Project Description

We want to build a banking management system. Consider a bank "XYZ". This bank has several branches in different cities. Each branch is identified by a unique branch id. The bank monitors the total assets of each branch. The bank administration stores each person's details like name, date of birth (DoB), street, city, province, phone numbers (a person may have more than one phone number). A person is uniquely identified by its social security number (SSN). *A person can be a customer or an employee of the bank*. Customers are uniquely identified by their customer id. Bank stores customer credit rating information. *Customers* have accounts and *can take out loans*. *Customers can be employees of the bank*. Bank employees are uniquely identified by their employee id. The bank also keeps the track of the employee's salary, employee's dependents, joining date and length of the employment (experience). *Manager manages employees from a date. A manager is also an employee.* Manager information is track by manager id which is an employee's id. *The bank offers two types of account saving and current. Accounts can be held by a single customer or more than one customer. A customer can have more than one account.* Each account is assigned a unique account number. *A branch can have multiple accounts, but an account belongs to only one branch*. The bank maintains a record of account balance. It also tracks the date and time on which the account was last accessed by each customer. Each saving account has an interest rate. Overdrafts are recorded for each current account. *A loan is approved by a particular branch. A loan can be held by one or more customers. Also, a customer can borrow multiple loan.* A loan is identified by a unique loan number. For each loan, the bank keeps track of the loan amount. Loan payments keeps payment record of all loans. *A payment number cannot uniquely identify a particular loan payment. A payment number may identify a particular payment for a specific loan*. Each payment dates and payment amounts are recorded for each loan payment.

Assignment 1

a) Identify the entities, attributes, and relationship. **(100 points)**

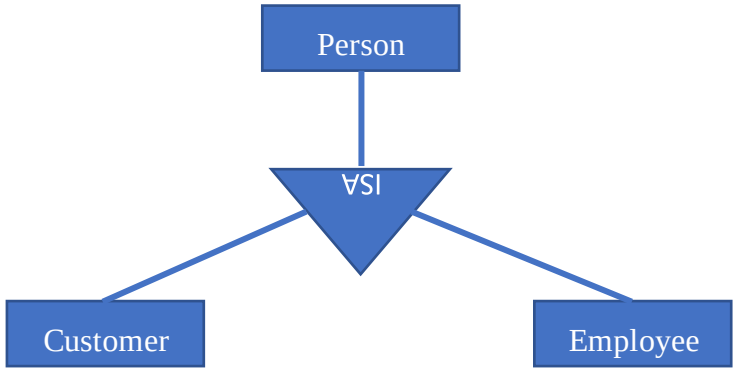
Entities and Attributes:

1. Branch (branch_id, branch_city, assets)
2. Person (ssn, name, dob, street, city, province, phone)
3. Customer (customer_id, credit_rating)
4. Employee (employee_id, salary, dependents, joining_date, experience)
5. Manager (employee_id)

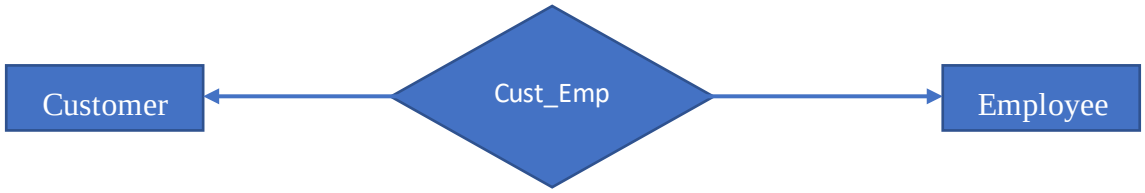
6. Account (account_number, balance, last_access_date)
7. Savings_Acc (interest_rate)
8. Current_Acc (overdrafts)
9. Loan (loan_number, loan_amount)
10. Payment (loan_payment_number, payment_date, amount)

Relationships:

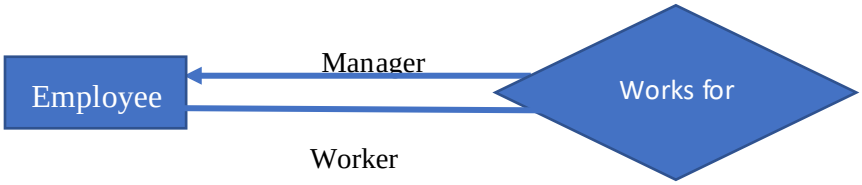
i) A person can be a customer or an employee of the bank.



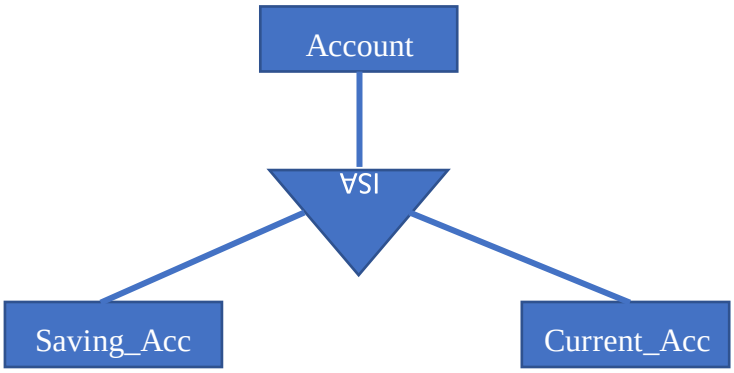
ii) One customer can be an employee of the bank and also an employee can be a customers of the bank. *Cardinality will be 1 : 1*



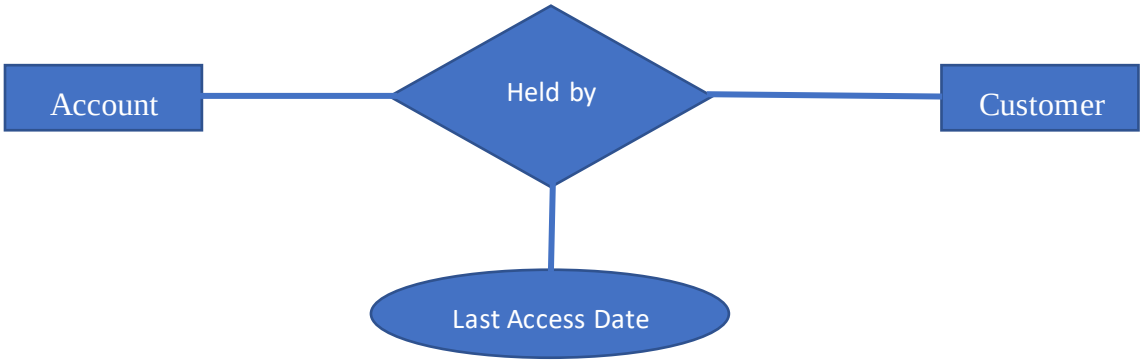
iii) Manager manages employees from a date. A manager is also an employee. (Recursive relationship exists)



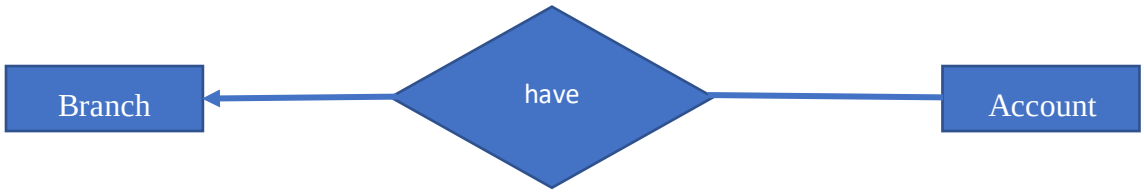
iv) The bank offers two types of account saving and current.



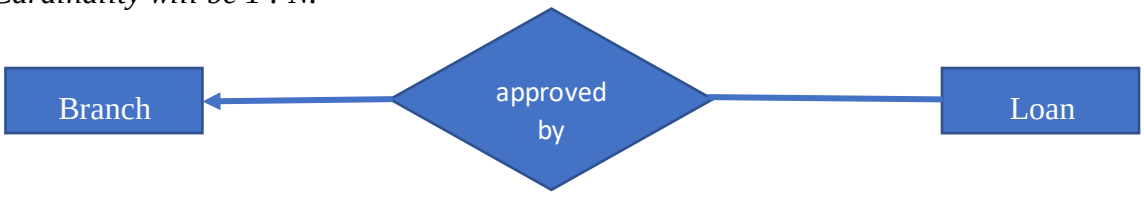
v) Accounts can be held by a single customer or more than one customer. A customer can have more than one account. Cardinality will be *M: N*



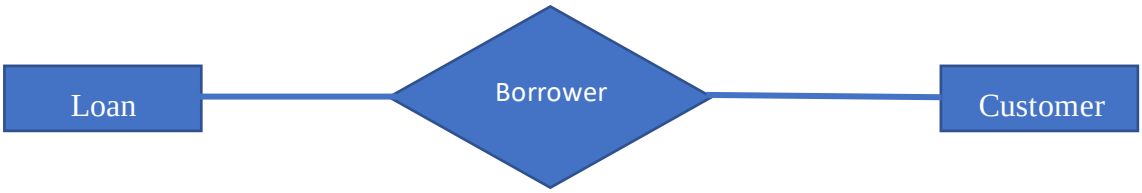
vi) A branch can have multiple accounts, but an account belongs to only one branch. *Cardinality will be 1 : N*



vii) A loan is approved by a particular branch. A branch contains multiple loan. *Cardinality will be 1 : N.*

