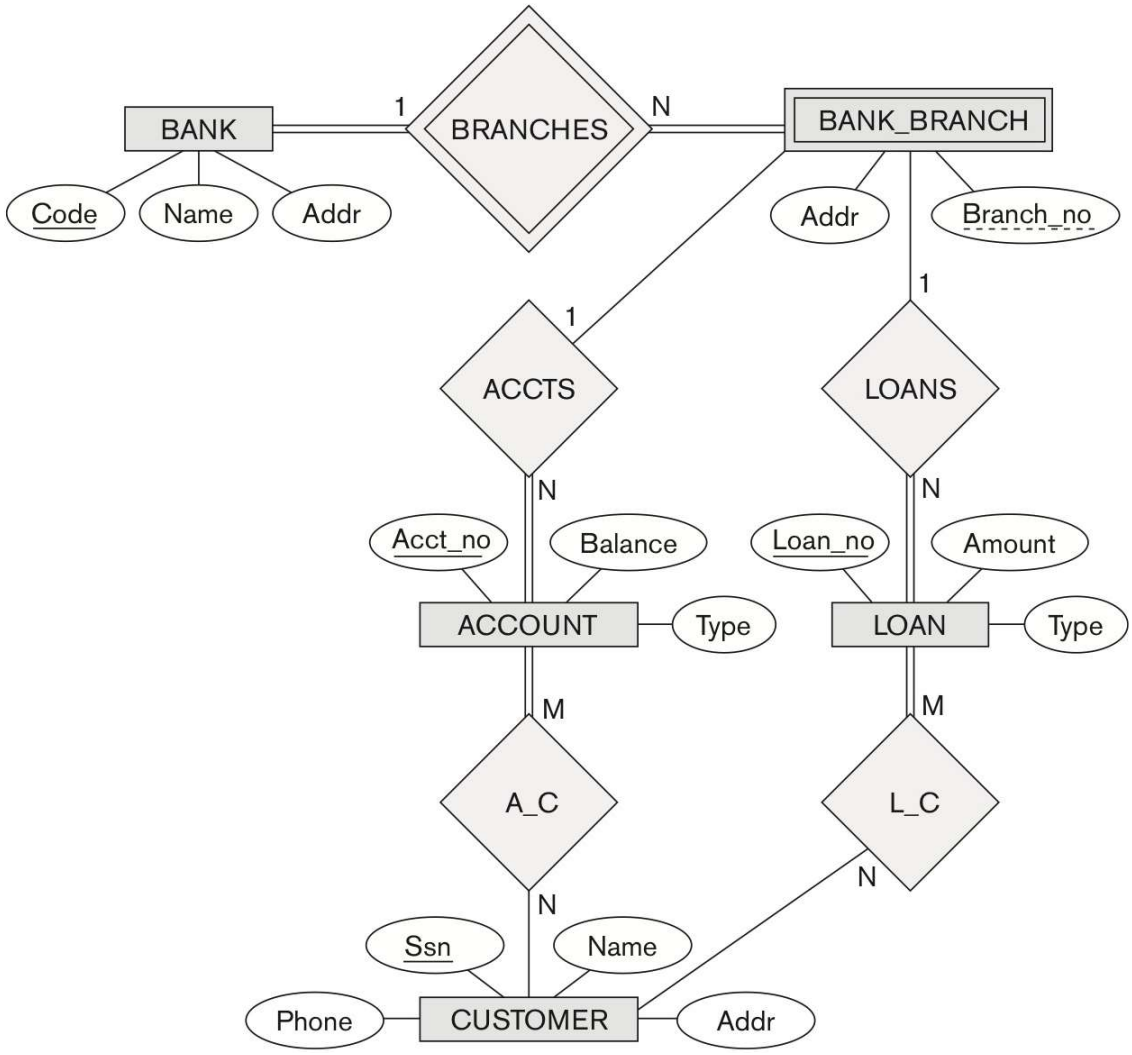
HOMEWORK 3	ER Diagram and database schema
Due Sun, Sep 30 at 11:30 pm	**Objectives:** To be able to create database schema using a tool

