ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COMPUTER GRAPHICS (CSE 2310)

Title: Bank Management System

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Introduction

Banking database systems are the core of every bank in the world. Without it, banks wouldn't be able to meet the demand of customers. This system allows banks to access customer data they need faster and reliably than they would with a normal centralized system. Customers can access their accounts remotely without going to the bank. They can transfer money to other accounts, deposit funds, take loans in a much simple way than before because of the system.

Banks will be able to modify customer data, generate a timely report either for branches or customers, run the organization in a more decentralized way in which branches are always in constant communication, change from paper-based data storage into digital form.

Background of Organization

Abay Bank was officially established on July 14, 2010 and started operation on November 4, 2010. It is named after the great Abay river to symbolize its immense potential for the country. The bank currently has more than 4,189 shareholders.

The bank provides consultancy and financial support for entrepreneurs and provides professional advice for clients to make them successful in their business. Abay bank currently offers the following services.

- Customer Account Services (Saving Deposit, Demand Deposit, Fixed Time Deposit, etc.)
- Loan Account Services
- International Banking services
- Foreign Exchange Services
- Local and international Money transfer services
- Children's Special Saving Account Services
- Youths' Special Saving Account Services
- Women's Special Saving Account Services
- Education Saving Account services
- Gift card Saving Account Services
- Club Saving Account Services
- Charity Saving Account Services
- Van Banking Service
- Muday Saving Account Services
- Senior Citizens Saving Account Services
- NGO employees Credit Services
- Interest Free Banking Services
- Abay Bedeje - Agent Banking Service
- Abay Card Banking Services
- Abay Mobile Banking Services
- Abay Online - Internet Banking Services

Objective

General Objective

The overall objective of this project to develop a system that will improve the inner working of the bank and fully convert its traditional data storage to a digital one and also improve services provided to customers.

Specific Objective

o Keep accurate data about Customers

o Making user friendly system

o Making a system that is available 24/7 for both the bank and customers

o Minimize the amount of time it takes to provide a service

o Minimize cost of resources

Scope

Our system deals with the automation of the following tasks done by either the bank or the customer: -

➢ Create Account

➢ Transfer funds

➢ Check balance

➢ Access account

➢ Generate receipt

1. User Requirements

The following is a list of all the user requirements for the system and is divided into two; the first one will be for the banks and the second for customers of the bank.

❖ **Banks**

➢ Modify customer data

➢ Generate reports

➢ Verify information given by the customer (includes Government ID, Checks)

➢ Way of communication among branches and branches with the head office

➢ Keep track of every transaction made by the customer

➢ Keep a list of each customer who has taken a loan

❖ **Customers**

➢ Create new account

➢ Transfer money

➢ Deposit money

➢ Take loans

➢ Access account remotely

➢ Get notified when changes happen to the account

➢ Get an electronic receipt (SMS) when transferring funds remotely

➢ See the current amount of money in their account

2. Entities, Attributes, and Relationships

2.1 Entities

The system has the following Entities

➔ Bank

➔ Customer

➔ Branch

➔ Bank teller

➔ Manager

➔ Loan

➔ Account

2.2 Attributes

The system has the following Attributes for each corresponding Entities

➔ Bank (B. Name, Headquarters address)

➔ Customer (C. Name, Address, phone, account number)

➔ Branch (Branch name, Manager name, Address)

➔ Bank teller (T. Name, phone, address)

➔ Manager (M. Name, phone, address, branch name)

➔ Loan (L. Type, amount, interest rate, customer name)

➔ Account (A. Type, account holder, creation date, balance)

2.2.1 Types of Attributes

Types	Attributes
Composite	C. Name, T. Name, M. Name, Customer name, Manager name
Primary key	Phone, Branch name, Account number
Simple	A. Type, account holder, Creation date, Balance, Address, B. Name, Headquarters address, L. Type
Multivalued	Amount
Stored	Interest rate

