RETAIL BANKING DATABASE

OBJECTIVE

To facilitate the bank employees for the smooth and fair running of the bank as well as provide better service to the customers. It aims to store information on customers and different bank accounts with linked products to provide fast and reliable services.

BY

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Description

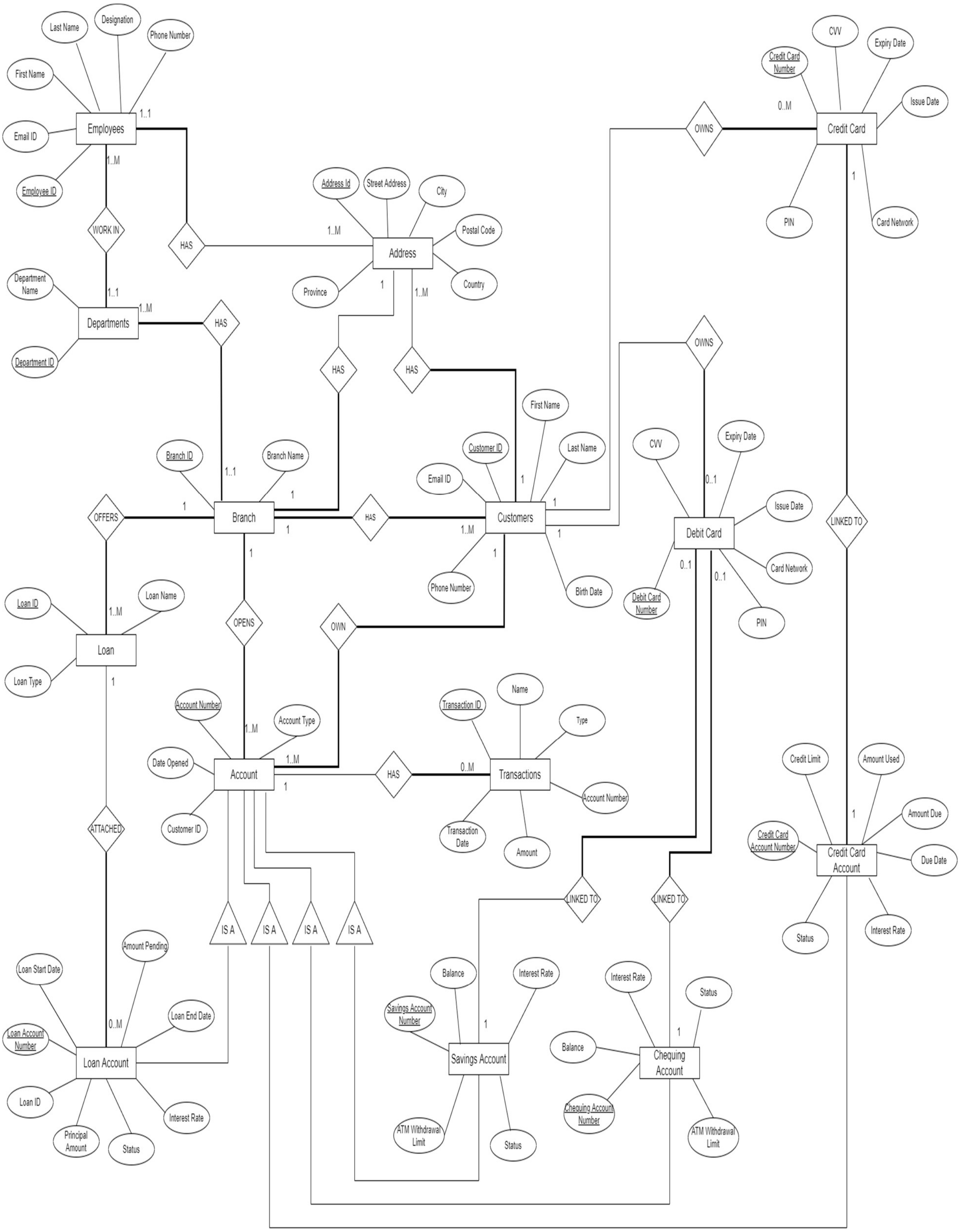
- A Bank has multiple Branch with Branch ID, Branch Name, and Address.
- Each Branch has Departments. Departments have a Department ID and Department Name.
- Employees work in Departments. Employees have Employee ID, First Name, Last Name, Designation, Address, Phone Number and Email ID. Employees can work only in one Department.
- Branch has Customers with the Customer ID, First Name, Last Name, Birth Date, Phone Number, and Email ID.
- Customers and Employees can have multiple Address.
- An Address has an Address ID, Street Address, City, Postal Code, Province, and Country.
- Each Branch opens an Account. An Account has an Account Number, Date Opened, and Account Type.
- An Account is of four types – Savings Account, Chequing Account, Loan Account, and Credit Card Account.