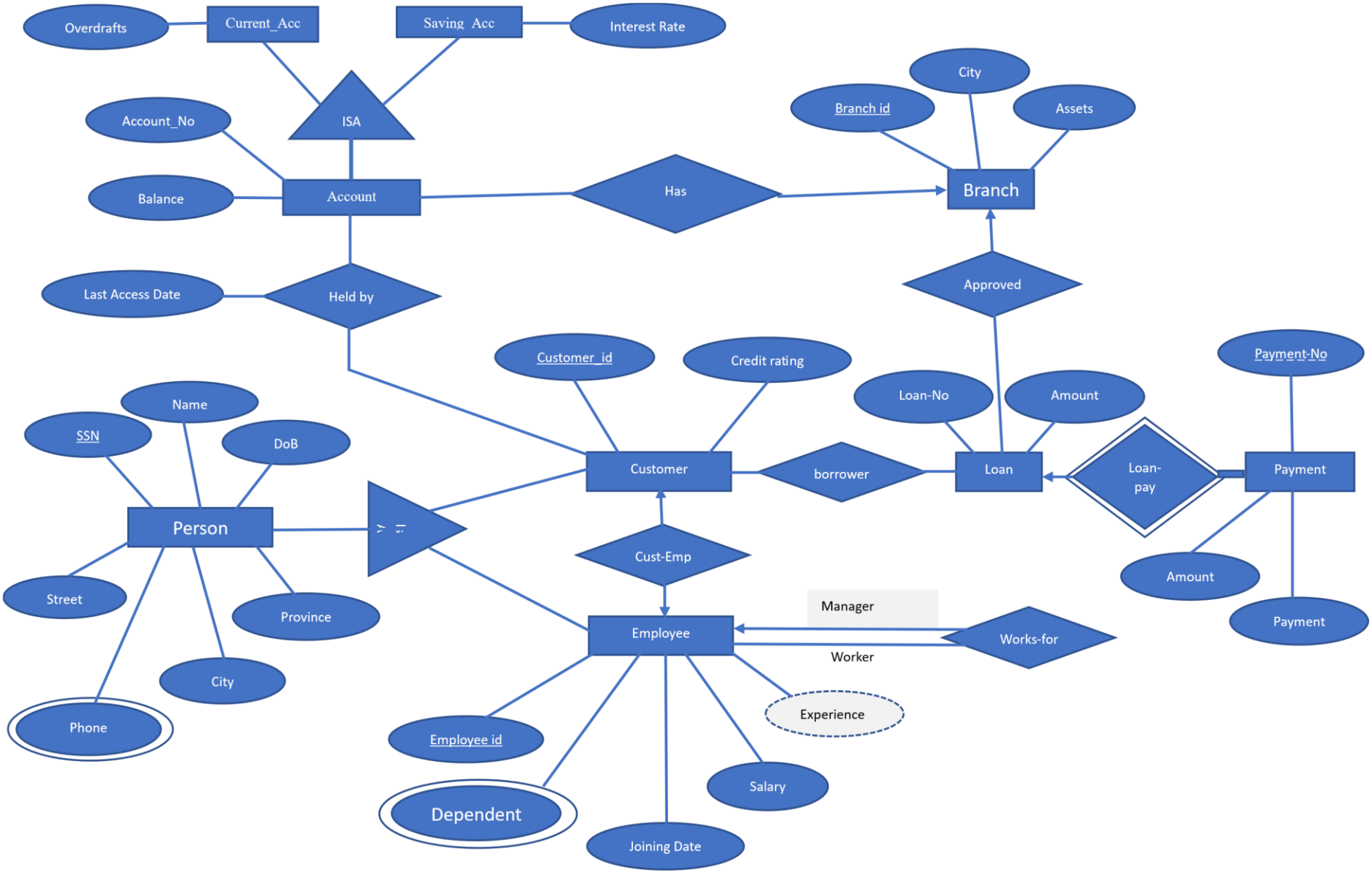


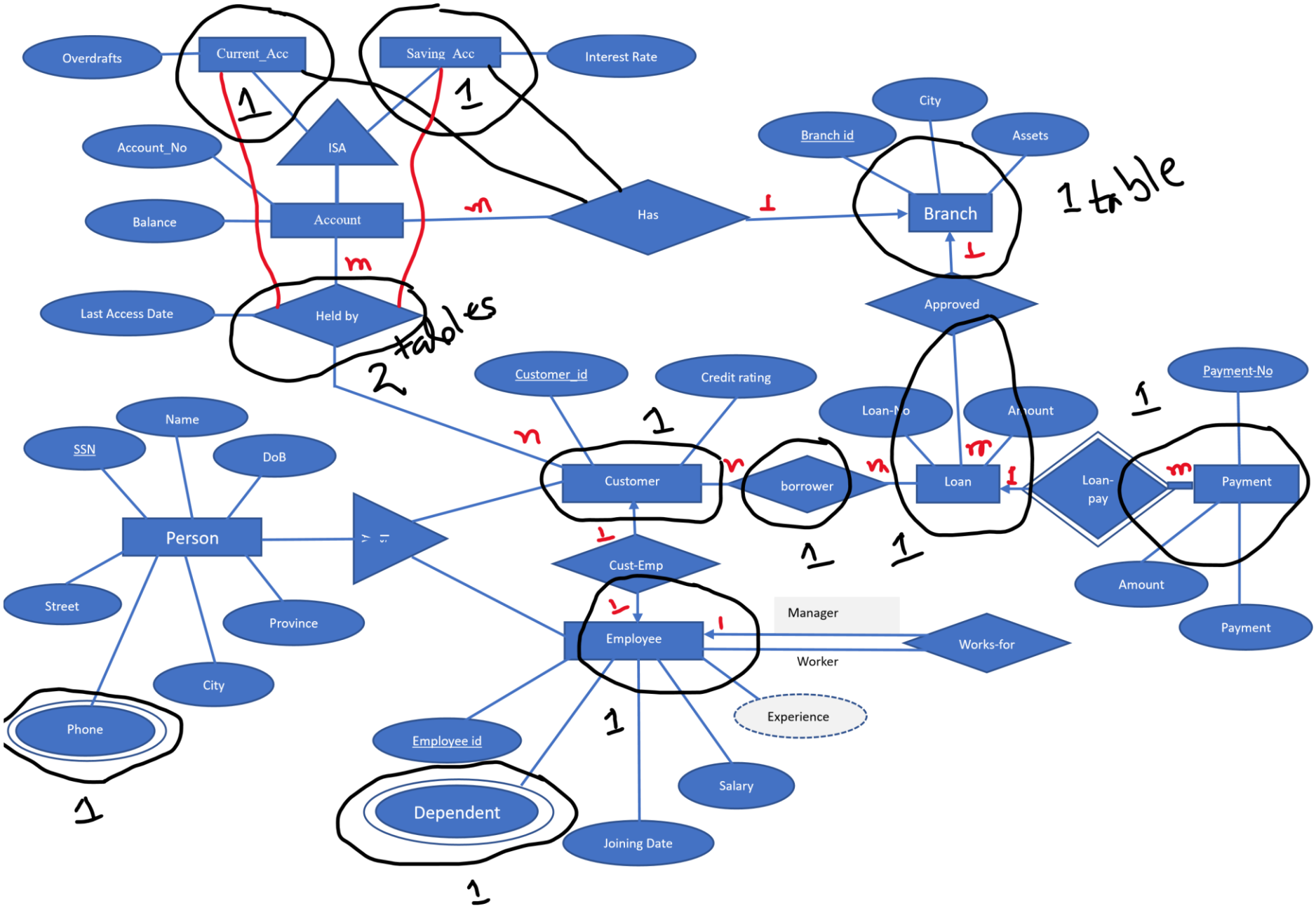
viii) A loan can be held by one or more customers. Also, a customer can borrow multiple loan. *Cardinality will be M : N*



ix) A payment number cannot uniquely identify a particular loan payment. A payment number may identify a particular payment for a specific loan. *Cardinality will be 1 : N*

b) Construct a clean and concise ER diagram and clearly indicate the cardinality mappings, participation constraints as well as any role indicators in your ER diagram. **(200 points)**


Overdrafts
Current_Acc
Saving_Acc
Interest Rate
ISA
Account_No
Balance
Account
Has
Branch id
City
Assets
Branch
Last Access Date
Held by
Approved
Customer_id
Credit rating
Loan-No
Amount
Payment-No
Name
SSN
DoB
Customer
borrower
Loan
Loan-pay
Payment
Person
Cust-Emp
Street
Province
City
Phone
Manager
Employee
Works-for
Worker
Experience
Employee id
Dependent
Salary
Joining Date
Amount
Payment



c) Find the minimum number of tables required for the above ER diagram in relational model and convert it into relational table. **(200 points)**

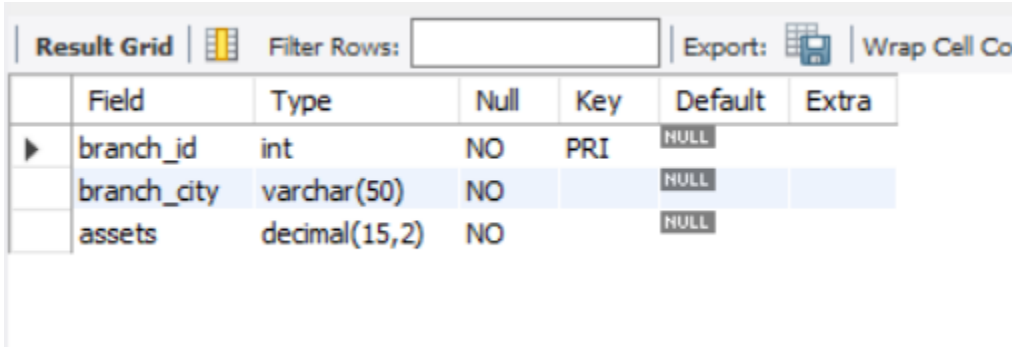
Tables / Entities and *Columns* / Attributes:

1. Branch (branch_id, branch_city, assets)
2. Person_Phone (ssn, phone)
3. Customer (customer_id, credit_rating, ssn, name, dob, street, city, province)
4. Employee (employee_id, salary, joining_date, manager_id, customer_id, ssn, name, dob, street, city, province)
5. Employee_Dependents (employee_id, dependents)
6. Savings_ Account (account_number, balance, branch_id, interest_rate)
7. Current_ Account (account_number, balance, branch_id, overdrafts)
8. Savings_Account_Customer (account_number, customer_id, last_access_date)
9. Current_ Account_Customer (account_number, customer_id, last_access_date)
10. Loan (loan_number, loan_amount, branch_id)
11. Customer_Loan (customer_id, loan_number)
12. Payment (loan_number, loan_payment_number, payment_date, amount)

Assignment 2

a) Insert data into each table of assignment 1 (c). **(100 points)**

Branch:



Field	Type	Null	Key	Default	Extra
branch_id	int	NO	PRI	NULL	
branch_city	varchar(50)	NO		NULL	
assets	decimal(15,2)	NO		NULL	

Result Grid | Filter Rows:

branch_id	branch_city	assets
1	thu dau hai	999.00
2	ho chi minh	100.00
3	hai phong	88.00
4	binh duong	60.00
NULL	NULL	NULL

Current_Account

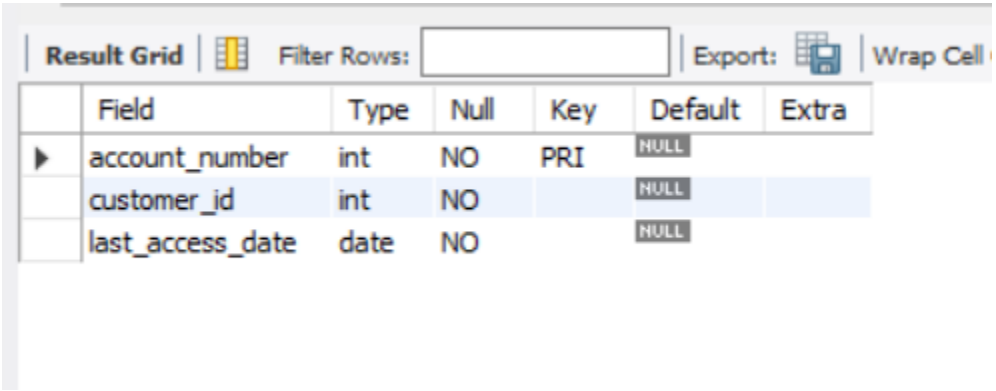
Result Grid | Filter Rows: | Export: | Wrap Cell Conter

Field	Type	Null	Key	Default	Extra
account_number	int	NO	PRI	NULL	
balance	decimal(15,2)	NO		NULL	
branch_id	int	NO		NULL	
overdrafts	int	NO		NULL	