2.3 Relationships

- **Bank** has Branch
  has Customer

- **Customer** has Account
  deposit in Account

- **Branch** has Bank teller
- **Bank Teller** serves Customer
  works in Bank

- **Manager** manages Branch
  Approves Loan

- **Loan** taken by Customer

3. ER Diagram
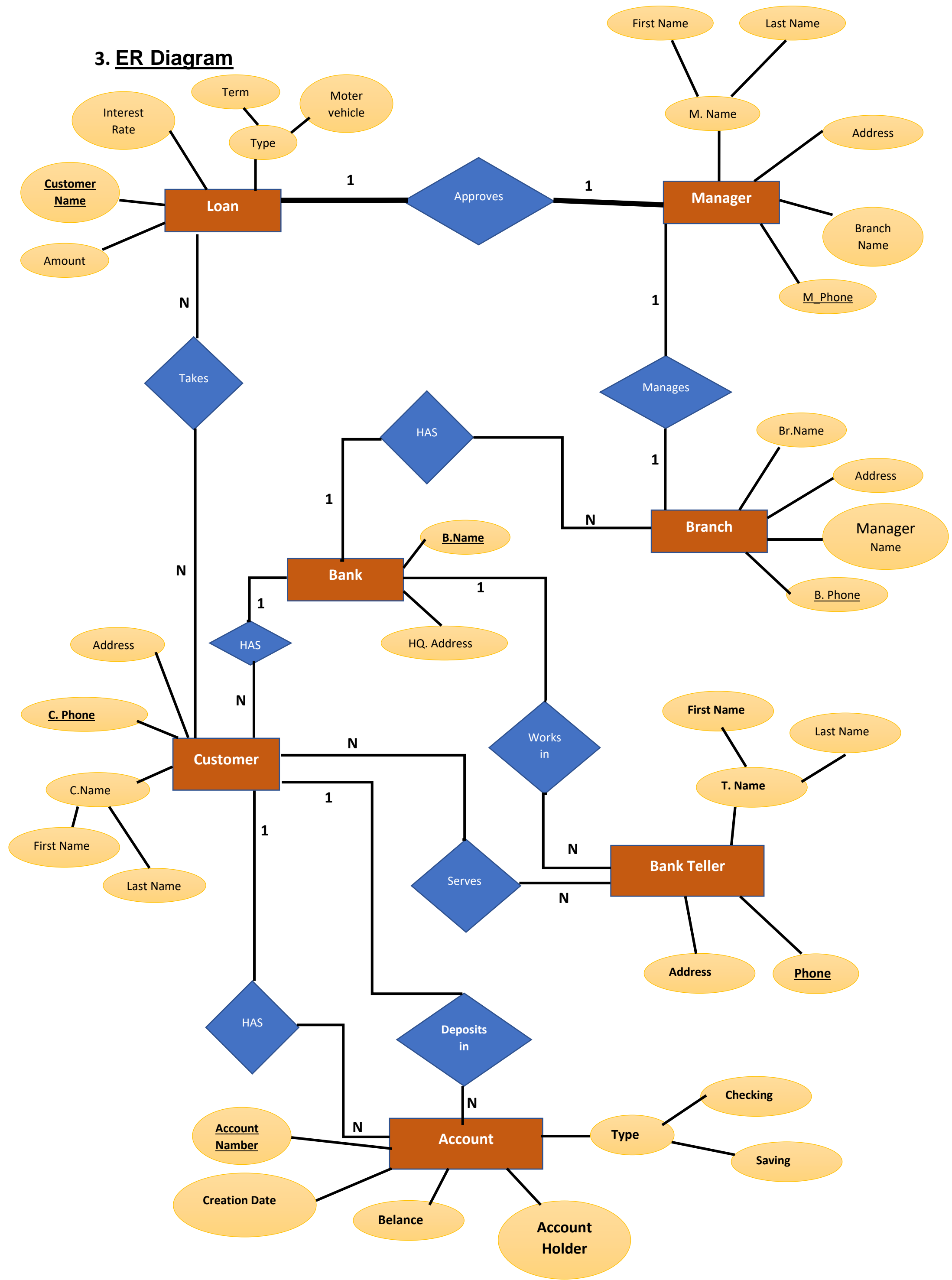
4. Relational Tables

❖ Bank

B. Name	HQ. Address
Abay Bank	Jomo Kenyatta Avenue

❖ Customer

C. Name		Phone	Address
First Name	Last Name		
Yeabsera	Lisanework	0924548362 0931470920	Yeka sub city
Ashebir	Wondemeneh	0934047361	Bole sub city
Ashagire	Selamu	0972837889 0983162063	Lideta sub city
Milkias	Solomon	0983205121	Arada sub city

