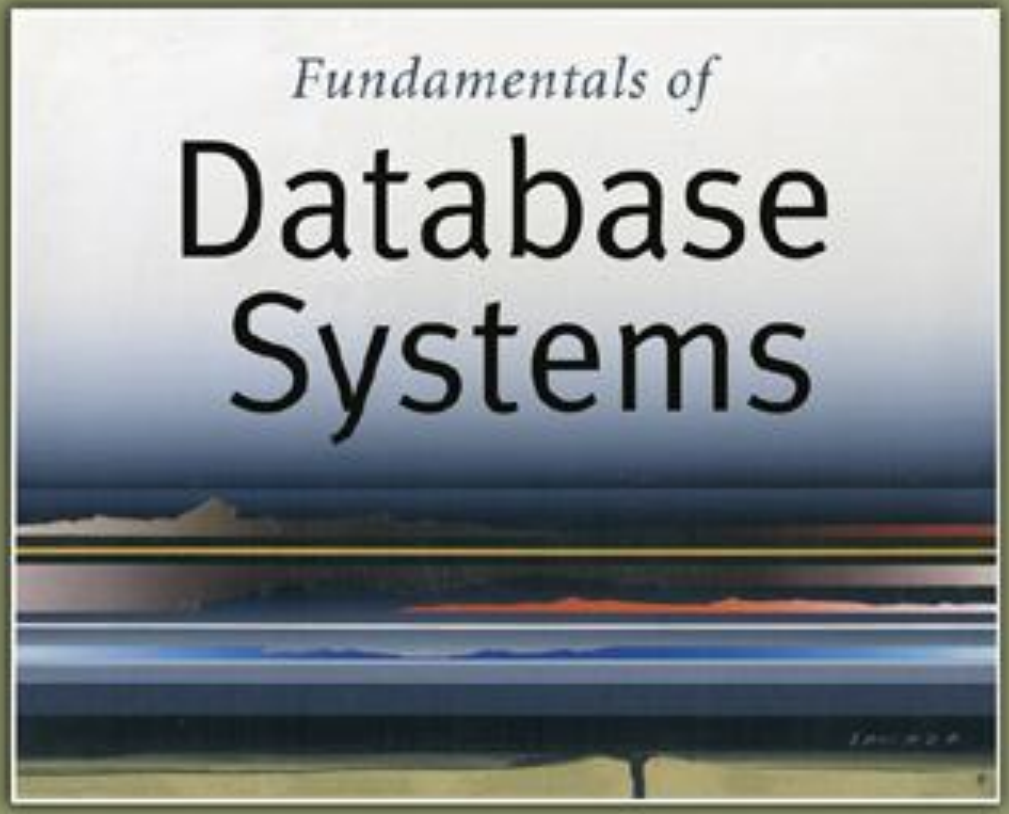
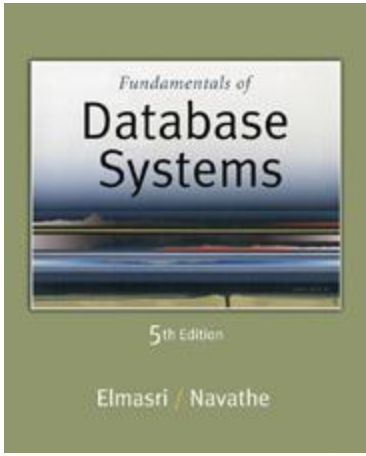