Result Grid | Filter Rows: | Edit:

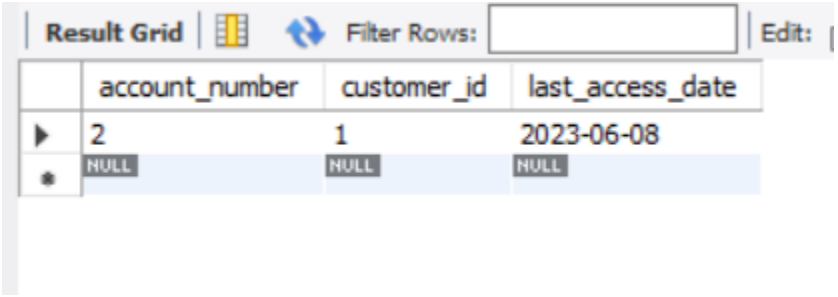
account_number	balance	branch_id	overdrafts
2	100.00	1	200
NULL	NULL	NULL	NULL

Current_Account_Customer



Result Grid | Filter Rows: | Export: | Wrap Cell

Field	Type	Null	Key	Default	Extra
account_number	int	NO	PRI	NULL	
customer_id	int	NO		NULL	
last_access_date	date	NO		NULL	



Result Grid | Filter Rows: | Edit:

account_number	customer_id	last_access_date
2	1	2023-06-08
NULL	NULL	NULL

Customer

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Field	Type	Null	Key	Default	Extra
customer_id	int	NO	PRI	NULL	
credit_rating	int	NO		NULL	
ssn	varchar(11)	NO		NULL	
name	varchar(50)	NO		NULL	
dob	date	NO		NULL	
street	varchar(50)	NO		NULL	
city	varchar(50)	NO		NULL	
province	varchar(50)	NO		NULL	

Result Grid | Filter Rows: | Edit: | Export/Import: | W

customer_id	credit_rating	ssn	name	dob	street	city	province
1	100	3	viet	2014-06-13	binh phuoc	bd	bd
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Customer_loan

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Field	Type	Null	Key	Default	Extra
customer_id	int	NO	PRI	NULL	
loan_number	int	NO	PRI	NULL	

customer_id	loan_number
1	1
NULL	NULL

Employee

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Field	Type	Null	Key	Default	Extra
employee_id	int	NO	PRI	NULL	
salary	decimal(10,2)	NO		NULL	
joining_date	date	NO		NULL	
manager_id	int	YES		NULL	
customer_id	int	YES		NULL	
ssn	varchar(11)	NO		NULL	
name	varchar(50)	NO		NULL	
dob	date	NO		NULL	
street	varchar(50)	NO		NULL	
city	varchar(50)	NO		NULL	
province	varchar(50)	NO		NULL	

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

employee_id	salary	joining_date	manager_id	customer_id	ssn	name	dob	street	city	province
1	50000.00	2018-06-15	1	1	1	Huyen	1996-04-25	Tran Hung Dao	hcm	hcm
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Employee_dependents

Result Grid | Filter Rows: | Export: | Wrap

Field	Type	Null	Key	Default	Extra
employee_id	int	NO	PRI	NULL	
dependents	int	NO		NULL	

Result Grid | Filter Rows:

employee_id	dependents
1	1
NULL	NULL

Loan

Result Grid | Filter Rows: | Export: | Wrap Cell Con

Field	Type	Null	Key	Default	Extra
loan_number	int	NO	PRI	NULL	
loan_amount	decimal(15,2)	NO		NULL	
branch_id	int	NO		NULL	

Result Grid | Filter Rows:

loan_number	loan_amount	branch_id
1	100.00	1
NULL	NULL	NULL

Payment

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Field	Type	Null	Key	Default	Extra
loan_number	int	NO	PRI	NULL	
loan_payment_number	int	NO	PRI	NULL	
payment_date	date	NO		NULL	
amount	decimal(10,2)	NO		NULL	

Result Grid | Filter Rows: | Edit:

loan_number	loan_payment_number	payment_date	amount
1	10000	2023-06-23	999999.00
NULL	NULL	NULL	NULL

Person_phone

Result Grid | Filter Rows: | Export:

Field	Type	Null	Key	Default	Extra
ssn	varchar(11)	NO	PRI	NULL	
phone	varchar(15)	NO		NULL	

Result Grid | Filter Rows:

ssn	phone
1	0938456254
NULL	NULL

Savings_account

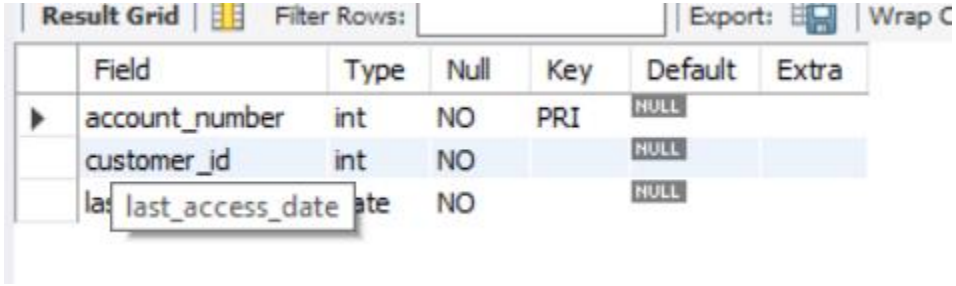
Result Grid | Filter Rows: | Export: | Wrap Cell Content:

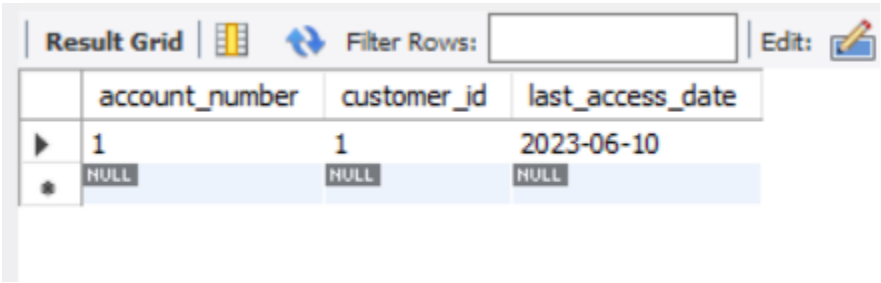
Field	Type	Null	Key	Default	Extra
account_number	int	NO	PRI	NULL	
balance	decimal(15,2)	NO		NULL	
branch_id	int	NO		NULL	
interest_rate	decimal(5,2)	NO		NULL	

Result Grid | Filter Rows: | Edit:

account_number	balance	branch_id	interest_rate
1	232323.00	1	15.00
NULL	NULL	NULL	NULL

Savings_account_customer





b) Find all the possible functional dependencies (FD's) for each relation tables. **(200 points)**

Branch

Branch ID -> Branch City

Branch ID -> Assets

Branch city -> Assets

Branch City -> Branch ID

Person_phone

ssn -> phone

phone -> ssn

(ssn, phone) -> ssn

(ssn, phone) -> phone

Customer

customer_id -> credit_rating, ssn, name, dob, street, city, province
ssn -> name, dob
street, city, province -> customer_id
customer_id -> street, city, province
ssn -> customer_id
customer_id -> ssn

Employee

employee_id -> salary, joining_date, manager_id, customer_id, ssn, name, dob, street, city, province

Employee_Dependents

employee_id -> dependents

Savings_Account

account_number -> balance, branch_id, interest_rate

Current_Account

account_number -> balance, branch_id, overdrafts

Savings_Account_Customer

account_number -> customer_id, last_access_date
customer_id -> account_number, last_access_date

Current_Account_Customer

account_number -> customer_id, last_access_date
customer_id -> account_number, last_access_date

Loan

loan_number -> loan_amount, branch_id

Customer_Loan

customer_id -> loan_number

Payment

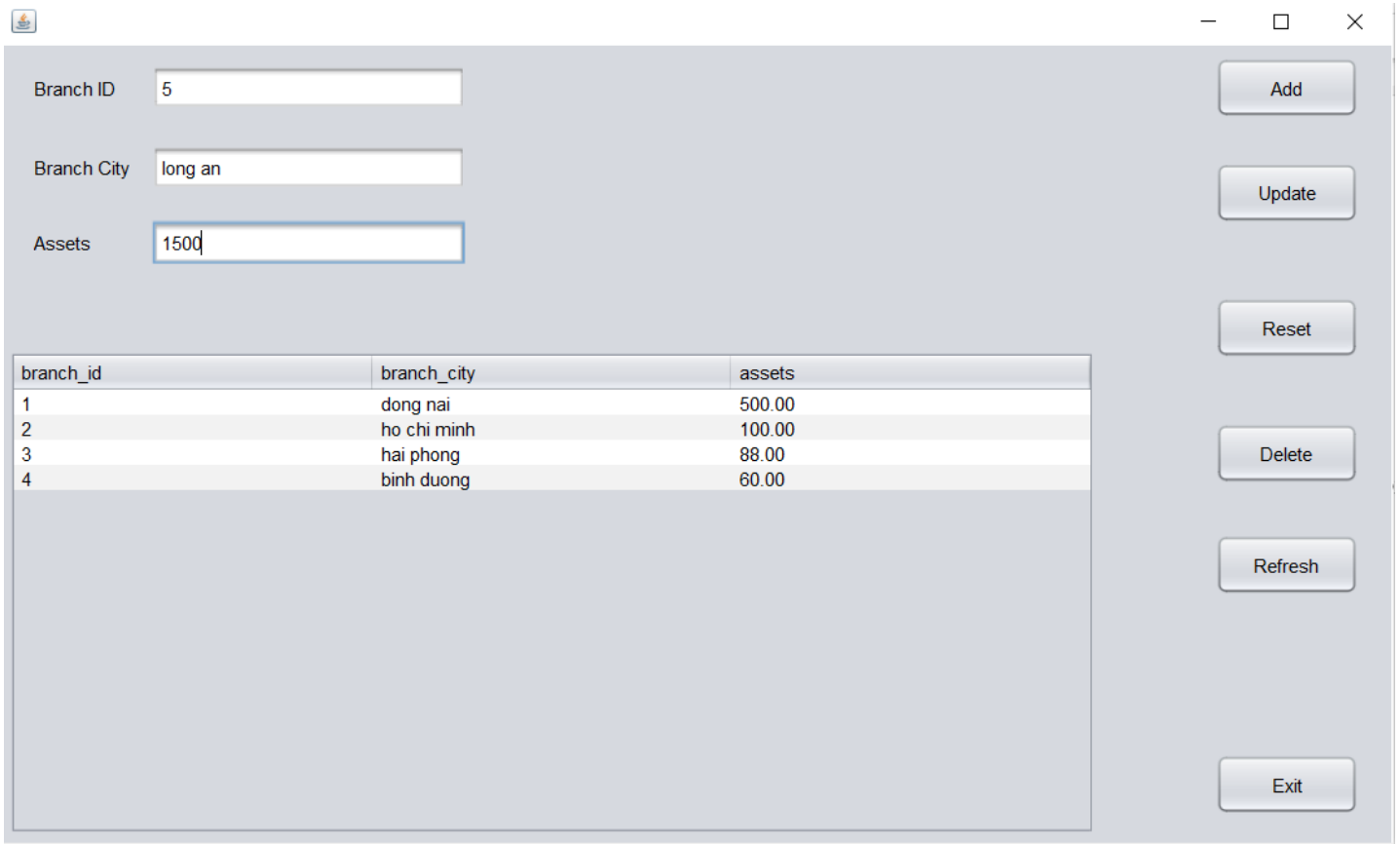
loan_number -> loan_payment_number, payment_date, amount

