



## Sheet #2

### Relational Model

1. What is the difference between a key and a super key? and why do we designate one of the candidate keys of a relation to be the primary key?
2. Define foreign key. What is this concept used for?
3. Why are tuples in a relation not ordered? and why are duplicate tuples not allowed in a relation?
4. Consider the following six relations for an order-processing database application in a company:

**CUSTOMER** (Cust#, Cname, City)

**ORDER** (Order#, Odate, Cust#, Ord\_amt)

**ORDER\_ITEM** (Order#, Item#, Qty)

**ITEM** (Item#, Unit\_price)

**SHIPMENT** (Order#, Warehouse#, Ship\_date)

**WAREHOUSE** (Warehouse#, City)

**Here**, Ord\_amt refers to total dollar amount of an order; Odate is the date the order was placed; and Ship\_date is the date an order (or part of an order) is shipped from the warehouse.

**Assume** that an order can be shipped from several warehouses.

**Specify** the foreign keys for this schema, stating any assumptions you make.

**What** other constraints can you think of for this database?

5. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course:

**STUDENT** (Ssn, Name, Major, Bdate)

**COURSE** (Course#, Quarter, Cname, Dept)

**ENROLL** (Ssn, Course#, Quarter, Grade)

**BOOK\_ADOPTION** (Course#, Quarter, Book\_isbn)

**TEXT** (Book\_isbn, Book\_title, Publisher, Author)

**Specify** the foreign keys for this schema, stating any assumptions you make.



6. Suppose that each of the following Update operations is applied directly to the database state shown in Figure 3.6. Discuss *all* integrity constraints violated by each operation, if any, and the different ways of enforcing these constraints.
- Insert <'Robert', 'F', 'Scott', '943775543', '1972-06-21', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1> into EMPLOYEE.
  - Insert <'ProductA', 4, 'Bellaire', 2> into PROJECT.
  - Insert <'Production', 4, '943775543', '2007-10-01'> into DEPARTMENT.
  - Insert <'677678989', NULL, '40.0'> into WORKS\_ON.
  - Insert <'453453453', 'John', 'M', '1990-12-12', 'spouse'> into DEPENDENT.
  - Delete the WORKS\_ON tuples with Essn = '333445555'.
  - Delete the EMPLOYEE tuple with Ssn = '987654321'.
  - Delete the PROJECT tuple with Pname = 'ProductX'.
  - Modify the Mgr\_ssn and Mgr\_start\_date of the DEPARTMENT tuple with Dnumber = 5 to '123456789' and '2007-10-01', respectively.
  - Modify the Super\_ssn attribute of the EMPLOYEE tuple with Ssn = '999887777' to '943775543'.
  - Modify the Hours attribute of the WORKS\_ON tuple with Essn = '999887777' and Pno = 10 to '5.0'.

**Figure 3.6**

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



### **Multiple Choice Questions**

1. What does an RDBMS consist of?
  - a) Collection of Records
  - b) Collection of Keys
  - c) Collection of Tables
  - d) Collection of Fields
2. The values appearing in given attributes of any tuple in the referencing relation must likewise occur in specified attributes of at least one tuple in the referenced relation, according to \_\_\_\_\_ integrity constraint.
  - a) Referential
  - b) Primary
  - c) Referencing
  - d) Specific
3. The ability to query data, as well as insert, delete, and alter tuples, is offered by \_\_\_\_\_.
  - a) TCL (Transaction Control Language)
  - b) DCL (Data Control Language)
  - c) DDL (Data Definition Language)
  - d) DML (Data Manipulation Language)
4. \_\_\_\_\_ is a set of one or more attributes taken collectively to uniquely identify a record.
  - a) Primary Key
  - b) Foreign key
  - c) Super key
  - d) Candidate key



5. Which command is used to remove a relation from an SQL?

- a) Drop table
- b) Delete
- c) Purge
- d) Remove

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