Part 2

SELECT… FROM… WHERE QUERY

Basic Query Structure

- The SQL **data-manipulation language (*DML*)** provides the ability to query information, and insert, delete and update tuples
- A typical SQL query has the form:

  select $A_1, A_2, ..., A_n$
  from $r_1, r_2, ..., r_m$
  where P

  - A_i represents an attribute
  - R_i represents a relation
  - P is a predicate.
- The result of an SQL query is a relation.

The select Clause

- The **select** clause list the attributes desired in the result of a query
  - corresponds to the projection operation of the relational algebra

- Example: find the names of all instructors:
  select *name* **from** *instructor*

- NOTE: SQL names are **case insensitive** (i.e., you may use upper- or lower-case letters.)
  - E.g. *Name* ≡ *NAME* ≡ *name*
  - Some people use upper case wherever we use bold font.

select *name* **from** *instructor;*

Queries on a Single Relation

ID	*name*	*dept_name*	*salary*
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
76766	Crick	Biology	72000
10101	Srinivasan	Comp. Sci.	65000
58583	Califieri	History	62000
83821	Brandt	Comp. Sci.	92000
15151	Mozart	Music	40000
33456	Gold	Physics	87000
76543	Singh	Finance	80000

name
Einstein
Wu
El Said
Katz
Kim
Crick
Srinivasan
Califieri
Brandt
Mozart
Gold
Singh

Select dept_name from ins

dept_name
Comp. Sci.
Finance
Music
Physics
History
Physics
Comp. Sci.
History
Finance
Biology
Comp. Sci.
Elec. Eng.

The select Clause (Cont.)

- SQL **allows duplicates** in relations as well as in query results.

- To force the elimination of duplicates, insert the keyword **distinct** after select**.**
- Find the names of all departments with instructor, and remove duplicates

```
select distinct dept_name
from instructor
```

- The keyword **all** specifies that duplicates not be removed.

```
select all dept_name
from instructor
```

The select Clause (Cont.)

- An asterisk in the select clause denotes "all attributes"

```
select *
from instructor
```

- The **select** clause can contain arithmetic expressions involving the operation, +, –, ∗, and /, and operating on constants or attributes of tuples.

- The query:

```
select ID, name, salary/12
from instructor
```

would return a relation that is the same as the *instructor* relation, except that the value of the attribute *salary* is divided by 12.

The where Clause

- The **where** clause specifies conditions that the result must satisfy
  - Corresponds to the selection predicate of the relational algebra.

- To find all instructors in Comp. Sci. dept with salary > 80000

  select *name*
  from *instructor*
  where *dept_name* = 'Comp. Sci.' **and** *salary* > 80000

- Comparison results can be combined using the logical connectives **and, or, not**

- Comparisons can be applied to results of arithmetic expressions.

workout

```
-- create a table
CREATE TABLE students ( id INTEGER PRIMARY KEY,
                                                    name TEXT NOT NULL,
                                                    gender TEXT NOT NULL);

-- insert some values
INSERT INTO students VALUES (1, 'Ryan', 'M');
INSERT INTO students VALUES (2, 'Joanna', 'F');

-- fetch some values

SELECT * FROM students WHERE gender = 'F';
```

Queryin

An an example, suppose we want to answer the query "Retrieve the names of all instructors, along with their department names and department building name."

Looking at the schema of the relation ***instructor***, we realize that we can get the department name from the attribute ***dept name***, but the department **building name** is present in the attribute *building* of the relation ***department***.

To answer the query, each tuple in the *instructor* relation must be matched with the tuple in the *department* relation whose *dept name* value matches the *dept name* value of the *instructor* tuple.

```
select name, instructor.dept_name, building
from instructor, department
where instructor.dept_name= department.dept_name;
```

The from Clause

- The **from** clause lists the relations involved in the query
  - Corresponds to the Cartesian product operation of the relational algebra.