c) Normalize all tables up to third normal form (3NF). **(200 points)**

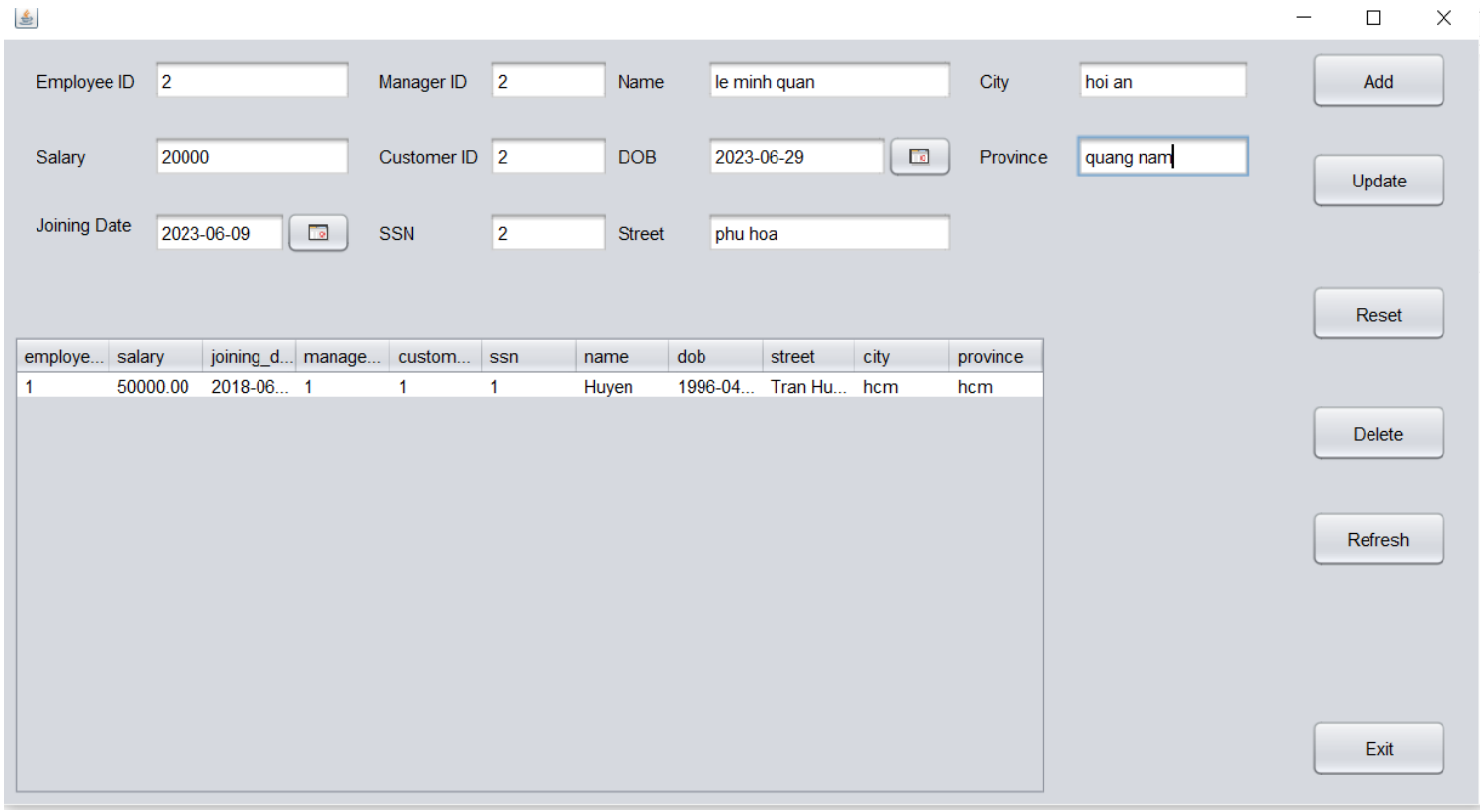
Assignment 3

Create a GUI based application using Core Java and MySQL to implement above system. GUI application will contain following criteria: **(1000 points)**

a) Create or insert data into database.

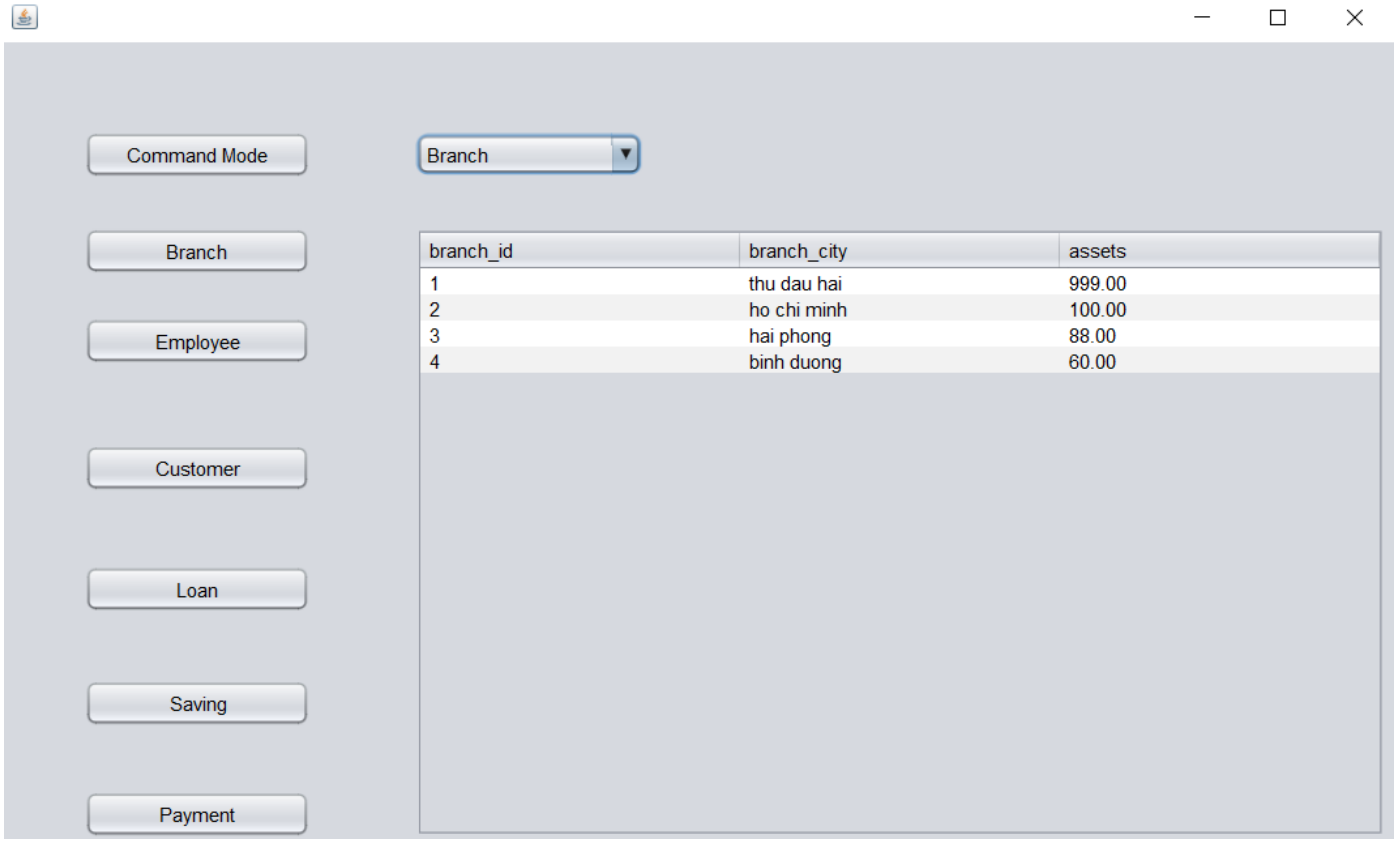


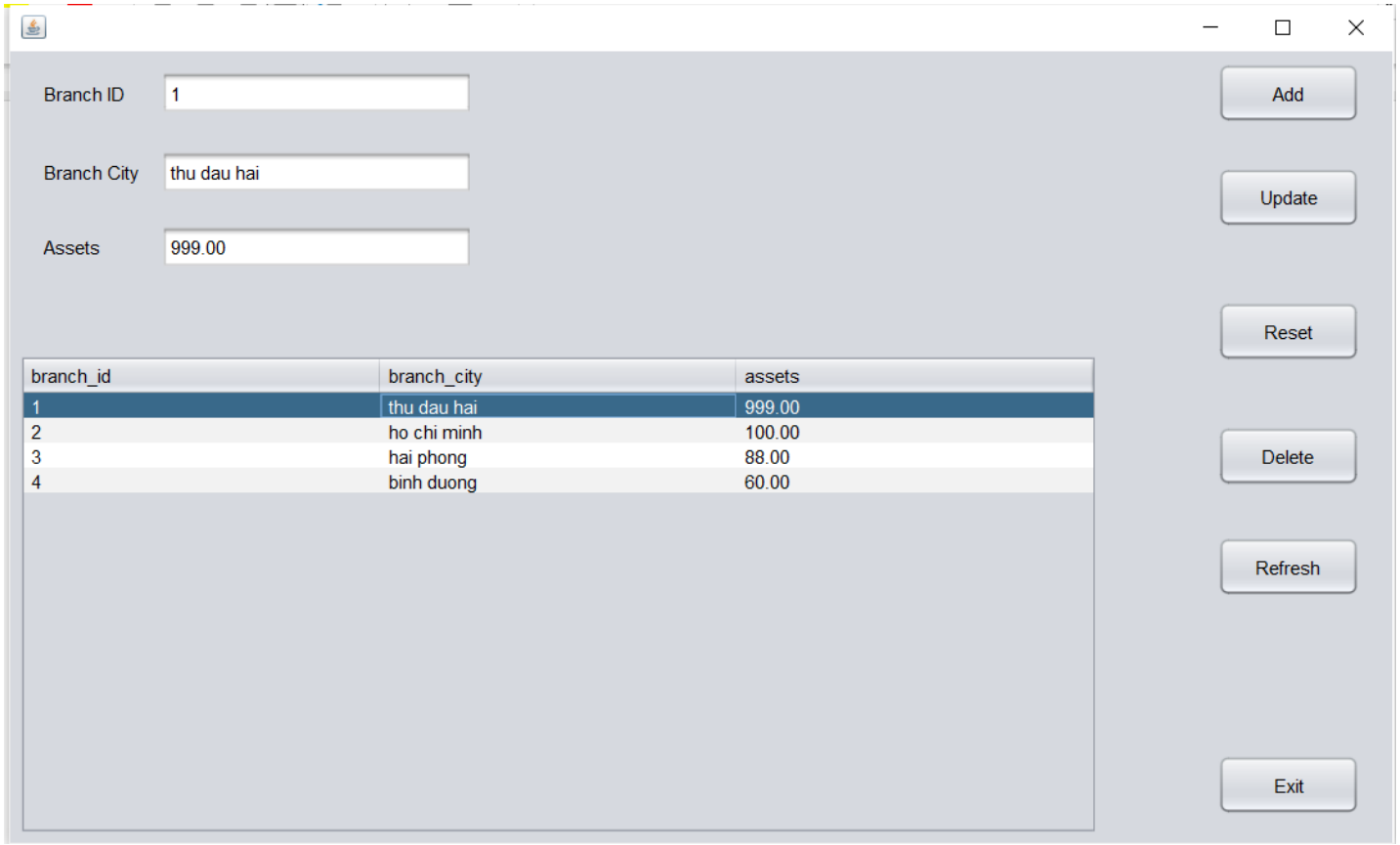
branch_id	branch_city	assets
1	dong nai	500.00
2	ho chi minh	100.00
3	hai phong	88.00
4	binh duong	60.00
5	long an	1500.00

