

Question 1.

Using the University schema, write a relational algebra expression to find all courses taught in the Spring 2010 semester.

- a) Goal is: to find courses
- b) Condition is: taught in Spring 2010 semester
- c) On schema, four tables have course: course, section, takes and teaches
- d) Three tables have semester and year: section, takes and teaches
- e) Any of these three would probably work but I choose teaches
- f) In relational algebra:

σ is used to express our condition and returns those rows that satisfy condition and Π is used to display just the columns of interest

Final Answer is:

$\Pi_{\text{course_id}} (\sigma_{\text{semester} = \text{"Spring"} \wedge \text{year} = 2010} (\text{teaches}))$

Question 2.

Compute the Cartesian Product of the following two relations:

R C	S D
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4	3
8	1
	7

The Cartesian Product $R \times S$ includes all possible combinations of rows from R and S. This results in:

C	D
4	3
4	1
4	7
8	3
8	1
8	7

So, $R \times S = \{(4, 3), (4, 1), (4, 7), (8, 3), (8, 1), (8, 7)\}$

Question 3.

Write a SQL query to find the name and department of all instructors with a salary more than \$79,000 and sort the result in department then name order.

```
SELECT name, dept_name AS department
FROM instructor
WHERE salary > 79000
ORDER BY department, name;
```

Output:

name	department
Brandt	Comp. Sci.
Kim	Elec. Eng.
Singh	Finance
Wu	Finance
Einstein	Physics
Gold	Physics

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Question 4.

Write a SQL Query to list the names of instructors along with the courses they have taught. Sort the output by name.

```
SELECT instructor.name, course.title
FROM instructor
JOIN teaches ON instructor.ID = teaches.ID
JOIN course ON teaches.course_id = course.course_id
ORDER BY instructor.name;
```

Output:

name	title
Brandt	Game Design
Brandt	Game Design
Brandt	Image Processing
Crick	Intro. to Biology
Crick	Genetics
Einstein	Physical Principles
El Said	World History
Katz	Intro. to Computer Science
Katz	Image Processing
Kim	Intro. to Digital Systems
Mozart	Music Video Production
Srinivasan	Intro. to Computer Science
Srinivasan	Robotics
Srinivasan	Database System Concepts
Wu	Investment Banking

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