❖ Branch

Branch Name	Manager Name	Address
Addisu Gebeya	Maza Shimels	Addisu Gebeya
Adey Abeba Stadium	Bethlehem Wendson	Infront Of New Stadium
Airport	Dawit Abebe	Bole

❖ Bank Teller

T. Name		Phone	Address
First Name	Last Name		
Almaz	Beyene	0913456567	Arada sub city
Saron	Belete	0922786546	Yeka sub city
Tsion	Kuru	0941237648	Bole

❖ Manager

M. Name		Branch Name	Phone	Address
First Name	Last Name			
Maza	Shimels	Addisu Gebeya	0985646875	Addisu Gebeya
Bethlehem	Wendson	Adey Abeba Stadium	0922654734	In front of New Stadium
Dawit	Abebe	Airport	0940548976	Bole

❖ Loan

Customer Name		Loan ID	Type		Amount	Interest rate
First Name	Last Name		Term	Motor Veh		
Ashebir	Wondemeneh	17785		✓	300,000	18%
Ashagire	Selamu	17786	✓		250,000	15%
		17787	✓		400,000	15%
Milkias	Solomon	17788	✓		400,000	15%

❖ Account

Account Holder	Account Number	Type		Creation date	Balance
		Saving	Checking		
Yeabsera Lisanework	100004584034	✓		12/06/2005	12,078.87
	100004584039			12/06/2006	877843.3
Ashebir Wondemeneh	100004584035		✓	08/11/1999	2,089,765
Ashagire Selamu	100004584036	✓		30/01/2005	12,345
	100006748754			30/01/2006	89,456.6
Milkias Solomon	100004584037		✓	23/04/2008	967,430.75

5. Normalization

Normalization is the branch of relational theory that provides design insights; it is the process of determining how much redundancy exists in a table. The goals of normalization are:

➢ be able to characterize the level of redundancy in relational schema
➢ provide mechanisms for transforming schemas in order to remove redundancy

5.1 First normal form (1NF)

In the first normal form, only single values are permitted at the intersection of each row and column; there are no repeating groups.

5.2 Second normal form (2NF)

For the second normal form, the relation must first be in 1NF. The relation is automatically in 2NF if, and only if, the PK comprises a single attribute.

5.3 Third normal form (3NF)

To be in third normal form, the relation must be in second normal form. Also all transitive dependencies must be removed; a non-key attribute may not be functionally dependent on another non-key attribute.

❖ The following are the normalization of our relational tables.

➢ **Loan**

Customer Name		Loan ID	Type		Amount	Interest rate
First Name	Last Name		Term	Motor Vehicle		
Ashebir	Wondemeneh	17785		✓	300,000	18%
Ashagire	Selamu	17786	✓		250,000	15%
		17787	✓		400,000	15%
Milkias	Solomon	17788	✓		400,000	15%

- **1NF**

Customer Name		Loan ID	Type		Amount	Interest rate
First Name	Last Name		Term	Motor Vehicle		
Ashebir	Wondemeneh	17785		✓	300,000	18%
Ashagire	Selamu	17786	✓		250,000	15%
Ashagire	Selamu	17787	✓		400,000	15%
Milkias	Solomon	17788	✓		400,000	15%

- **2NF**

Customer Name		Loan ID	Type		Interest rate	Account Number
First Name	Last Name		Term	Motor Vehicle		
Ashebir	Wondemeneh	17785		✓	18%	100004584035
Ashagire	Selamu	17786	✓		15%	100004584036
Ashagire	Selamu	17787	✓		15%	100067487254
Milkias	Solomon	17788	✓		15%	100004584037

