

CS 327E Class 3

February 11, 2019

1) A join is used to concatenate rows from two tables that are related via referential integrity. For example, joining T and U on $T.b$ and $U.b$ produces V when projecting all attributes from T and U .

$T(a: \text{int}, b: \text{string})$

$U(b: \text{string}, c: \text{string}, d: \text{date})$

$V(a: \text{int}, b: \text{string}, b: \text{string}, c: \text{string}, d: \text{date})$

- A. True
- B. False

2) A join is also used to union rows from two tables that share the same schema. For example, joining T and U produces V .

T

<u>id</u>	street	city
46	San Jacinto	Austin
82	Memorial Dr.	Houston
79	Main St.	Fort Davis

U

<u>id</u>	street	city
1	Chestnut	Philadelphia
2	South St.	Philadelphia
3	Market	Philadelphia

V

<u>id</u>	street	city
46	San Jacinto	Austin
82	Memorial Dr.	Houston
79	Main St.	Fort Davis
1	Chestnut	Philadelphia
2	South St.	Philadelphia
3	Market	Philadelphia

A. True
B. False

3) The fields in a join condition must be of compatible type. For example, a field of type `String` cannot be joined to a field of type `Integer`.

- A. True
- B. False

4) A `SELECT` statement can contain at most one join.

- A. True
- B. False

5) Which is not a valid join type?

- A. Self join
- B. Outer join
- C. Partial join
- D. Inner join

Syntax of Join Queries

SELECT <list of desired fields>

FROM <single table T1>

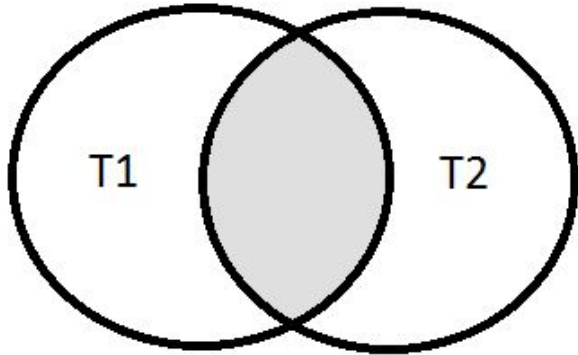
JOIN <single table T2> **ON** <T1.c1 = T2.c1>

WHERE <boolean conditions>

ORDER BY <list of fields to sort on>

Inner Join

```
SELECT *  
FROM T1  
[INNER] JOIN T2 ON T1.c1 = T2.c1
```



Inner Join

```
SELECT *  
FROM T1  
[INNER] JOIN T2 ON T1.c1 = T2.c1  
[INNER] JOIN T3 ON T2.c2 = T3.c2
```

Inner Join

Employee

<u>empid</u>	emp_name	emp_dep
2	Mike	1
23	Dave	2
3	Sarah	
5	Jim	4
6	Sunil	1
37	Morgan	4

Department

<u>depid</u>	dep_name
1	Sales
2	Product
3	Research
4	Engineering
5	HR

```
SELECT emp_name, dep_name  
FROM Employee JOIN Department ON emp_dep = depid;
```

Result Table

emp_name	dep_name
Mike	Sales
Dave	Product
Jim	Engineering
Sunil	Sales
Morgan	Engineering

First Question

What are first and last names and grades of students who take CS329E with Prof. Mitra?

Current_Student(sid, fname, lname, dob, cno, cname, credits, grade)

New_Student(sid, fname, lname, dob)

Class(tid, instructor, dept, cno, cname, credits)

iClicker Question

What are first and last names and grades of students who take CS329E with Prof. Mitra?

How many records are in the answer?

- A. 1
- B. 2
- C. 3

Second Question

Who are the students who take both CS327E and CS329E?

Current_Student(sid, fname, lname, dob, cno, cname, credits, grade)

New_Student(sid, fname, lname, dob)

Class(tid, instructor, dept, cno, cname, credits)

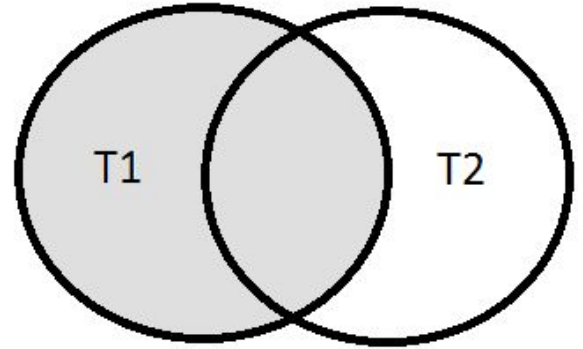
Second Question

Who are the students who take both CS327E and CS329E?

```
SELECT sid
FROM Current_Student
JOIN Current_Student on sid = sid
WHERE cno = 'CS327E'
AND cno = 'CS329E'
```

Left Outer Join

```
SELECT *  
FROM T1 LEFT [OUTER] JOIN T2  
ON T1.c1 = T2.c1
```