- Find the Cartesian product *instructor* **X** *teaches*

  select ∗ **from** *instructor, teaches*

  - generates every possible instructor – teaches pair, with all attributes from both relations

- Cartesian product not very useful directly, but useful combined with where-clause condition (selection operation in relational algebra)

Cartesian Product: *instructor X teaches*

instructor

ID	*name*	*dept_name*	*salary*
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000

teaches

ID	*course_id*	*sec_id*	*semester*	*year*
10101	CS-101	1	Fall	2009
10101	CS-315	1	Spring	2010
10101	CS-347	1	Fall	2009
12121	FIN-201	1	Spring	2010
15151	MU-199	1	Spring	2010
22222	PHY-101	1	Fall	2009
32343	HIS-351	1	Spring	2010
45565	CS-101	1	Spring	2010
45565	CS-319	1	Spring	2010
76766	BIO-101	1	Summer	2009
76766	BIO-301	1	Summer	2010
83821	CS-190	1	Spring	2009
83821	CS-190	2	Spring	2009
83821	CS-319	2	Spring	2010
98345	EE-181	1	Spring	2009

inst.ID	*name*	*dept_name*	*salary*	*teaches.ID*	*course_id*	*sec_id*	*semester*	*year*
10101	Srinivasan	Comp. Sci.	65000	10101	CS-101	1	Fall	2009
10101	Srinivasan	Comp. Sci.	65000	10101	CS-315	1	Spring	2010
10101	Srinivasan	Comp. Sci.	65000	10101	CS-347	1	Fall	2009
10101	Srinivasan	Comp. Sci.	65000	12121	FIN-201	1	Spring	2010
10101	Srinivasan	Comp. Sci.	65000	15151	MU-199	1	Spring	2010
10101	Srinivasan	Comp. Sci.	65000	22222	PHY-101	1	Fall	2009
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
12121	Wu	Finance	90000	10101	CS-101	1	Fall	2009
12121	Wu	Finance	90000	10101	CS-315	1	Spring	2010
12121	Wu	Finance	90000	10101	CS-347	1	Fall	2009
12121	Wu	Finance	90000	12121	FIN-201	1	Spring	2010
12121	Wu	Finance	90000	15151	MU-199	1	Spring	2010
12121	Wu	Finance	90000	22222	PHY-101	1	Fall	2009
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

joins

For all instructors who have taught some course, find their names and the course ID of the courses they taught.

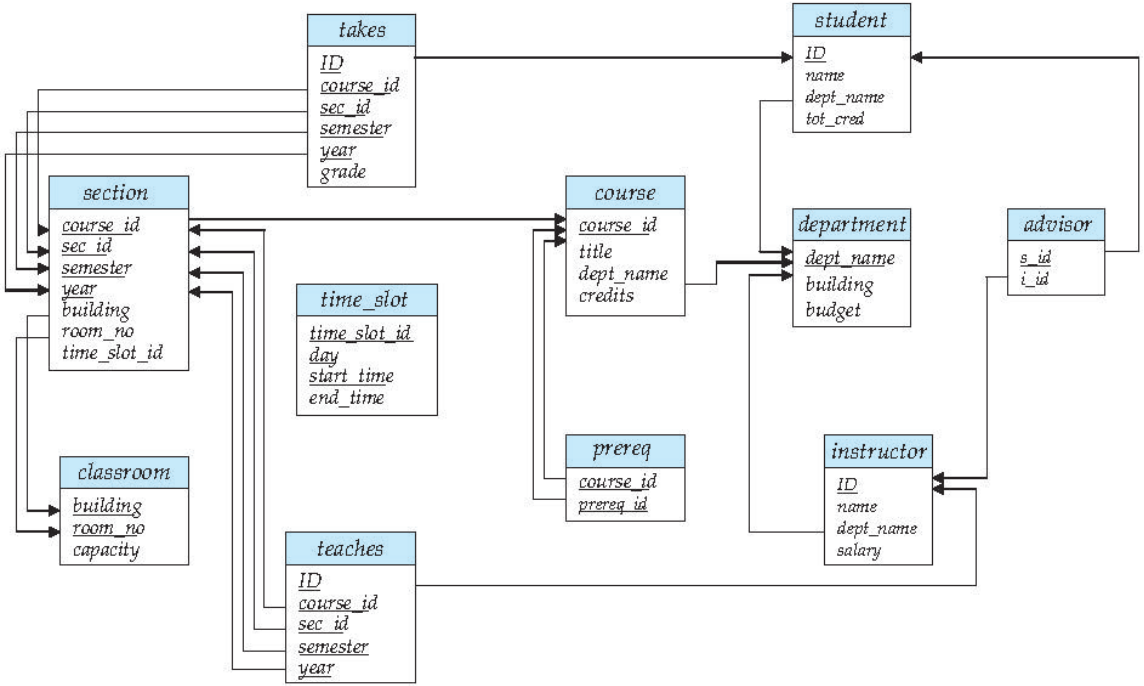
select *name, course_id*
from *instructor, teaches*
where *instructor.ID = teaches.ID*