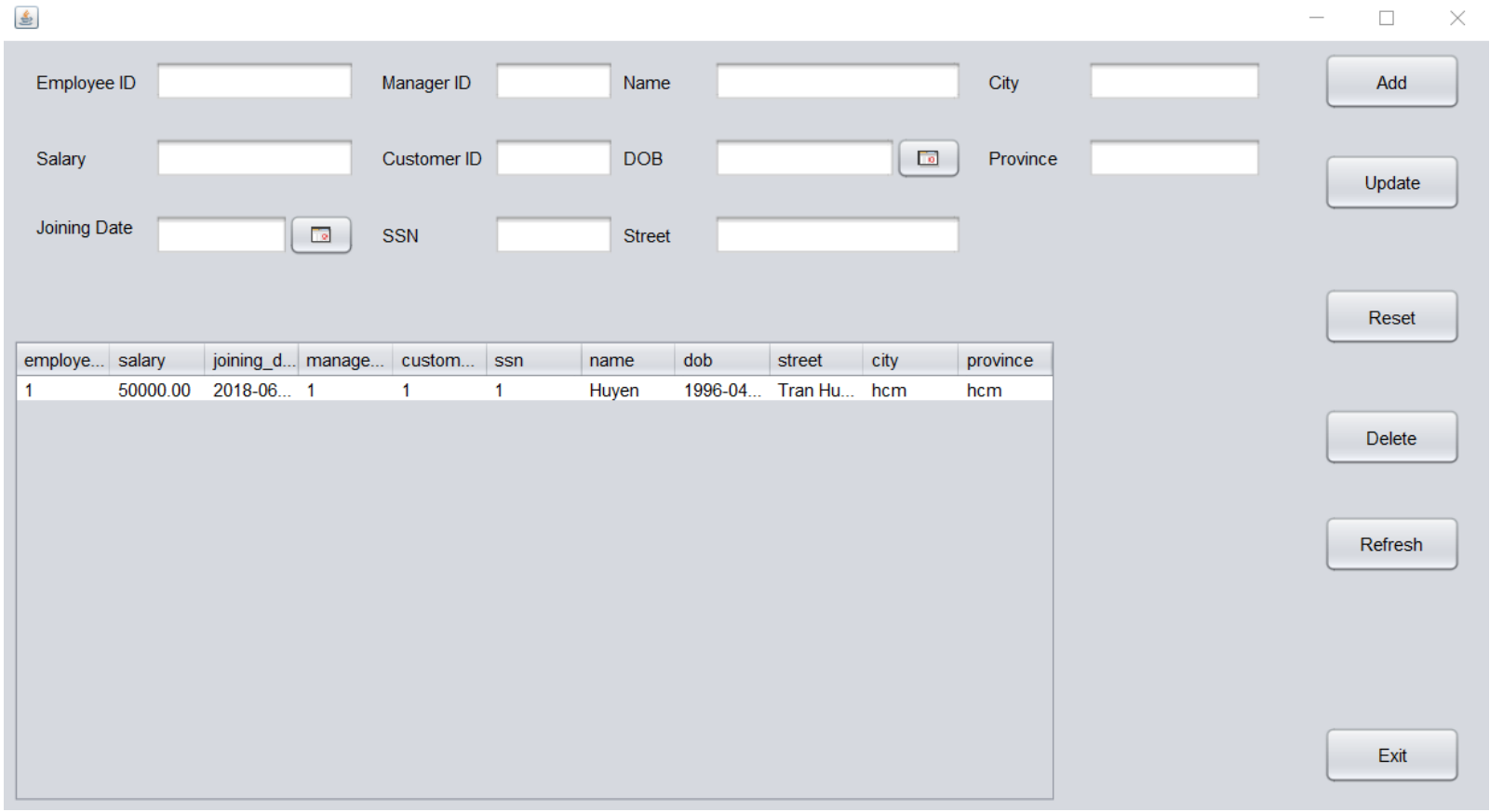


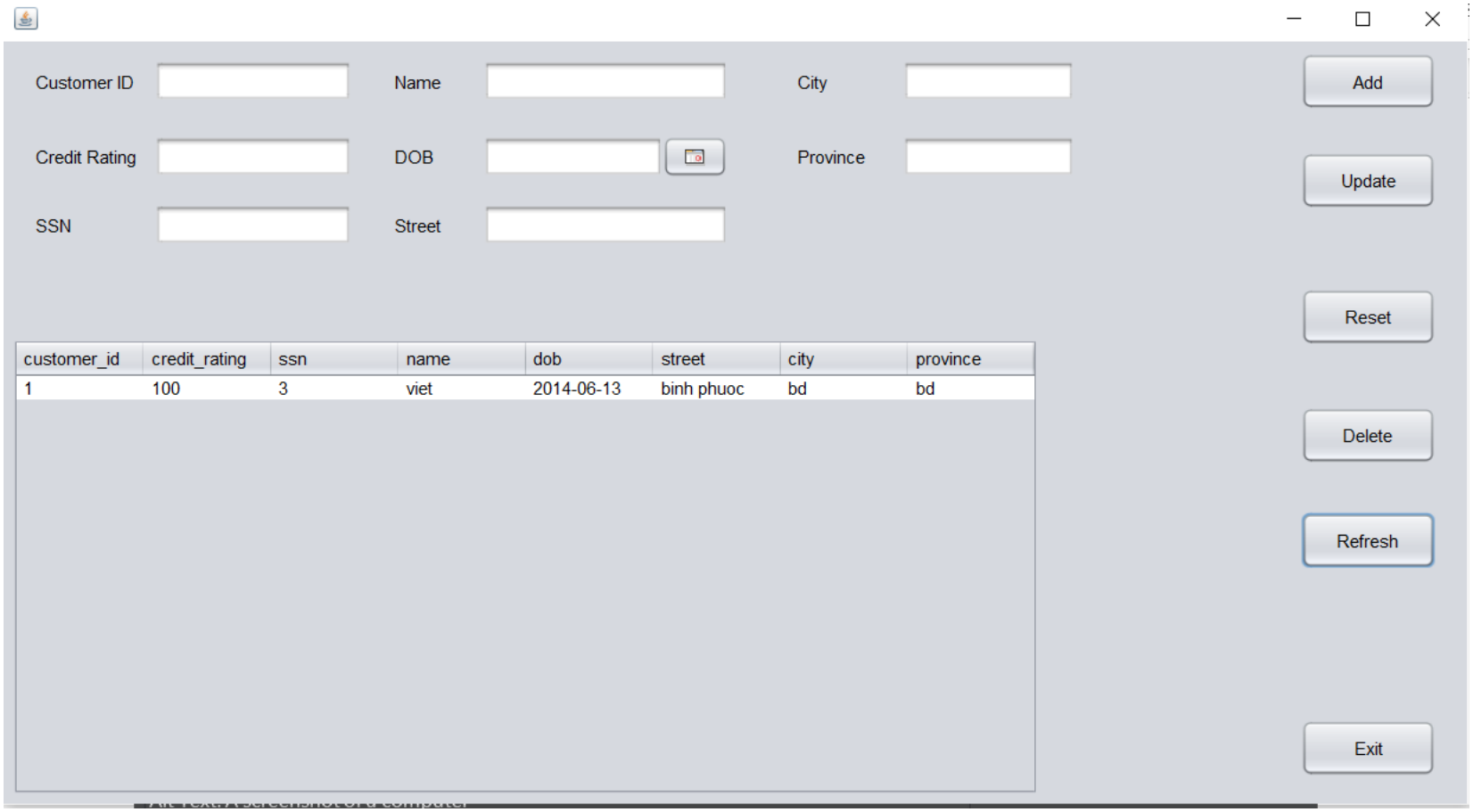
employe...	salary	joining_d...	manage...	custom...	ssn	name	dob	street	city	province
1	50000.00	2018-06...	1	1	1	Huyen	1996-04...	Tran Hu...	hcm	hcm
2	20000.00	2023-06...	2	2	2	le minh ...	2023-06...	phu hoa	hoi an	quang n...