- A Savings Account consists of the Savings Account Number, Balance, Interest Rate, ATM Withdrawal Limit, and Status(active/inactive/frozen).
- A Chequing Account consists of the Chequing Account Number, Balance, Interest Rate, ATM Withdrawal Limit, and Status(active/inactive/frozen).
- A Loan Account consists of the Loan ID, Loan Account Number, Loan Start Date, Loan End Date, Interest Rate, Principal Amount, Status, and Amount Pending.
- A Credit Card Account consists of the Credit Card Account Number, Credit Limit, Amount Used, Amount Due, Due Date, Status, and Interest Rate.
- Customers can own multiple types of Account.
- Customers can own a Debit Card. A Debit Card has a Debit Card Number, CVV, Expiry Date, Issue Date, Card Network, and PIN.
- A Debit Card is linked to a Savings Account and a Chequing Account.
- Customers can own a Credit Card. A Credit Card consists of a Credit Card Number, CVV, Expiry Date, Issue Date, Card Network, and PIN.
- A Credit Card is linked to a Credit Card Account.
- Branch offers Loan. Every Loan is attached to a Loan Account. A Loan consists of a Loan ID, Loan Name, and Loan Type.
- Each type of Account has Transactions. Transactions consist of Transaction ID, Name, Type(debit/credit), Account Number, Amount, and Transaction Date.