Joins

- Find the course ID, semester, year and title of each course offered by the Comp. Sci. department

```
select section.course_id, semester, year, title
 from section, course
 where section.course_id = course.course_id and
       dept_name = 'Comp. Sci.'
```

Try Writing Some Queries in SQL



1.Display id of students who have taken the course offered by physics department

2.List out the 4 credit courses offered by ICT department

3.Display names of all advisors from Maths department

4. Retrieve the names of all instructors, along with their department names and department building name.

5.Display Student and their respective advisor information

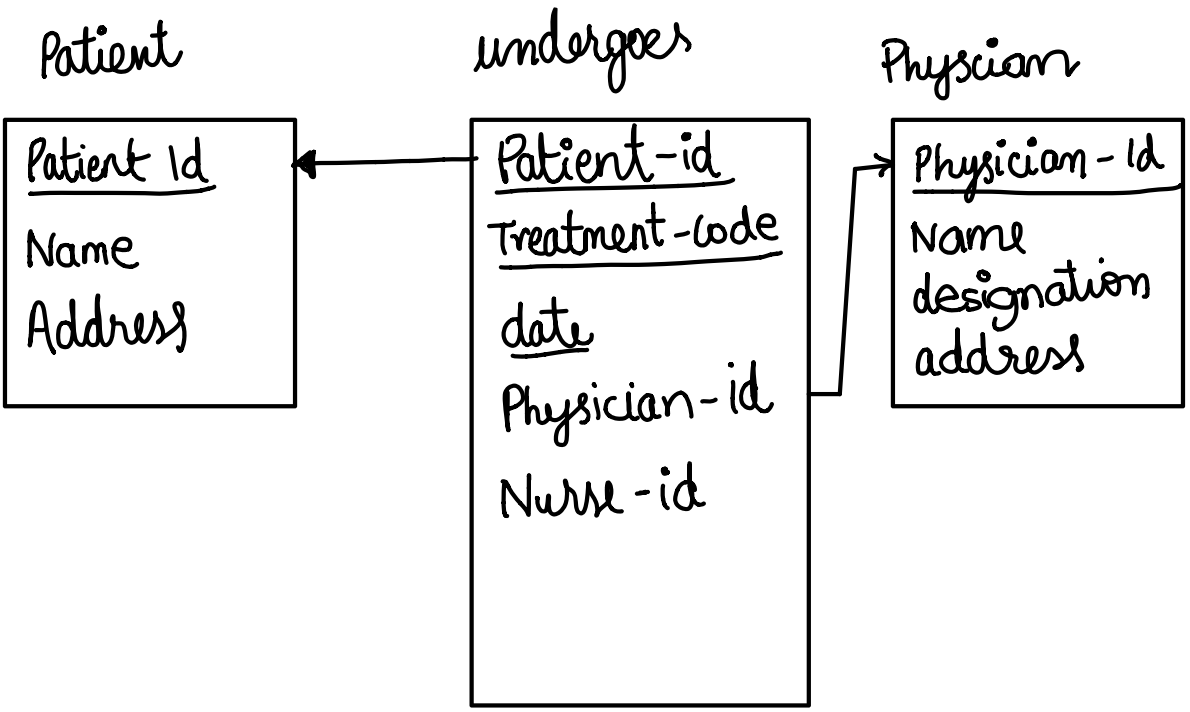
6.Display Course and its prerequisite information

7.Display the computer science courses which are held in room no=105 and building AB5

8. Display the student' details who scored A or A+ grade in DBS course.

(solution in doc file)

(2)




```
select * from physcian , undergoes where
Physcian.physcian-id = undergoes.Physcian-id;
```