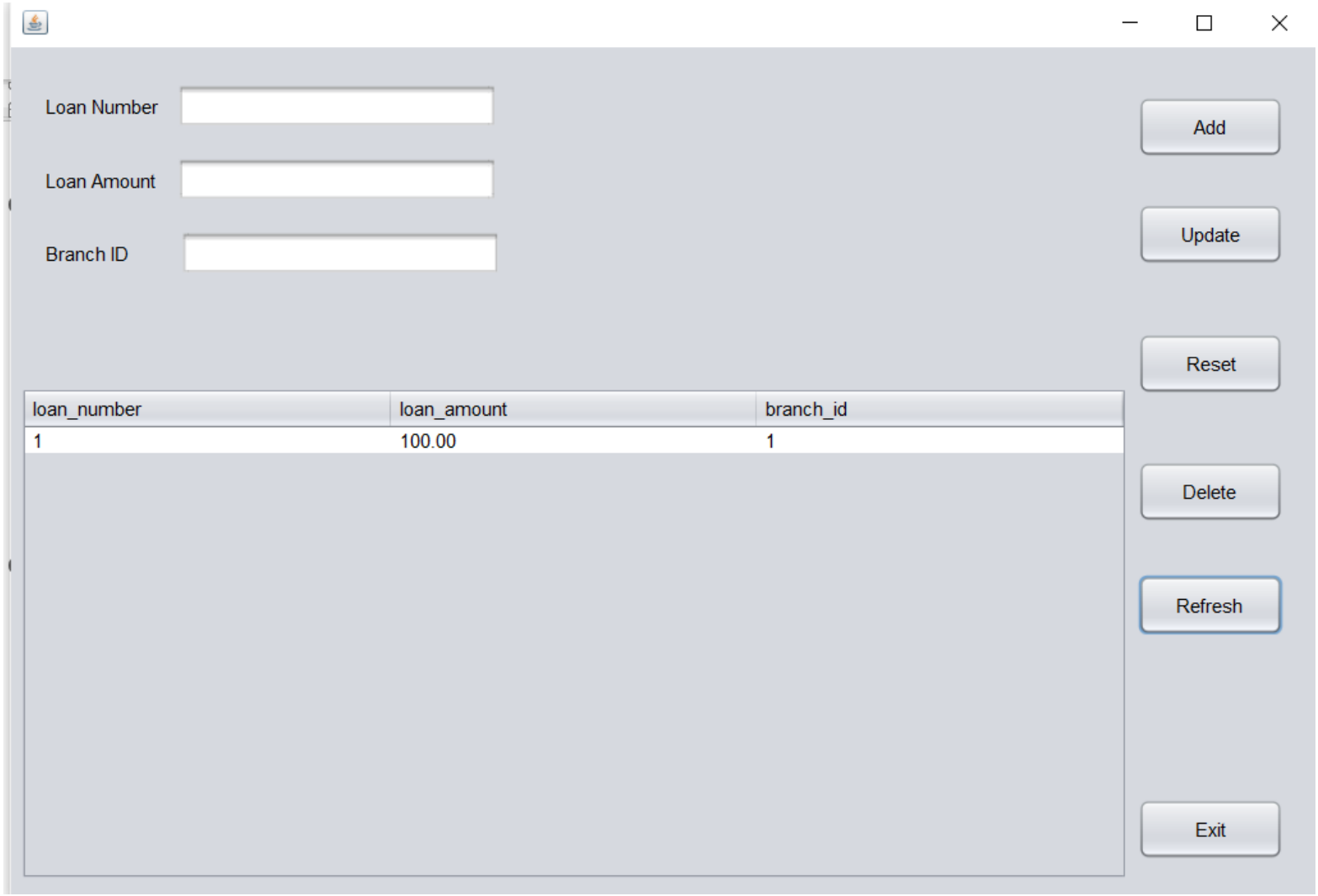
b) Read or select and display data from database.

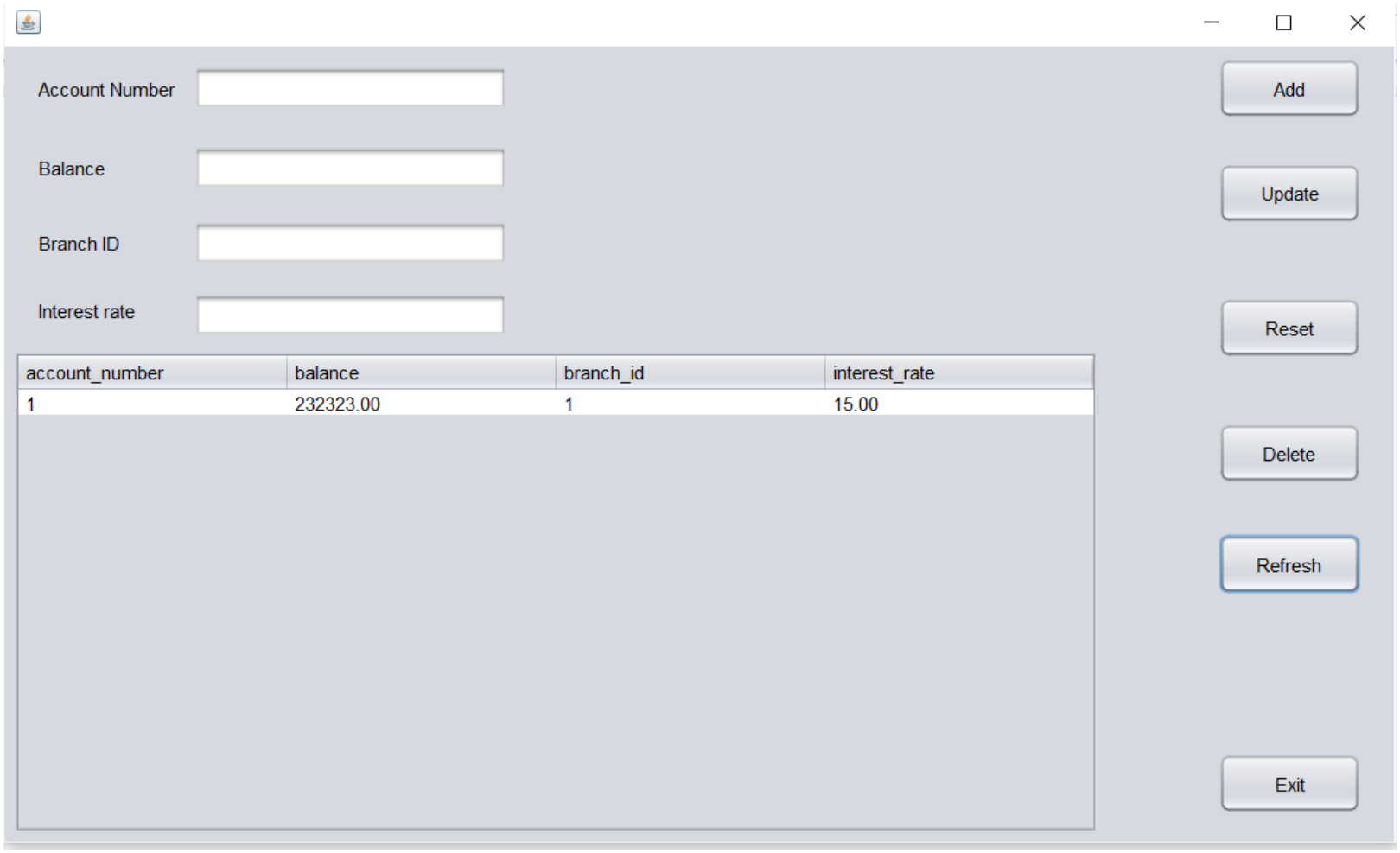


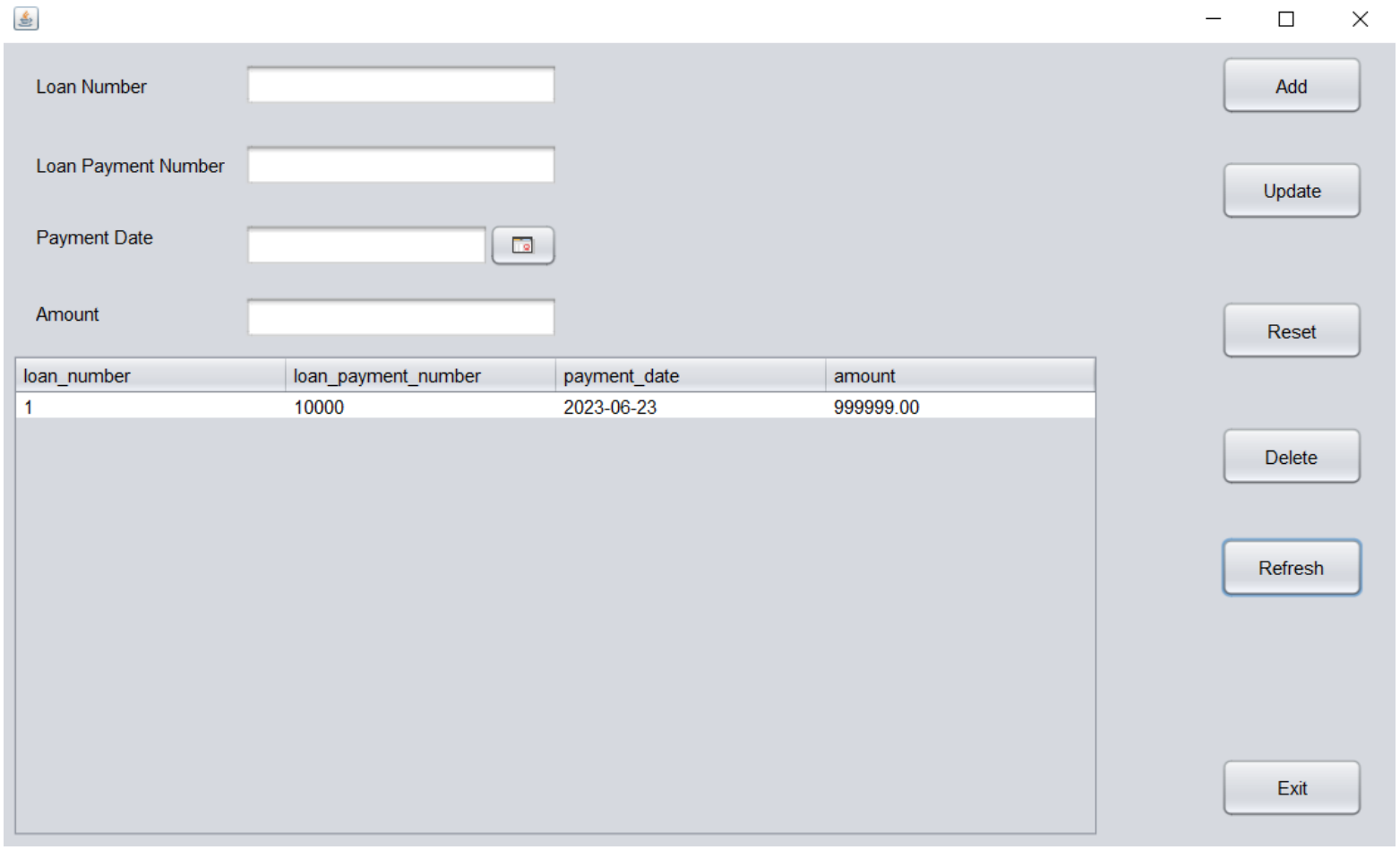

Branch ID
1
Branch City
thu dau hai
Assets
999.00
Add
Update
Reset
Delete
Refresh
Exit
branch_id
branch_city
assets
1
thu dau hai
999.00
2
ho chi minh
100.00
3
hai phong
88.00
4
binh duong
60.00


Employee ID
Manager ID
Name
City
Add
Salary
Customer ID
DOB
Province
Update
Joining Date
SSN
Street
Reset
employe...
salary
joining_d...
manage...
custom...
ssn
name
dob
street
city
province
1
50000.00
2018-06...
1
1
1
Huyen
1996-04...
Tran Hu...
hcm
hcm
Delete
Refresh
Exit