Red: Entity

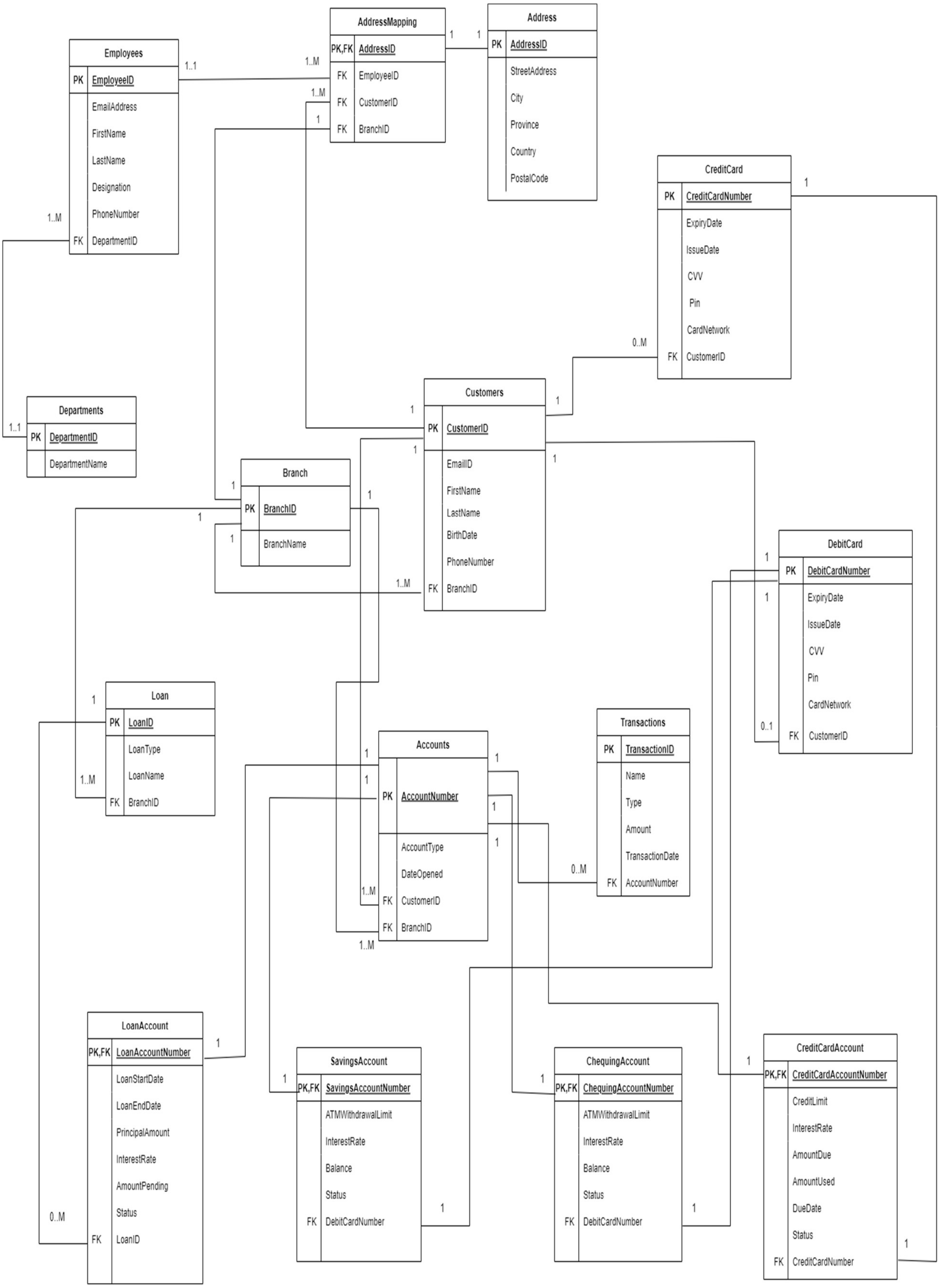
Blue: Attributes

Green: Relationships

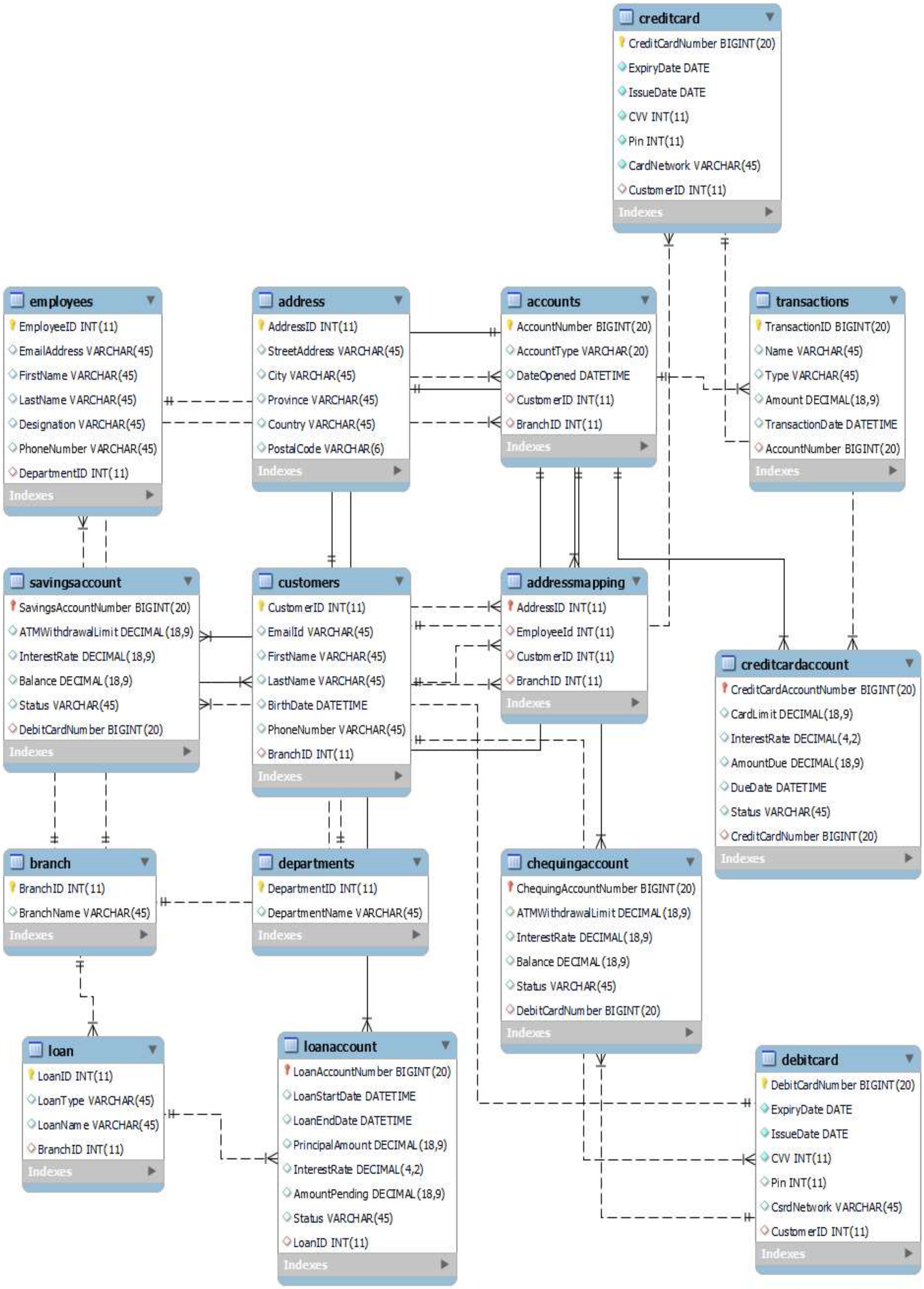
Entity Relationship Diagram



Relational Tables