Account Number	Amount
100004584035	300,000
100004584036	250,000
100067487254	400,000
100004584037	400,000

- **3NF**

Customer Name		Type ID	Interest rate	Account Number
First Name	Last Name			
Ashebir	Wondemeneh	MV	18%	100004584035
Ashagire	Selamu	TR	15%	100004584036
Ashagire	Selamu	TR	15%	100067487254
Milkias	Solomon	TR	15%	100004584037

Account Number	Amount
100004584035	300,000
100004584036	250,000
100067487254	400,000
100004584037	400,000

Type ID	Type
TR	Term
MV	Motor Vehicle

6. SQL CODE

```sql
CREATE DATABASE Abay_Bank;
USE Abay_Bank;

CREATE TABLE Loan (
    LoanID VARCHAR(20),
    LF_Name VARCHAR(20),
    LL_Name VARCHAR(20),
    Term VARCHAR(3),
     Motor_vihicle VARCHAR(3),

    Amount REAL,
    Interest_Rate varchar(4),
    PRIMARY KEY (LoanID)
);

CREATE TABLE Manager (
    First_Name VARCHAR(20),
    Last_Name VARCHAR(20),
    Branch_Name VARCHAR(20),
    M_Phone int,
    Address VARCHAR(40),
    LoanID VARCHAR(20),
    FOREIGN KEY (LoanID) REFERENCES Loan (LoanID),
    PRIMARY KEY (M_Phone)
);

CREATE TABLE Bank (
    B_Name VARCHAR(20),
    Hq_Address VARCHAR(40),
    PRIMARY KEY (B_Name)
);

CREATE TABLE Branch (
    Br_Name VARCHAR(20),
    Manage_Name VARCHAR(20),
    Address VARCHAR(40),
    B_Phone INT,
    B_Name VARCHAR(20),
    M_Phone INT,
    FOREIGN KEY (M_Phone) REFERENCES Manager (M_Phone),
    FOREIGN KEY (B_Name) REFERENCES Bank (B_Name),
    PRIMARY KEY (B_Phone)
);
```

```sql
CREATE TABLE Bank_Teller (
    First_Name VARCHAR(20),
    Last_Name VARCHAR(20),
    T_Phone INT,
    Address VARCHAR(40),
    B_Name VARCHAR(20),
    FOREIGN KEY (B_Name) REFERENCES Bank (B_Name),
    PRIMARY KEY (T_Phone)
);

CREATE TABLE Customer (
    Frist_name VARCHAR(20),
    Last_name VARCHAR(20),
    C_Phone INT,
    Address VARCHAR(40),
    PRIMARY KEY (C_Phone)
);

CREATE TABLE Takes (
    LoanID VARCHAR(20),
    C_Phone INT,
    Takes VARCHAR(20),
