pine St, City, Country | 1990-07-25  | female |
+------------+-----------+----------+-----------------------+-------------------------+-------------+--------+
1 row in set (0.002 sec)

MariaDB [bankDB]> select * from B_customers where lastname like 'miller';
+------------+-----------+----------+-----------------------+-------------------------+-------------+--------+
| CustomerID | FirstName | LastName | Email                 | Address                 | DateOfBirth | gender |
+------------+-----------+----------+-----------------------+-------------------------+-------------+--------+
|          7 | Brian     | Miller   | brian.miller@example.com | 404 Birch St, City, Country | 1975-06-14  | male   |
+------------+-----------+----------+-----------------------+-------------------------+-------------+--------+
1 row in set (0.071 sec)
```

14. Union

```
MariaDB [bankDB]> select B_customers.customerID AS bank_customersID from B_customers union select accounts.customerID from accounts;
+-----------------+
| bank_customersID |
+-----------------+
|               1 |
|               2 |
|               3 |
|               4 |
|               5 |
|               6 |
|               7 |
|               8 |
|               9 |
|              10 |
+-----------------+
10 rows in set (0.004 sec)
```

15. Joins

a) INNER join:

```
MariaDB [bankDB]> SELECT B_Customers.CustomerID, b_Customers.FirstName, b_Customers.LastName, Accounts.AccountNumber
    -> FROM b_Customers
    -> INNER JOIN Accounts ON b_Customers.CustomerID = Accounts.CustomerID;
+------------+-------------+----------+---------------+
| CustomerID | FirstName   | LastName | AccountNumber |
+------------+-------------+----------+---------------+
|          1 | John        | Doe      |           101 |
|          2 | Jane        | Smith    |           102 |
|          3 | Michael     | Johnson  |           103 |
|          4 | Emily       | Brown    |           104 |
|          5 | David       | Lee      |           105 |
|          6 | Sarah       | White    |           106 |
|          7 | Brian       | Miller   |           107 |
|          8 | Linda       | Taylor   |           108 |
|          9 | Christopher | Anderson |           109 |
|         10 | Amanda      | Martinez |           110 |
+------------+-------------+----------+---------------+
10 rows in set (0.074 sec)
```

b) LEFT join:

```
MariaDB [bankDB]> SELECT b_Customers.CustomerID, b_Customers.FirstName, b_Customers.LastName, Accounts.AccountNumber
    -> FROM b_Customers
    -> LEFT JOIN Accounts ON b_Customers.CustomerID = Accounts.CustomerID;
+------------+-------------+----------+---------------+
| CustomerID | FirstName   | LastName | AccountNumber |
+------------+-------------+----------+---------------+
|          1 | John        | Doe      |           101 |
|          2 | Jane        | Smith    |           102 |
|          3 | Michael     | Johnson  |           103 |
|          4 | Emily       | Brown    |           104 |
|          5 | David       | Lee      |           105 |
|          6 | Sarah       | White    |           106 |
|          7 | Brian       | Miller   |           107 |
|          8 | Linda       | Taylor   |           108 |
|          9 | Christopher | Anderson |           109 |
|         10 | Amanda      | Martinez |           110 |
+------------+-------------+----------+---------------+
10 rows in set (0.008 sec)
```

c) RIGHT join:

```
MariaDB [bankDB]> SELECT b_Customers.CustomerID, b_Customers.FirstName, b_Customers.LastName, Accounts.AccountNumber
    -> FROM b_Customers
    -> RIGHT JOIN Accounts ON b_Customers.CustomerID = Accounts.CustomerID;
+------------+-------------+----------+---------------+
| CustomerID | FirstName   | LastName | AccountNumber |
+------------+-------------+----------+---------------+
|          1 | John        | Doe      |           101 |
|          2 | Jane        | Smith    |           102 |
|          3 | Michael     | Johnson  |           103 |
|          4 | Emily       | Brown    |           104 |
|          5 | David       | Lee      |           105 |
|          6 | Sarah       | White    |           106 |
|          7 | Brian       | Miller   |           107 |
|          8 | Linda       | Taylor   |           108 |
|          9 | Christopher | Anderson |           109 |
|         10 | Amanda      | Martinez |           110 |
+------------+-------------+----------+---------------+
10 rows in set (0.008 sec)
```

16. Subquery

```
MariaDB [bankDB]> select customerID,firstname,lastname from B_customers where customerID IN (select customerID from accounts where balance>5000);
+------------+-----------+---------+
| customerID | firstname | lastname |
+------------+-----------+---------+
|          3 | Michael   | Johnson |
|          5 | David     | Lee     |
|          7 | Brian     | Miller  |
|          9 | Christopher | Anderson |
+------------+-----------+---------+
4 rows in set (0.072 sec)

MariaDB [bankDB]>
```

17. Views

```
MariaDB [bankDB]> create view employee_view as select employeeID,firstname,lastname,position from employees;
Query OK, 0 rows affected (0.075 sec)

MariaDB [bankDB]> select * from employee_view;
+------------+-------------+----------+----------------------+
| employeeID | firstname   | lastname | position             |
+------------+-------------+----------+----------------------+
|          1 | John        | Doe      | Manager              |
|          2 | Jane        | Smith    | Sales Representative |
|          3 | Michael     | Johnson  | Analyst              |
|          4 | Emily       | Brown    | Developer            |
|          5 | David       | Lee      | Designer             |
|          6 | Sarah       | White    | Manager              |
|          7 | Brian       | Miller   | Sales Representative |
|          8 | Linda       | Taylor   | Analyst              |
|          9 | Christopher | Anderson | Developer            |
|         10 | Amanda      | Martinez | Designer             |
+------------+-------------+----------+----------------------+
10 rows in set (0.040 sec)

MariaDB [bankDB]>
```