MySql Tables



Normalization:

- The tables are in the third NF.

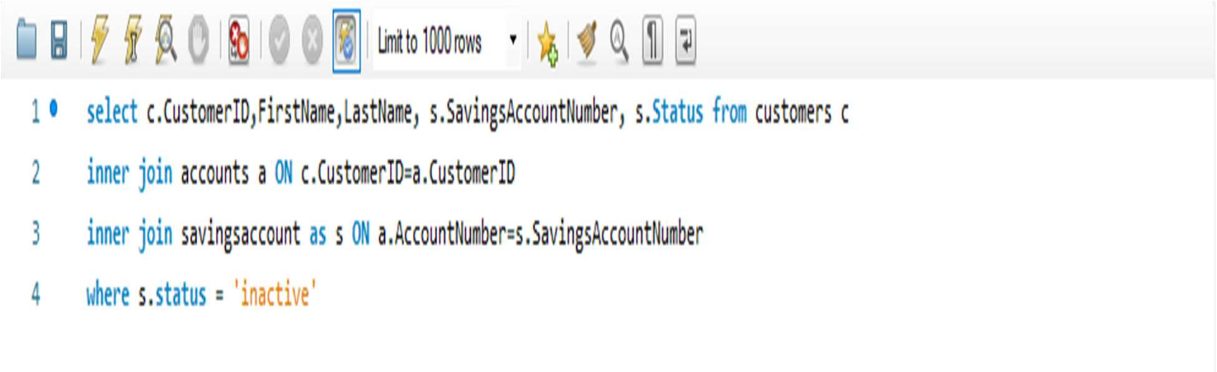
Queries

1. List customers details whose savings accounts are ‘inactive’

Algebra Query:

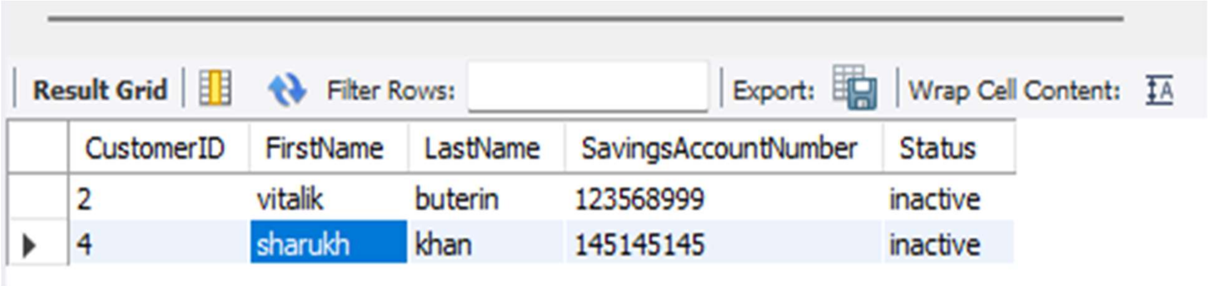
πCustomerId,FirstName,LastName,SavingsAccountNumber,Status(σ Status='Inactive'(Accounts ⋈ SavingsAccount))⋈Customers)

SQL Query:



```
select c.CustomerID,FirstName,LastName, s.SavingsAccountNumber, s.Status from customers c
inner join accounts a ON c.CustomerID=a.CustomerID
inner join savingsaccount as s ON a.AccountNumber=s.SavingsAccountNumber
where s.status = 'inactive'
```

Output:



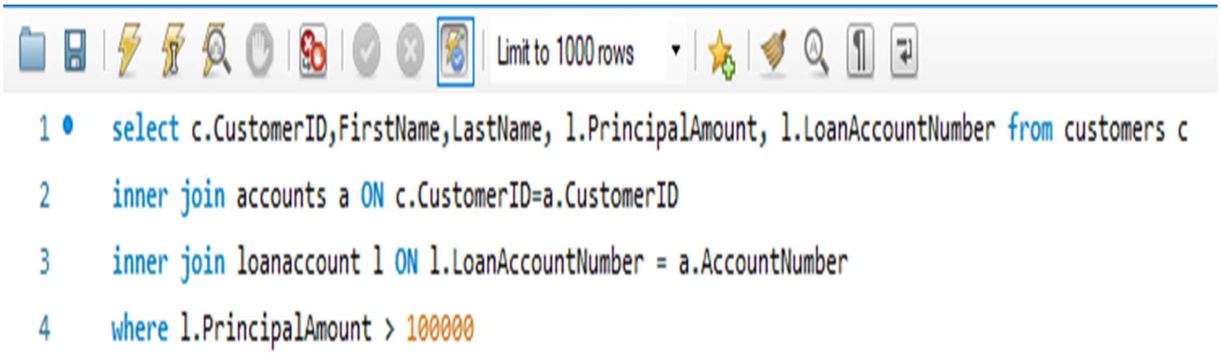
CustomerID	FirstName	LastName	SavingsAccountNumber	Status
2	vitalik	buterin	123568999	inactive
4	sharukh	khan	145145145	inactive

2. List customers details who have availed a loan greater than $1,000,00

Algebra Query:

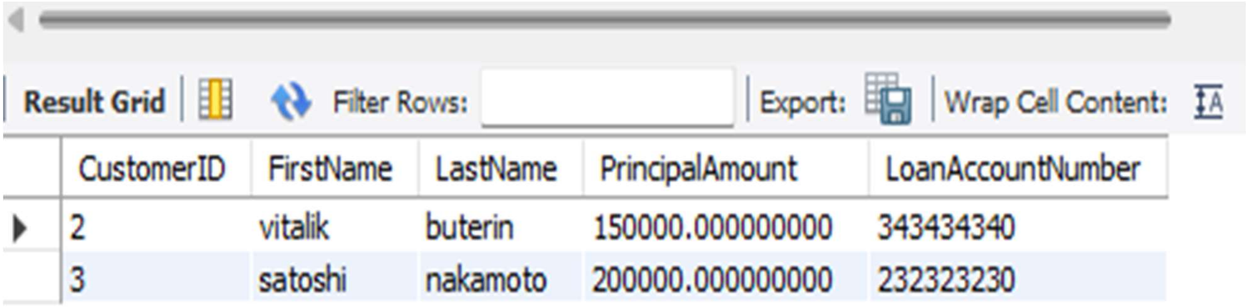
πCustomerId,FirstName,LastName,PrincipalAmount,LoanAccountNumber((((σPrinciple Amount>100000LoanAccount)⋈Loan))⋈Accounts⋈Customers)