    FOREIGN KEY (LoanID) REFERENCES Loan (LoanID),
    FOREIGN KEY (C_Phone) REFERENCES Customer (C_Phone),
    PRIMARY KEY (LoanID , C_Phone)
);
CREATE TABLE Serves (
    C_Phone INT,
    Serves VARCHAR(20),
    T_Phone INT,
    FOREIGN KEY (T_Phone) REFERENCES Bank_Teller (T_Phone),
    FOREIGN KEY (C_Phone) REFERENCES Customer (C_Phone),
    PRIMARY KEY (C_Phone , T_Phone)
);

CREATE TABLE Account (
    Account_Number VARCHAR(20),
    Creation_Date DATE,
    Balance REAL,
    AF_Name VARCHAR(20),
    AL_Name VARCHAR(20),
    Chacking VARCHAR(3),
    Saving VARCHAR(3),
    C_Phone INT,
    FOREIGN KEY (C_Phone) REFERENCES Customer (C_Phone),
    PRIMARY KEY (Account_Number));
```

```sql
Insert into Bank values('Abay Bank','Jomo Kenyatta Avenue');

Insert into Loan values('17785','Ashebir','Wondemeneh','N','Y',300000,'18%');
Insert into Loan values('17786','Ashagire','Selamu','Y','N',250000,'15%');
Insert into Loan values('17787','Ashagire','Selamu','Y','N',400000,'15%');
Insert into Loan values('17788','Milkias','Solomon','Y','N',400000,'15%');

Insert into Manager values('Maza','Shemelse','Addisu Gebeya',0985646875,'Addisu Gebeya','17785');
Insert into Manager values('Betelhem','Wondosen','Adey Abeba Stadium',0922654734,'In Front of New Stadium','17786');
Insert into Manager values('Betelhem','Wondosen','Adey Abeba Stadium',0922654739,'In Front of New Stadium','17787');
Insert into Manager values('Dawit','Abebe','Airport',0940548976,'Bole','17788');

Insert into Customer values('Yeabsera','Lisanework',0931470920,'Yeka Sub City');
Insert into Customer values('Yeabsera','Lisanework',0924548362,'Yeka Sub City');
Insert into Customer values('Ashebir','Wondemeneh',0934047361,'Bole Sub City');
Insert into Customer values('Ashagire','Selamu',0983162063,'Lideta Sub City');
Insert into Customer values('Ashagire','Selamu',0972837889,'Lideta Sub City');