CS 4347: DATABASE SYSTEMS **ALEX LUNDIN** **AML140830**

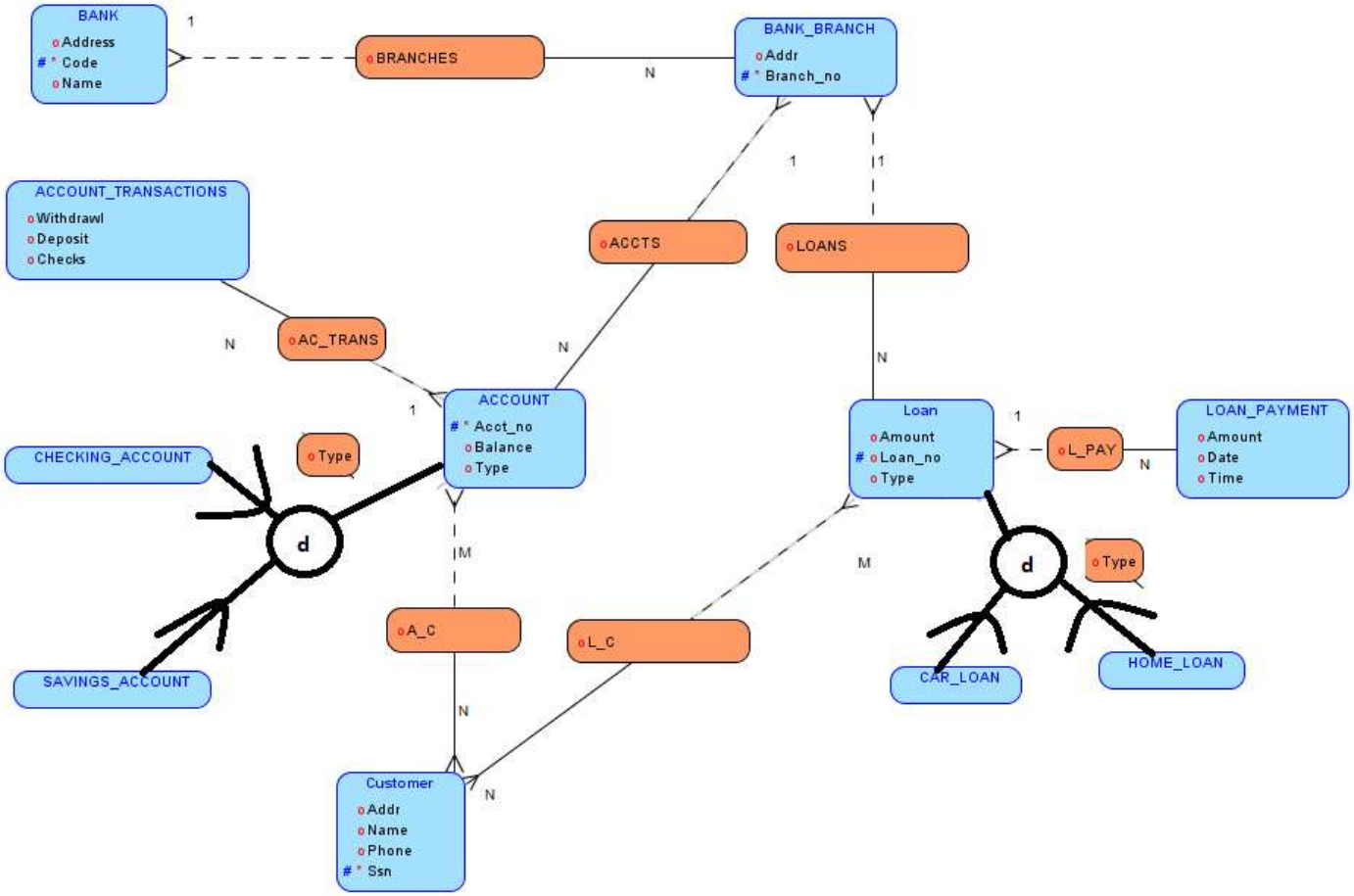
4.17 - Consider the BANK ER schema of Figure , and suppose that it is necessary to keep track of different types of ACCOUNTS (SAVINGS_ACCTS, CHECKING_ACCTS,

...) and LOANS (CAR_LOANS, HOME_LOANS, ...). Suppose that it is also desirable to keep track of each account's TRANSACTIONs (deposits, withdrawals, checks, ...) and each loan's PAYMENTs; both of these include the amount, date, time, ... Modify the BANK schema, using ER and EER concepts of specialization and generalization. State any assumptions you make about the additional requirements.



Assumptions:

Answer:



5.11 - Suppose each of the following Update operations is applied directly to the database of Figure 5.6. Discuss *all* integrity constraints violated by each operation, if any, and the different ways of enforcing these constraints:

Figure 5.6
One possible database state for the COMPANY relational database schema.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

(a) Insert < 'Robert', 'F', 'Scott', '943775543', '21-JUN-42', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1 > into EMPLOYEE.

No violations

(b) Insert < 'ProductA', 4, 'Bellaire', 2 > into PROJECT.

Violations

Referential Integrity

Bellaire maps to dnumber 4, so the reference is wrong

(c) Insert < 'Production', 4, '943775543', '01-OCT-88' > into DEPARTMENT.

Violations

Primary Key Uniqueness

Dnumber 4 is already in use

Referential Integrity

SSN 943775543 is not in the employee table

(d) Insert < '677678989', null, '40.0' > into WORKS_ON.

Violations

Referential Integrity

SSN 677678989 is not in the employee table

Entity Integrity

PNO is a primary key and cannot be null

(e) Insert < '453453453', 'John', M, '12-DEC-60', 'SPOUSE' > into DEPENDENT.