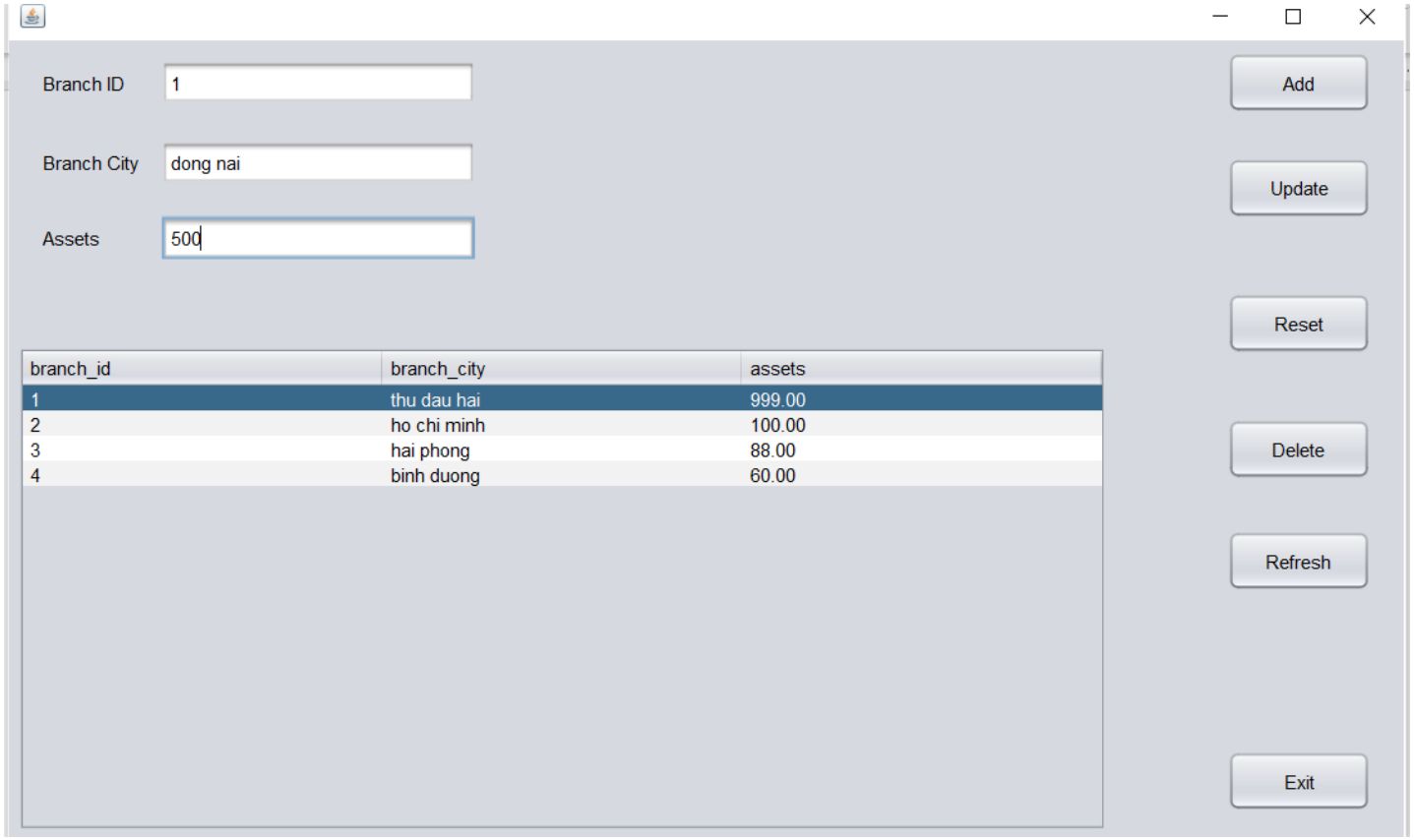

Customer ID
Name
City
Credit Rating
DOB
Province
SSN
Street
Add
Update
Reset
Delete
Refresh
Exit
customer_id credit_rating ssn name dob street city province
1 100 3 viet 2014-06-13 binh phuoc bd bd


Loan Number
Loan Amount
Branch ID
Add
Update
Reset
Delete
Refresh
Exit
loan_number
loan_amount
branch_id
1
100.00
1

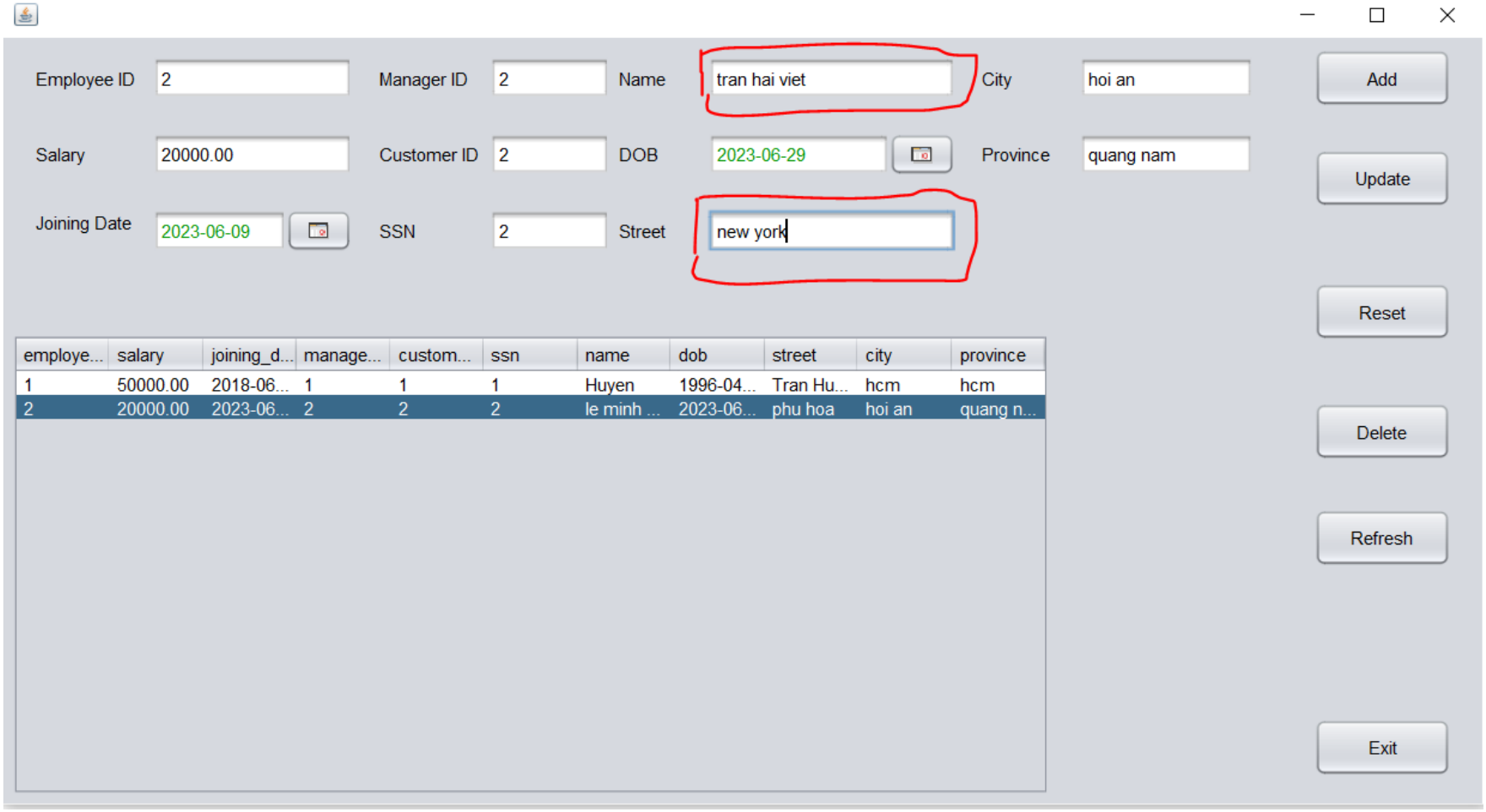

Account Number
Balance
Branch ID
Interest rate
Add
Update
Reset
Delete
Refresh
Exit
account_number
balance
branch_id
interest_rate
1
232323.00
1
15.00

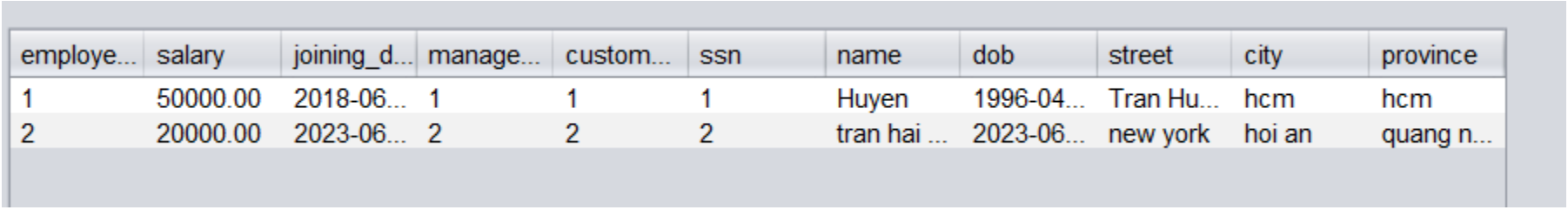


c) Update a record into database.



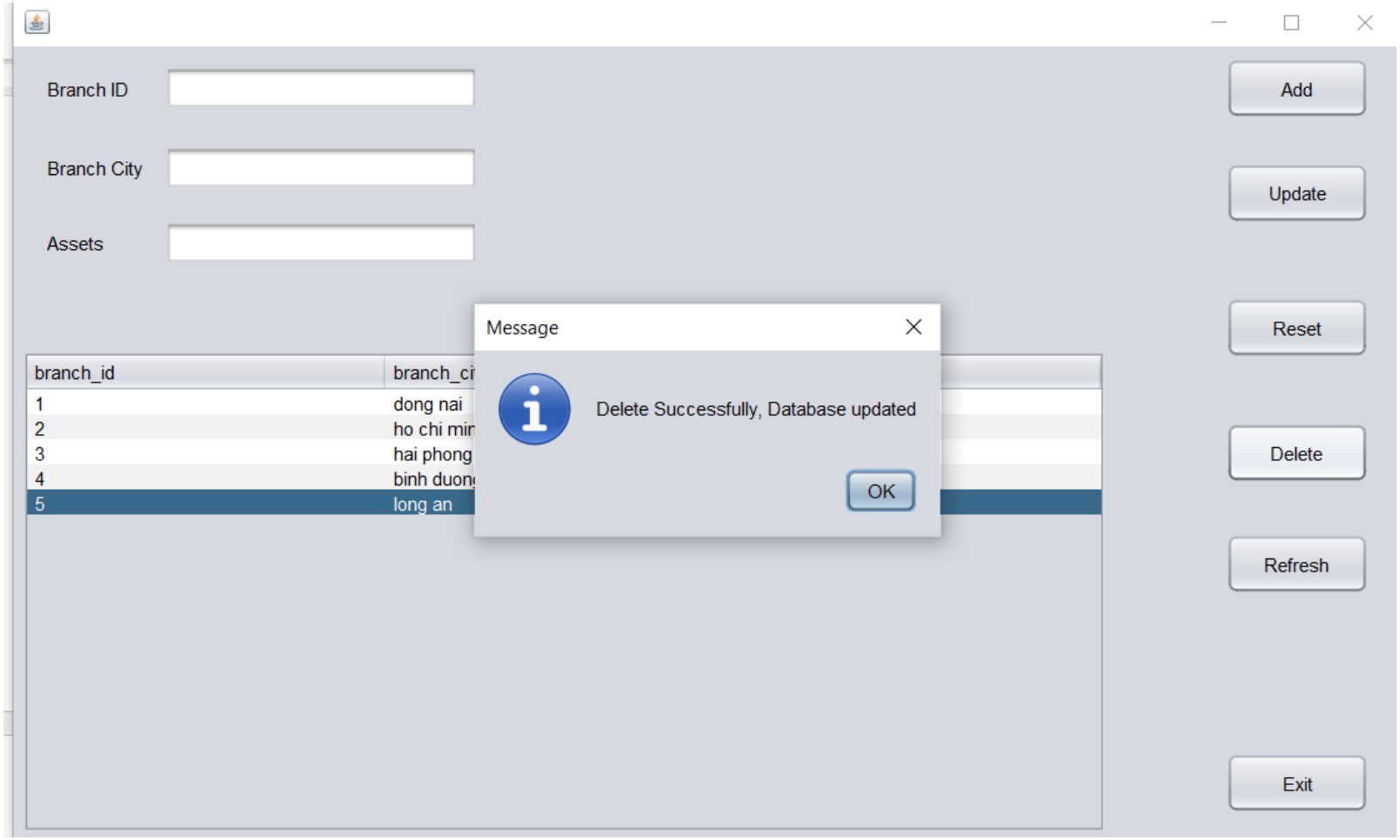
branch_id	branch_city	assets
1	dong nai	500.00
2	ho chi minh	100.00
3	hai phong	88.00
4	binh duong	60.00