SQL Query:



```
select c.CustomerID,FirstName,LastName, l.PrincipalAmount, l.LoanAccountNumber from customers c
inner join accounts a ON c.CustomerID=a.CustomerID
inner join loanaccount l ON l.LoanAccountNumber = a.AccountNumber
where l.PrincipalAmount > 100000
```

Output:



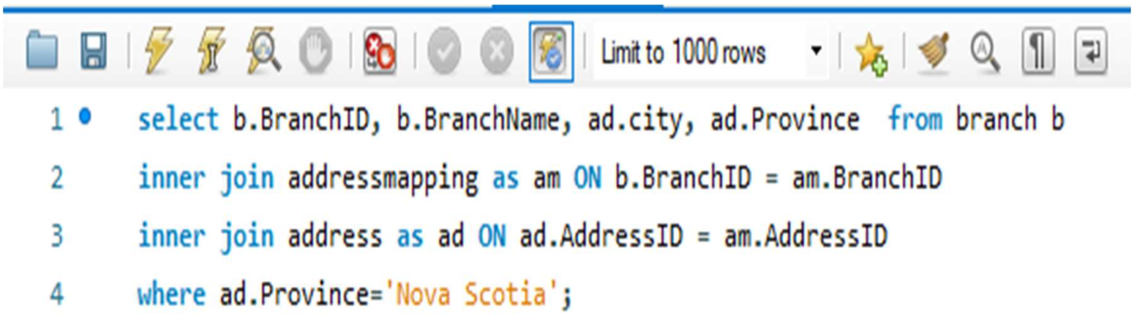
CustomerID	FirstName	LastName	PrincipalAmount	LoanAccountNumber
2	vitalik	buterin	150000.000000000	343434340
3	satoshi	nakamoto	200000.000000000	232323230

3. List all bank branches in the province of Nova Scotia.

Algebra Query:

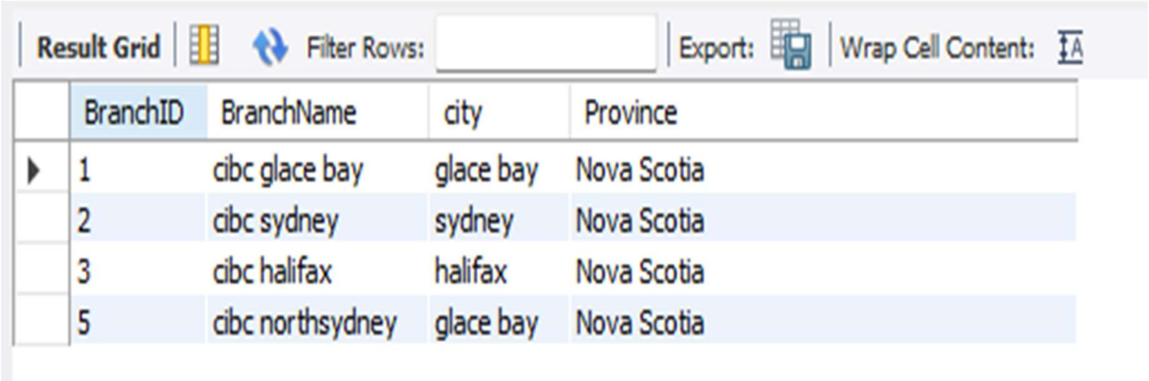
π BranchID, BranchName, City, Province(σProvince='Nova Scotia'(Branch ⋈ AddressMapping ⋈ Address))