Violations

Referential Integrity

Super_SSN 453453453 is not in the employee table

(f) Delete the WORKS_ON tuples with ESSN= '333445555'.

No violations

(g) Delete the EMPLOYEE tuple with SSN= '987654321'.

Referential Integrity

SSN 453453453 is part of the DEPARTMENT, and WORKS_ON table

(h) Delete the PROJECT tuple with PNAME= 'ProductX'.

Referential Integrity

SSN 453453453 is part of the WORKS_ON table

(i) Modify the MGRSSN and MGRSTARTDATE of the DEPARTMENT tuple with DNUMBER=5 to '123456789' and '01-OCT-88', respectively.

No violations

(j) Modify the SUPERSSN attribute of the EMPLOYEE tuple with SSN= '999887777' to '943775543'.

No violations

(k) Modify the HOURS attribute of the WORKS_ON tuple with ESSN= '999887777' and PNO= 10 to '5.0'.

No violations

6.5 - Consider the database shown in Figure 1.2, whose schema is shown in Figure 2.1.

(a) What are the referential integrity constraints that should hold on the schema?

EMPLOYEE Table

1 (PK) Ssn must contain all references for DEPARTMENT Table Mgr_SSN WORKS_ON Table Essn and DEPENDENT Table Essn

2 (FK) Super_ssn must refer to an existing Ssn in the EMPLOYEE Table

3 (FK) Dno must refer to an existing Dnumber in the DEPARTMENT Table

DEPARTMENT Table

1 (PK) Dnumber must contain all references for EMPLOYEE Table Dno, Dept_Locations Table Dnumber and PROJECT Table Dnum

DEPT_LOCATIONS Table

1 (FK) Dnumber must refer to an existing Dnumber in the DEPARTMENT Table

PROJECT Table

1 (PK) Pnumber must contain all references for WORKS_ON Table Pno

2 (FK) Dnum must refer to an existing Dnumber in the DEPARTMENT Table

WORKS_ON Table

1 (FK) Pno must refer to an existing Pnumber in the PROJECT Table

2 (FK) Essn must refer to an existing Ssn in the EMPLOYEE Table

DEPENDENT Table

1 (FK) Essn must refer to an existing Ssn in the EMPLOYEE Table

(b) Write appropriate SQL DDL statements to define the database.

```
CREATE TABLE EMPLOYEES
 (Fname     VARCHAR(15)    NOT NULL,
  Minit     CHAR,
  Lname     VARCHAR(15)    NOT NULL,
  Ssn       CHAR(9)        NOT NULL,
  Bdate     DATE,
  Address   VARCHAR(60),
  Sex       CHAR,
  Salary    DECIMAL(10,2),
  Super_ssn CHAR(9),
  Dno       INT            NOT NULL,
  PRIMARY KEY(Ssn));

CREATE TABLE DEPARTMENT
 (Dname     VARCHAR(15)    NOT NULL,
  Dnumber   INT            NOT NULL,
  Mgr_ssn   CHAR(9)        NOT NULL,
  Mgr_start_date DATE,
  PRIMARY KEY(Dnumber),
  UNIQUE(Dname),
  FOREIGN KEY(Mgr_ssn) REFERENCES EMPLOYEES(Ssn));
```

```
CREATE TABLE DEPT_LOCATIONS
  (Dnumber    INT           NOT NULL,
   Dlocation  VARCHAR(15)    NOT NULL,
   PRIMARY KEY(Dnumber, Dlocation),
   FOREIGN KEY(Dnumber) REFERENCES DEPARTMENT(Dnumber));

CREATE TABLE PROJECT
  (Pname      VARCHAR(15)    NOT NULL,
   Pnumber    INT            NOT NULL,
   Plocation  VARCHAR(15),
   Dnum       INT            NOT NULL,
   PRIMARY KEY(Pnumber),
   UNIQUE(Pname),
   FOREIGN KEY(Dnum) REFERENCES DEPARTMENT(Dnumber));

CREATE TABLE WORKS_ON
  (Essn     CHAR(9)          NOT NULL,
   Pno      INT              NOT NULL,
   Hours    DECIMAL(3,1)     NOT NULL,
   PRIMARY KEY(Essn, Pno),
   FOREIGN KEY(Essn) REFERENCES EMPLOYEES(Ssn),
   FOREIGN KEY(Pno) REFERENCES PROJECT(Pnumber));

CREATE TABLE DEPENDENT
  (Essn     CHAR(9)          NOT NULL,
   Dependent_name VARCHAR(15) NOT NULL,
   Sex      CHAR,
   Bdate    DATE,
   Relationship VARCHAR(8),
   PRIMARY KEY(Essn, Dependent_name),
   FOREIGN KEY(Essn) REFERENCES EMPLOYEES(Ssn));
```