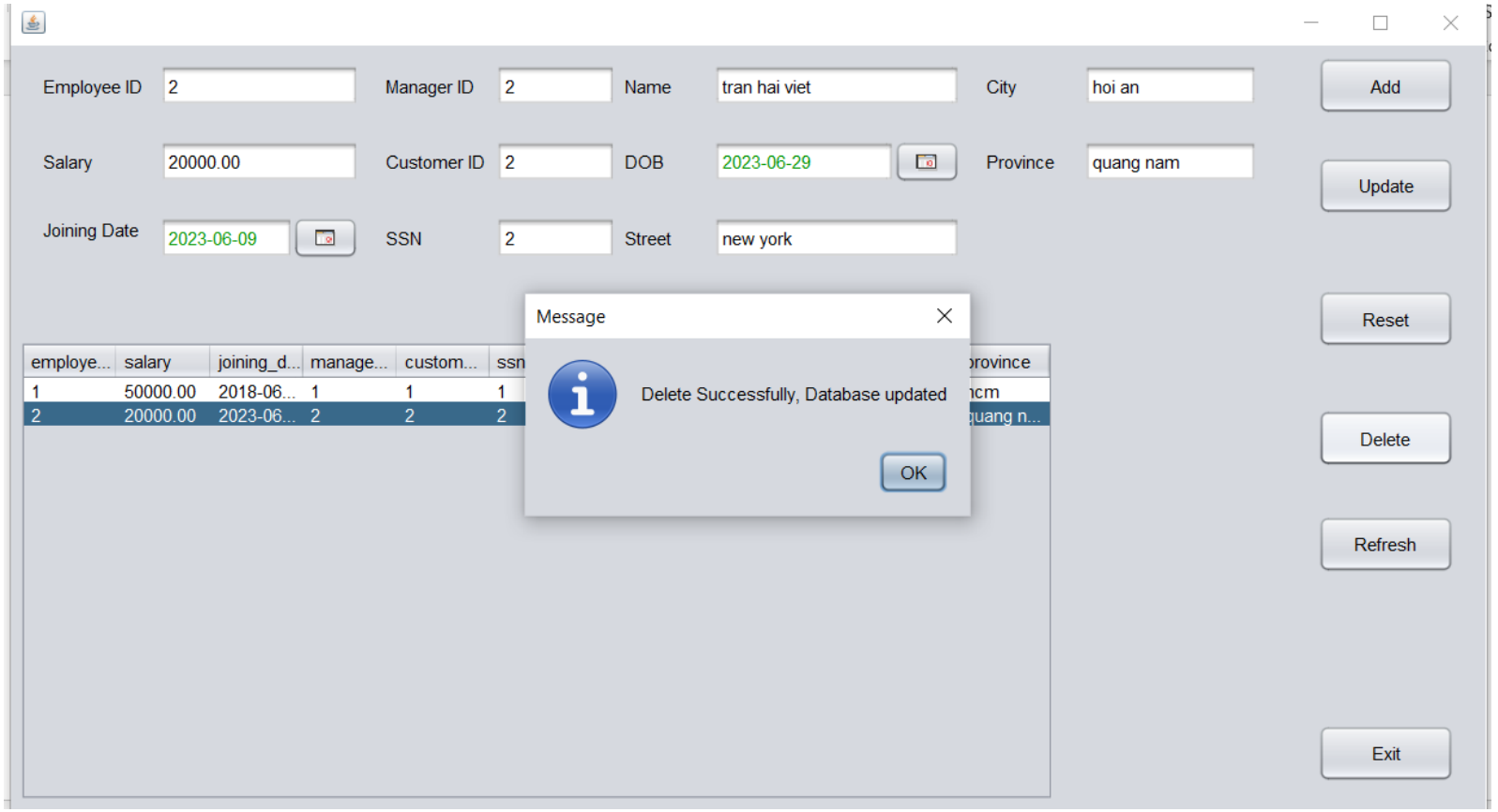


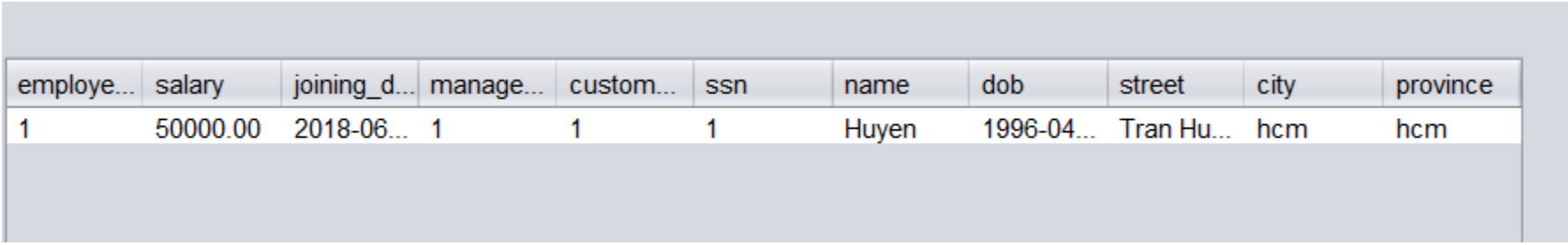
employe...	salary	joining_d...	manage...	custom...	ssn	name	dob	street	city	province
1	50000.00	2018-06...	1	1	1	Huyen	1996-04...	Tran Hu...	hcm	hcm
2	20000.00	2023-06...	2	2	2	tran hai ...	2023-06...	new york	hoi an	quang n...

d) Delete a record into database.



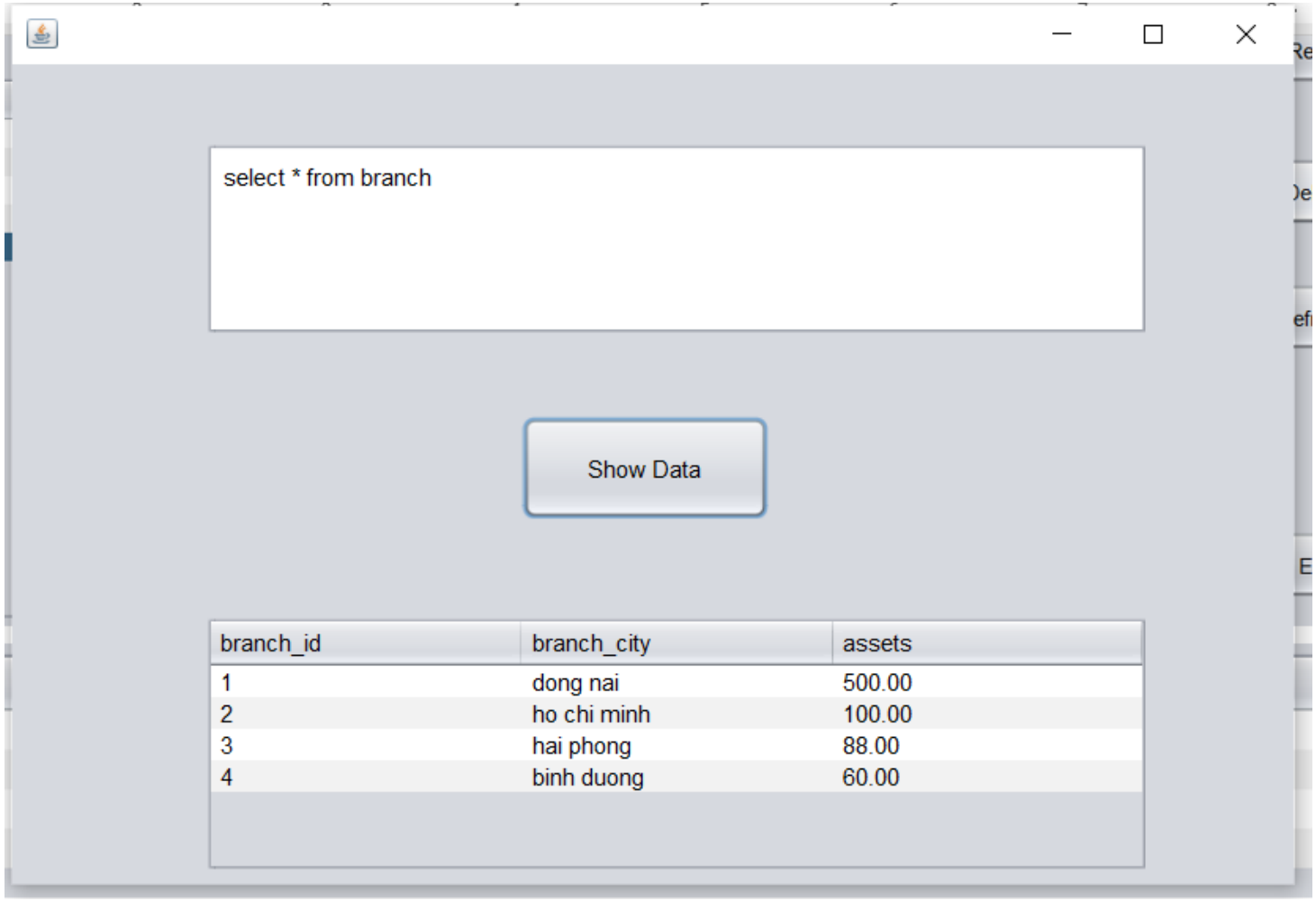
branch_id	branch_city	assets
1	dong nai	500.00
2	ho chi minh	100.00
3	hai phong	88.00
4	binh duong	60.00





employe...	salary	joining_d...	manage...	custom...	ssn	name	dob	street	city	province
1	50000.00	2018-06...	1	1	1	Huyen	1996-04...	Tran Hu...	hcm	hcm

e) Custom operation on database (Provided by instructor).


select * from branch
Show Data
branch_id
branch_city
assets
1
dong nai
500.00
2
ho chi minh
100.00
3
hai phong
88.00
4
binh duong
60.00