Left Outer Join

Employee

<u>empid</u>	emp_name	emp_dep
2	Mike	1
23	Dave	2
3	Sarah	
5	Jim	4
6	Sunil	1
37	Morgan	4

Department

<u>depid</u>	dep_name
1	Sales
2	Product
3	Research
4	Engineering
5	HR

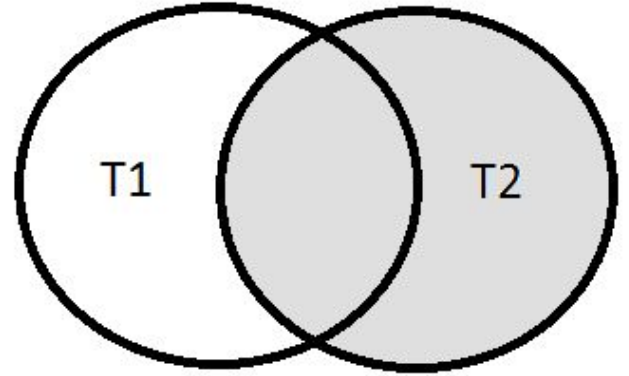
```
SELECT emp_name, dep_name  
FROM Employee LEFT JOIN Department ON emp_dep = depid  
ORDER BY emp_name;
```

Result Table

emp_name	dep_name
Dave	Product
Jim	Engineering
Mike	Sales
Morgan	Engineering
Sarah	
Sunil	Sales

Right Outer Join

```
SELECT *  
FROM T1 RIGHT [OUTER] JOIN T2  
ON T1.c1 = T2.c1
```



Right Outer Join

Employee

empid	emp_name	emp_dep
2	Mike	1
23	Dave	2
3	Sarah	
5	Jim	4
6	Sunil	1
37	Morgan	4

Department

depid	dep_name
1	Sales
2	Product
3	Research
4	Engineering
5	HR

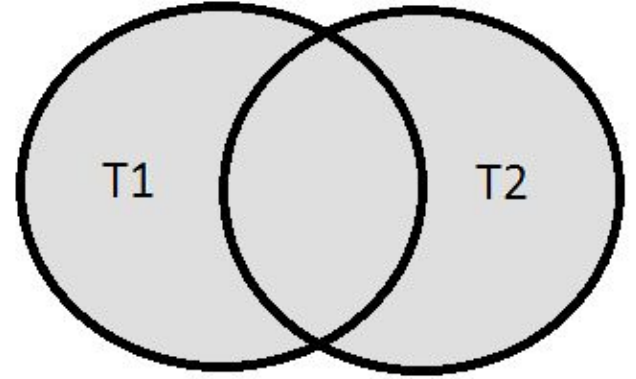
```
SELECT emp_name, dep_name
FROM Employee RIGHT JOIN Department ON emp_dep = depid
ORDER BY dep_name, emp_name;
```

Result Table

emp_name	dep_name
Jim	Engineering
Morgan	Engineering
	HR
Dave	Product
	Research
Mike	Sales
Sunil	Sales

Full Outer Join

```
SELECT *  
FROM T1 FULL [OUTER] JOIN T2  
ON T1.c1 = T2.c1
```



Full Outer Join

Employee

empid	emp_name	emp_dep
2	Mike	1
23	Dave	2
3	Sarah	
5	Jim	4
6	Sunil	1
37	Morgan	4

Department

depid	dep_name
1	Sales
2	Product
3	Research
4	Engineering
5	HR

```
SELECT emp_name, dep_name
FROM Employee FULL JOIN Department ON emp_dep = depid
ORDER BY dep_name, emp_name;
```

Result Table

emp_name	dep_name
Jim	Engineering
Morgan	Engineering
	HR
Dave	Product
	Research
Mike	Sales
Sunil	Sales
Sarah	

Third Question

Which instructors have no students in their class?

Current_Student(sid, fname, lname, dob, cno, cname, credits, grade)

New_Student(sid, fname, lname, dob)

Class(tid, instructor, dept, cno, cname, credits)

iClicker Question

Which instructors have no students in their class?

What type of join does this query require?

- A. Self join
- B. Outer join
- C. Inner join

Fourth Question

Which classes are taught by two teachers?

Show the answer as the cno of the class and tid for both teachers.

```
Current_Student(sid, fname, lname, dob, cno, cname, credits, grade)
```

```
New_Student(sid, fname, lname, dob)
```

```
Class(tid, instructor, dept, cno, cname, credits)
```

iClicker Question

Which classes are taught by two teachers?

Show the answer as the cno of the class and tid for both teachers.

How many records does the answer have?

- A. 4
- B. 3
- C. 2
- D. 1

Demo: Creating an ERD

College ERD v1

Class		
	tid	String
	instructor	String
	dept	String
	cno	String
	cname	String
	credits	Integer

Current_Student		
	sid	String
	fname	String
	lname	String
	dob	String
	cno	String
	cname	String
	credits	Integer
	grade	String

New_Student		
PK	sid	String
	fname	String
	lname	String
	dob	String

Milestone 3

<http://www.cs.utexas.edu/~scohen/milestones/Milestone3.pdf>