SQL Query:



```sql
select b.BranchID, b.BranchName, ad.city, ad.Province  from branch b
inner join addressmapping as am ON b.BranchID = am.BranchID
inner join address as ad ON ad.AddressID = am.AddressID
where ad.Province='Nova Scotia';
```

Output:



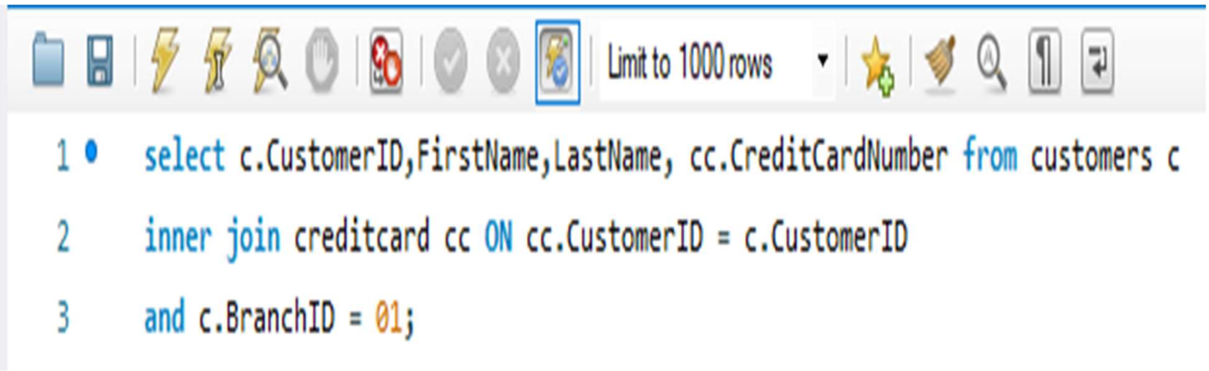
BranchID	BranchName	city	Province
1	cibc glace bay	glace bay	Nova Scotia
2	cibc sydney	sydney	Nova Scotia
3	cibc halifax	halifax	Nova Scotia
5	cibc northsydney	glace bay	Nova Scotia

4. List all the customers under Branch ID "01" who owns a credit card.

Algebra Query:

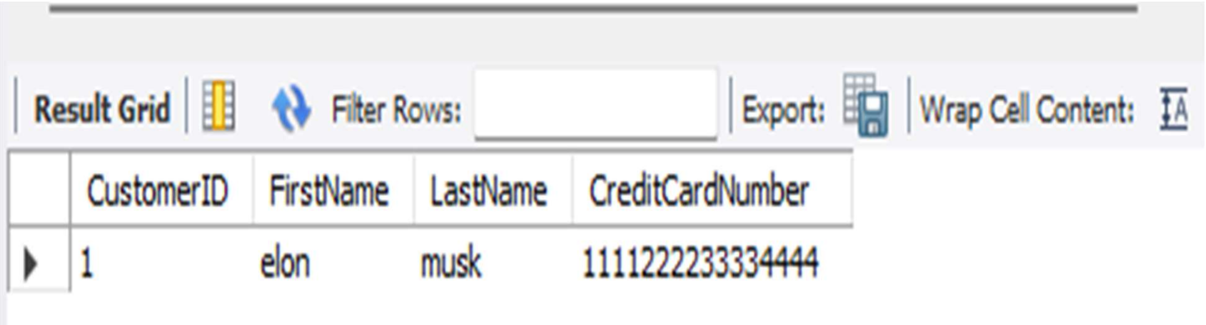
π CustomerID, FirstName, LastName, CreditCardNumber(σ BranchID=01(Customers) ⋈ (ΠCustomerID,CreditCardNumber(CreditCard))

SQL Query:



```
select c.CustomerID,FirstName,LastName, cc.CreditCardNumber from customers c
inner join creditcard cc ON cc.CustomerID = c.CustomerID
and c.BranchID = 01;
```

Output:



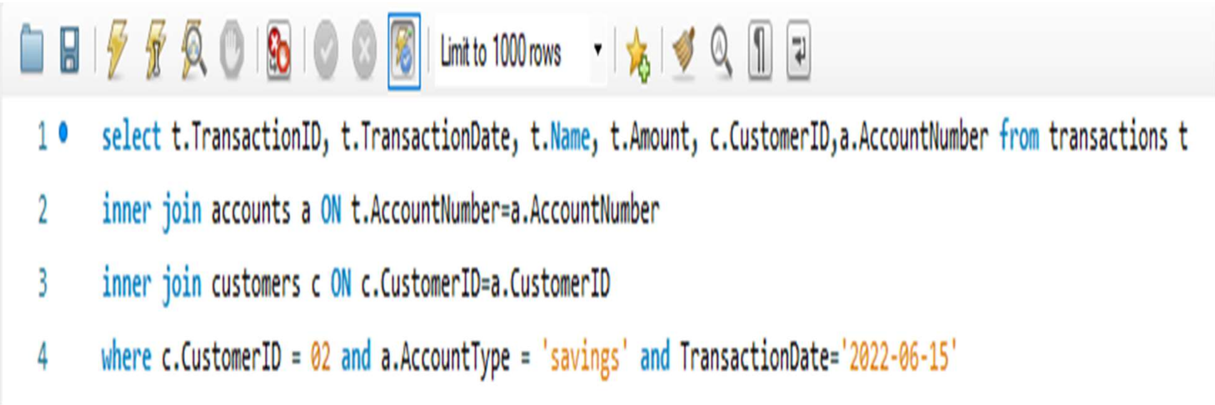
CustomerID	FirstName	LastName	CreditCardNumber
1	elon	musk	1111222233334444

5. List all the savings account transactions of customer ‘02’ on date ‘2022-06-15’.

Algebra Query:

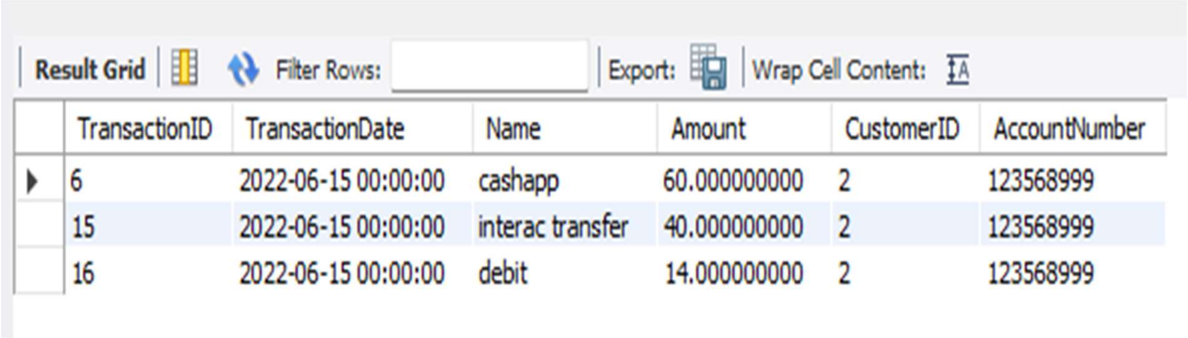
π TransactionID, Name, Amount, CustomerID, AccountNumber,Name (σCustomerID='02' and AccountType='Savings'(Customers ⋈ Accounts) ⋈ σTransactionDate='2022-06-15' Transactions)

SQL Query:



```
select t.TransactionID, t.TransactionDate, t.Name, t.Amount, c.CustomerID,a.AccountNumber from transactions t
inner join accounts a ON t.AccountNumber=a.AccountNumber
inner join customers c ON c.CustomerID=a.CustomerID
where c.CustomerID = 02 and a.AccountType = 'savings' and TransactionDate='2022-06-15'
```

Output:



TransactionID	TransactionDate	Name	Amount	CustomerID	AccountNumber
6	2022-06-15 00:00:00	cashapp	60.000000000	2	123568999
15	2022-06-15 00:00:00	interac transfer	40.000000000	2	123568999
16	2022-06-15 00:00:00	debit	14.000000000	2	123568999