Insert into Customer values('Milkias','Solomon',0983205121,'Arada Sub City');

Insert into Bank_Teller values ('Saron','Belete',0922785546,'Yeka Sub City','Abay Bank');
Insert into Bank_Teller values('Tsion','kuru',0941237648,'Bole','Abay Bank');
Insert into Bank_Teller values('Almaz','Beyene',0912456567,'Arada Sub city','Abay Bank');

Insert into Branch values('Addisu Gebeya','Maze Shimels','Addisu Gebeya',0955866988,'Abay Bank',0985646875);
Insert into Branch values('Adey Abeba Stadium','Bethlehem Wendson','Infront of New Stadium',0988444444,'Abay Bank',0922654734);
Insert into Branch values('Airport','Dawit Abebe','Airport',0912457896,'Abay Bank',0940548976);

Insert into Account values(100004584034,'2005-06-12',1233.22,'Yeabsera','Lisanework','Y','N',0931470920);
Insert into Account values(100004584039,'2006-06-12',877843.22,'Yeabsera','Lisanework','Y','N',0924548362);
Insert into Account values(100004584035,'1999-11-08',741852.22,'Ashebir','Wondemeneh','Y','N',0934047361);
Insert into Account values(100004584036,'2005-01-30',12345.00,'Ashagire','Selamu','N','Y',0983162063);
Insert into Account values(100006748754,'2006-01-30',894566.56,'Ashagire','Selamu','N','Y',0972837889);
Insert into Account values(100004584037,'2008-04-23',100000.00,'Milkias','Solomon','N','Y',0983205121);

Insert into takes values('17785',0934047361,'Takes');
Insert into takes values('17786',0983162063,'Takes');
Insert into takes values('17786',0972837889,'Takes');
Insert into takes values('17788',0983205121,'Takes');

Insert into serves values (0931470920,'Serves',0922785546);
Insert into serves values (0924548362,'Serves',0922785546);
Insert into serves values (0934047361,'Serves',0941237648);
Insert into serves values (0983162063,'Serves',0941237648);
Insert into serves values (0972837889,'Serves',0912456567);
Insert into serves values (0983205121,'Serves',0912456567);
```
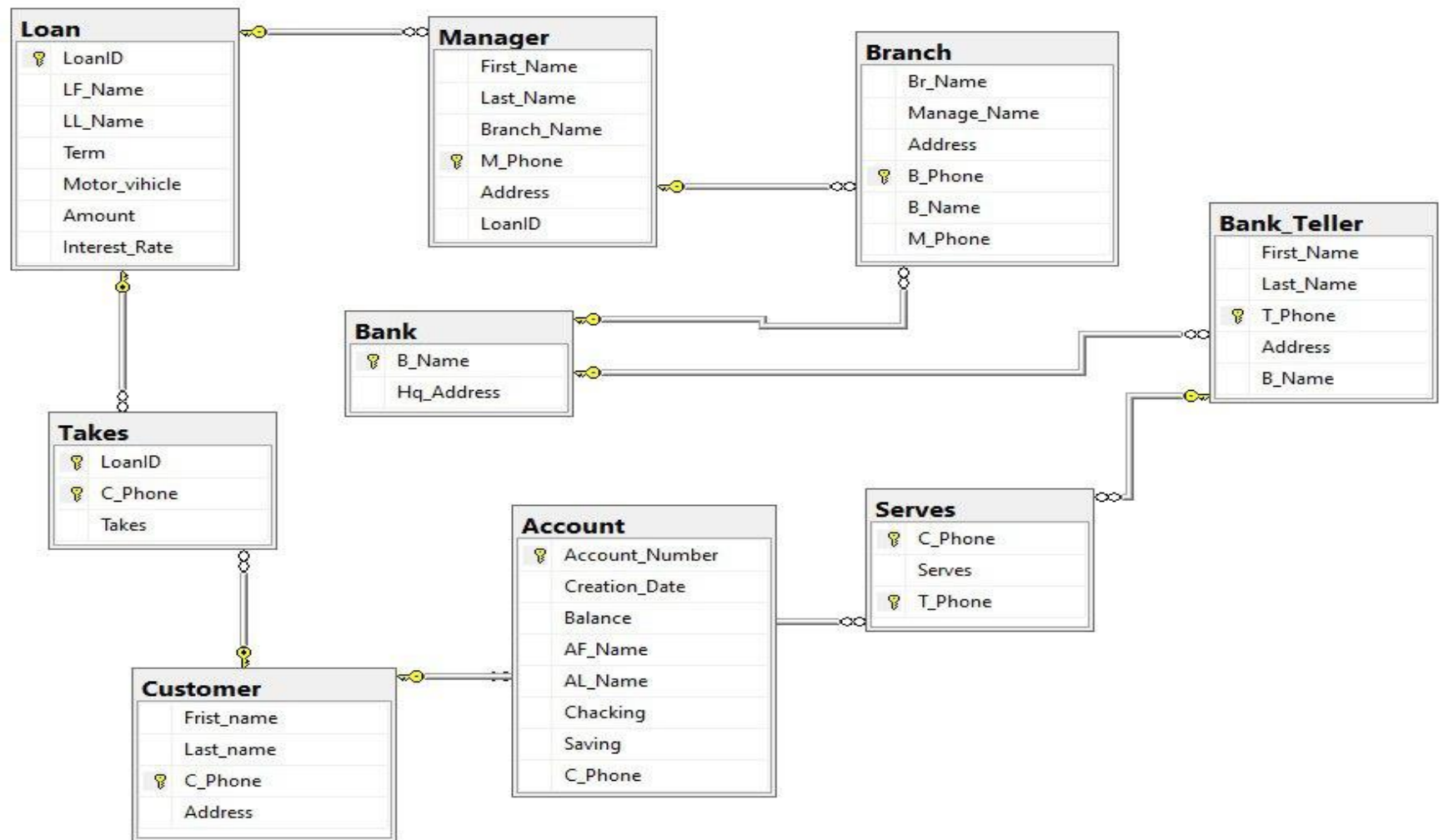
7. Table Diagram