7th Edition

Elmasri / Navathe

LECTURE 7

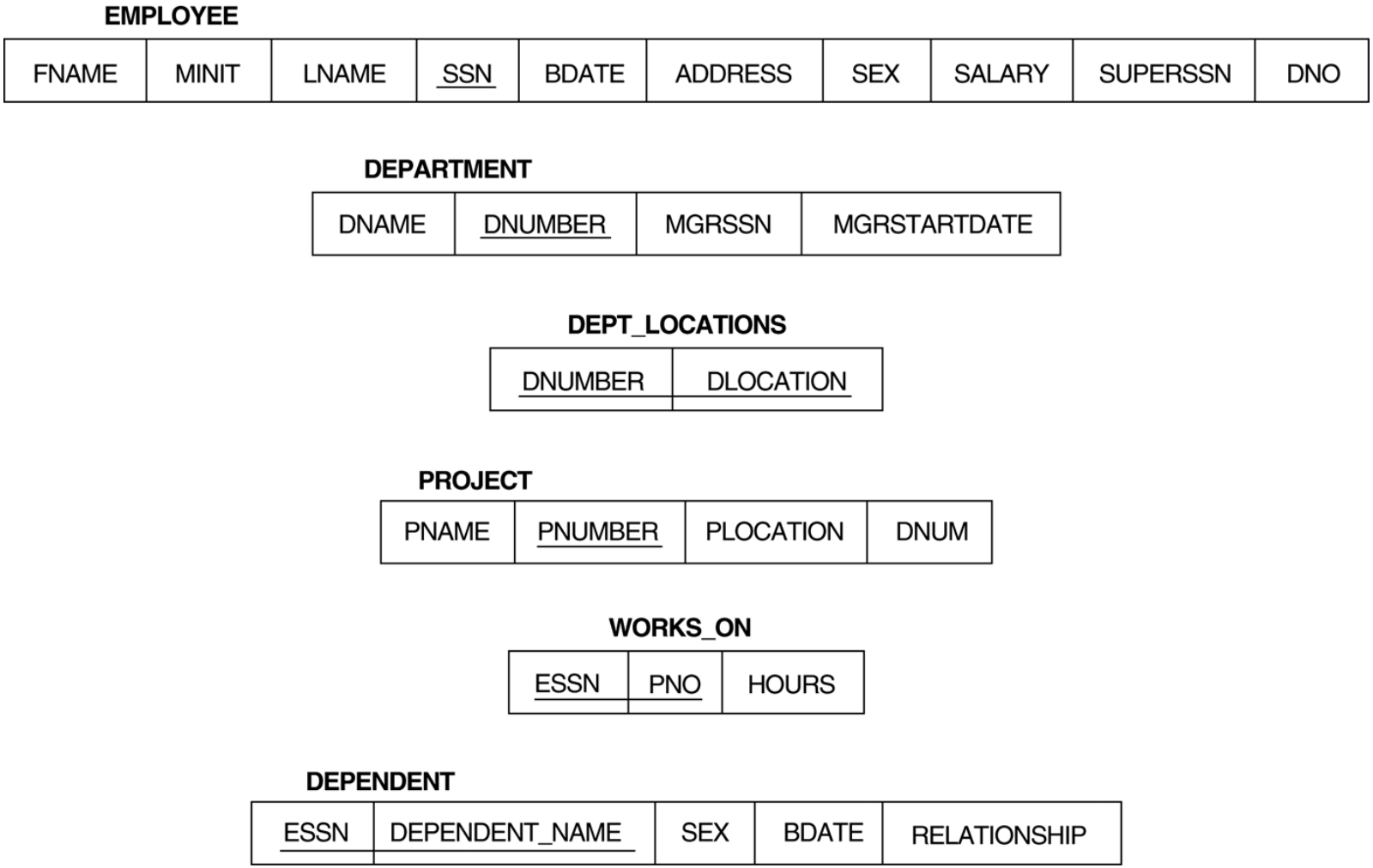
SQL : Schema Definition, Constraints, and Queries and Views



SQL is an abbreviation of "**S**tructured **Q**uery **L**anguage"

- The SQL has the Data definition language (DDL) and Data Manipulation Language (DML)
- DDL used to CREATE, DROP, and ALTER the descriptions of the tables (relations) of a database
- SQL provides four DML statements SELECT, UPDATE, DELETE, and INSERT.

Relational Database Schema



Populated Database

EMPLOYEE	FNAME	MINIT	LNAME	SSN	BDATE	ADDRESS	SEX	SALARY	SUPERSSN	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	1968-07-19	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

DEPT_LOCATIONS	DNUMBER	DLOCATION
	1	Houston
	4	Stafford
	5	Bellaire
	5	Sugarland
	5	Houston

DEPARTMENT	DNAME	DNUMBER	MGRSSN	MGRSTARTDATE
	Research	5	333445555	1988-05-22
	Administration	4	987654321	1995-01-01
	Headquarters	1	888665555	1981-06-19

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

CREATE TABLE

The general format for this statement is:

CREATE TABLE base-table-name
(column-definition [,column-definition]….
[, primary-key-definition]
[, foreign-key-definition[, foreign-key-definition]….);

Where a “column-definition” has the form:

Column-name data-type [NOT NULL]

Data Types: Numeric data

- **INTEGER** Signed full word binary integer.
- **SMALLINT** Signed half word binary integer.
- **DECIMAL(p,q)** or **NUMBER(p,q)** Signed packed decimal number p digits and sign with assumed decimal point q digits
- **FLOAT** Signed floating point number

String data

CHARACTER(n) or **CHAR(n)**

Fixed length string of exactly n 8-bit characters.

VARCHAR(n) Varying length string of up to n 8-bit characters.

GRAPHIC(n) Fixed length string of exactly n 16-bit characters.

VARGRAPHIC(n) Varying length string of up to n 16-bit characters.

