1. The Relational Model

1.4 Primary Keys

Underline potential Primary Key attributes in the Relation Schemas:

Employee (FullName, Street, City)
Works (FullName, CompanyName, Salary)
Company (CompanyName, City)

One of many possible Answers:

Employee (FullName, Street, City)
Works (FullName, CompanyName, Salary)
Company (CompanyName, City)

Defined this way two employees cannot have the same name in the database, an employee cannot work for more than one company, and a company can only be located in one city!

If an employee is to be allowed to work for more than one company, then CompanyName should be made part of the primary key in Works.

If a company is to be allowed to be located in more than one city, then City should be made part of the primary key in Company.

Often an ID will be defined for each Employee to allow for several employees with the same name.

1.5 Insert and Delete Violations

Give examples of insert and delete violations of the Foreign Key constraint.

```
Instructor
InstID InstName DeptName  Salary
12121  Wu       Finance   90000
15151  Mozart   Music     40000
22222  Einstein Physics   95000

Department
DeptName  Building Budget
Finance   Painter  120000
Music     Packard   80000
Physics   Watson    70000
```

Answer:

Trying to insert a row in the Instructor table, where the instructor works in the department Biology, will violate the Foreign Key constraint, since Biology is not listed in table Department. First the tuple describing Biology must be inserted in relation Department, and then the instructor working in Biology can be inserted in Instructor.

Trying to delete the Finance department in table Department will violate the Foreign Key constraint, since Wu in the Instructor table is listed to work for Finance. However, the deletion can be tolerated if given the SQL DDL command "ON DELETE SET NULL" as part of the foreign key constraint, in which case, as a side-effect of the deletion, the DeptName for Wu in the Instructor table will be set to NULL. You will learn more about "ON DELETE SET NULL" later in the semester.

1.6 Foreign Keys

Banking Database Relation Schemas:

Branch(BName, BCity, Assets)
Customer(CName, CStreet, CCity)
Loan(LNumber, BName, Amount)
Borrower(CName, LNumber)
Account(ANumber, BName, Balance)
Depositor(CName, ANumber)

Check the table below and write the Foreign Keys and Referenced Relations.

Relation	Primary Keys	Foreign Keys	Referencing
Branch	BName		
Customer	CName		
Loan	LNumber		
Borrower	CName LNumber		
Account	ANumber		
Depositor	CName ANumber		

Answer:

Relation	Primary Keys	Foreign Keys	Referencing
Branch	BName		
Customer	CName		
Loan	LNumber	BName	Branch
Borrower	CName LNumber	CName LNumber	Customer Loan
Account	ANumber	BName	Branch
Depositor	CName ANumber	CName ANumber	Customer Account

1.7 Database Schema Diagram

Draw a Database Schema Diagram for the Banking Database.

Answer:

E.g. the table Depositor has the Primary Attributes CName and ANumber (i.e. both underlined) and CName is also a Foreign Key referencing table Customer (i.e. a pointing arrow) .