8. OUTPUT

SQLQuery2.sql - DE...Abay_Bank (sa (56))* | **SQLQuery1.sql - DE...Abay_Bank (sa (55))**

```
select * from Branch;
```

	Br_Name	Manage_Name	Address	B_Phone	B_Name	M_Phone
1	Airport	Dawit Abebe	Airport	912457896	Abay Bank	940548976
2	Addisu Gebeya	Maze Shimels	Addisu Gebeya	955866988	Abay Bank	985646875
3	Adey Abeba Stadium	Bethlehem Wendson	Infront of New Stadium	988444444	Abay Bank	922654734

SQLQuery2.sql - DE...Abay_Bank (sa (56))* | SC

```
select * from Bank;
```

	B_Name	Hq_Address
1	Abay Bank	Jomo Kenyatta Avenue

SQLQuery2.sql - DE...Abay_Bank (sa (56))* SQLQuery1.sql - DE..

```sql
select * from Customer;
```

100 %

Results | Messages

	Frist_name	Last_name	C_Phone	Address
1	Yeabsera	Lisanework	924548362	Yeka Sub City
2	Yeabsera	Lisanework	931470920	Yeka Sub City
3	Ashebir	Wondemeneh	934047361	Bole Sub City
4	Ashagire	Selamu	972837889	Lideta Sub City
5	Ashagire	Selamu	983162063	Lideta Sub City
6	Milkias	Solomon	983205121	Arada Sub City

SQLQuery2.sql - DE...Abay_Bank (sa (56))*

```sql
select * from Takes;
```

100 %

Results | Messages

	LoanID	C_Phone	Takes
1	17785	934047361	Takes
2	17786	972837889	Takes
3	17786	983162063	Takes
4	17788	983205121	Takes

SQLQuery2.sql - DE...Abay_Bank (sa (56))* SQLQuery1.sql - DE...Abay_Bank (sa (55))

```sql
select * from Manager;
```

100 %

Results | Messages

	First_Name	Last_Name	Branch_Name	M_Phone	Address	LoanID
1	Betelhem	Wondosen	Adey Abeba Stadium	922654734	In Front of New Stadium	17786
2	Betelhem	Wondosen	Adey Abeba Stadium	922654739	In Front of New Stadium	17787
3	Dawit	Abebe	Airport	940548976	Bole	17788
4	Maza	Shemelse	Addisu Gebeya	985646875	Addisu Gebeya	17785

SQLQuery2.sql - DE...Abay_Bank (sa (56))* SQLQuery1.sql - DE...Abay_B

```sql
select * from Bank_Teller;
```

100 %

Results | Messages

	First_Name	Last_Name	T_Phone	Address	B_Name
1	Almaz	Beyene	912456567	Arada Sub city	Abay Bank
2	Saron	Belete	922785546	Yeka Sub City	Abay Bank
3	Tsion	kuru	941237648	Bole	Abay Bank

SQLQuery2.sql - DE...Abay_Bank (sa (56))* ╫ ✕ SQLQuery1.sql - DE...Abay_Bank (sa (55))

```
select * from Account;
```

100 % ▾ ◂

▦ Results ▤ Messages

	Account_Number	Creation_Date	Balance	AF_Name	AL_Name	Chacking	Saving	C_Phone
1	100004584034	2005-06-12	1233.22	Yeabsera	Lisanework	Y	N	931470920
2	100004584035	1999-11-08	741852.3	Ashebir	Wondemeneh	Y	N	934047361
3	100004584036	2005-01-30	12345	Ashagire	Selamu	N	Y	983162063
4	100004584037	2008-04-23	100000	Milkias	Solomon	N	Y	983205121
5	100004584039	2006-06-12	877843.3	Yeabsera	Lisanework	Y	N	924548362
6	100006748754	2006-01-30	894566.6	Ashagire	Selamu	N	Y	972837889

SQLQuery2.sql - DE...Abay_Bank (sa (56))* ╫ ✕

```
select * from Serves;
```

100 % ▾ ◂

▦ Results ▤ Messages

	C_Phone	Serves	T_Phone
1	924548362	Serves	922785546
2	931470920	Serves	922785546
3	934047361	Serves	941237648
4	972837889	Serves	912456567
5	983162063	Serves	941237648
6	983205121	Serves	912456567

SQLQuery2.sql - DE...Abay_Bank (sa (56))* ╫ ✕ SQLQuery1.sql - DE...Abay_Bank (sa (55))

```
select * from Loan;
```

100 % ▾ ◂

▦ Results ▤ Messages

	LoanID	LF_Name	LL_Name	Term	Motor_vihicle	Amount	Interest_Rate
1	17785	Ashebir	Wondemeneh	N	Y	300000	18%
2	17786	Ashagire	Selamu	Y	N	250000	15%
3	17787	Ashagire	Selamu	Y	N	400000	15%
4	17788	Milkias	Solomon	Y	N	400000	15%

Reference

➢ IT department of Abay Bank
➢ Customer service office of Abay Bank