Date and Time

- **DATE** date (yyyy-mm-dd)
- **TIME** time (hh:mm:ss)
- **TIMESTAMP** combination of date and time
- **TIME(i):**
  - Made up of hour:minute:second plus i additional digits specifying fractions of a second
  - format is hh:mm:ss:ii...i

CREATE TABLE : Example

- A constraint NOT NULL may be specified on an attribute

```
CREATE TABLE DEPARTMENT (
   DNAME     VARCHAR(10)NOT NULL,
   DNUMBER   INTEGER      NOT NULL,
   MGRSSN    CHAR(9),
   MGRSTARTDATE    CHAR(9)   );
```

Candidate and Primary key

- For candidate key we use the following format and it may appear more than one :

  UNIQUE (col_commalist)

- For PRIMARY key we use the following format and it is used only once in each table definition.

  PRIMARY KEY (col_commalist)

CREATE TABLE : EXAMPLE

```
CREATE TABLE DEPT (
  DNAME              VARCHAR(10)    NOT NULL,
  DNUMBER            INTEGER        NOT NULL,
  MGRSSN             CHAR(9),
  MGRSTARTDATE       CHAR(9),
  PRIMARY KEY (DNUMBER),
  UNIQUE (DNAME),
  FOREIGN KEY (MGRSSN) REFERENCES EMP  );
```

CREATE TABLE : EXAMPLE

```
CREATE TABLE WORKS-ON (
  ESSN          INTEGER    NOT NULL,
  PNO           INTEGER    NOT NULL,
  HOURS         FLOAT,
  PRIMARY KEY (ESSN,PNO),
  FOREIGN KEY (ESSN) REFERENCES EMP(SSN),
  FOREIGN KEY (PNO) REFERENCES PROJECT(PNUMBER)
        );
```

Foreign keys

FOREIGN KEY (col_commalist)

REFERENCE base_table [col-commalist]

[ON DELETE option]

[ON UPDATE option]

Option may be:

CASCADE, SET NULL, SET DEFAULT or RESTRICT

REFERENTIAL INTEGRITY OPTIONS

```
CREATE TABLE DEPT (
   DNAME            VARCHAR(10)    NOT NULL,
   DNUMBER          INTEGER        NOT NULL,
   MGRSSN           CHAR(9),
   MGRSTARTDATE     CHAR(9),
   PRIMARY KEY (DNUMBER),
   UNIQUE (DNAME),

FOREIGN KEY (MGRSSN) REFERENCES EMP
    ON DELETE RESTRICT
    ON UPDATE CASCADE);
```

REFERENTIAL INTEGRITY OPTIONS (continued)

```
CREATE TABLE EMP(
  ENAME       VARCHAR(30)    NOT NULL,
  ESSN        CHAR(9),
  BDATE       DATE,
  DNO         INTEGER  DEFAULT 1,
  SUPERSSN    CHAR(9),
  PRIMARY KEY (ESSN),
  FOREIGN KEY (DNO) REFERENCES DEPT
   ON DELETE   SET DEFAULT
    ON UPDATE  CASCADE,
  FOREIGN KEY (SUPERSSN) REFERENCES EMP
  ON DELETE SET NULL
   ON UPDATE CASCADE);
```

DROP TABLE

- Used to remove a relation (base table) and its definition
- The relation can no longer be used in queries, updates, or any other commands since its description no longer exists
- The general format is:

DROP TABLE base-table-name option;

Option: CASCADE or RESTRICT

DROP TABLE

- Example:

```
DROP TABLE  DEPENDENT CASCADE;
```

DEPENDENT table will be removed from the system with all views based on that table.

ALTER TABLE

- Used to add or drop an attribute to one of the base relations
  - When add new attribute,it will have NULLs in all the tuples of the relation right after the command is executed; hence, the NOT NULL constraint is not allowed for such an attribute
- Example:

```
ALTER TABLE EMPLOYEE ADD JOB
VARCHAR(12);
```

- The database users must still enter a value for the new attribute JOB for each EMPLOYEE tuple.
  - This can be done using the UPDATE command.

ALTER TABLE

- To drop an attribute, we must use option (RESTRICT or CASCADE)
- EXAMPLE:

ALTER TABLE EMPLOYEE DROP ADDRESS CASCADE;

That means all constraints and views that reference that attribute will be dropped too.

CREATE and DROP SCHEMA

- Specifies a new database schema by giving it a name

CREATE SCHEMA COMPANY **AUTHORIZATION** JOHN;

- DROP a schema with option

  DROP SCHEMA COMPANY RESTRICT;

That means drop schema if it has no elements in it