

Relational Model Assignment

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1. Consider the following database instance, which contains information about employees and the projects to which they are assigned:

Emp	
empId	lastName
E101	Smith
E105	Jones
E110	Adams
E115	Smith

Assign		
empId	projNo	hours
E101	P10	200
E101	P15	300
E105	P10	400
E110	P15	700
E110	P20	350
E115	P10	300
E115	P20	400

Proj		
projNo	projName	budget
P10	Hudson	500000
P15	Columbia	350000
P20	Wabash	350000
P23	Arkansas	600000

Show the final tables that would be produced by each of the following relational algebra queries:

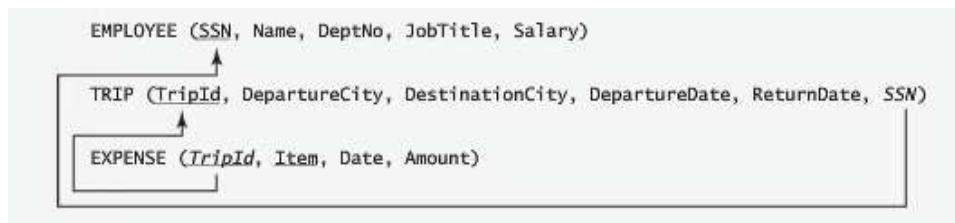
(a)

$$\Pi_{\text{budget}}(\Pi_{\text{projNo}}(\text{Assign}) \bowtie \text{Proj})$$

(b)

$$\Pi_{\text{lastName}}(\Pi_{\text{empId}}(\sigma_{\text{hours} \geq 500}(\text{Assign})) \bowtie \text{Emp})$$

2. Consider the following schema for a database that keeps information about business trips and their associated expenses by employees:



Write relational algebra or pseudo-SQL queries for each of the following:

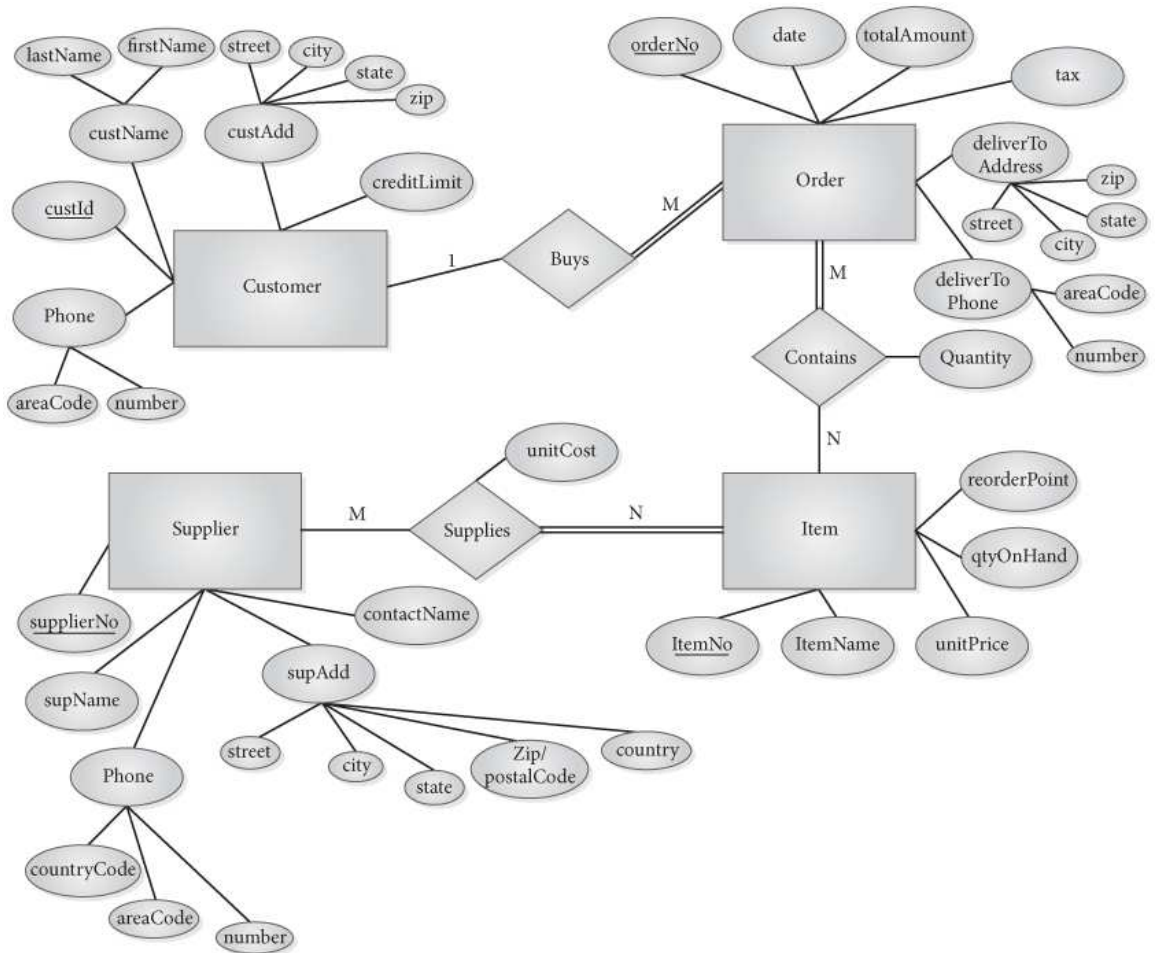
- Find the names and salaries of all those with the job title of 'Technology Evangelist'.
 - Find the destination of all trips taken by members of the Marketing department during 2016.
 - Find the names, departments, and job titles of all employees who have any expense item with value 'Service Charge' for trips taken to Melbourne last year, along with the date and amount of the expense.
3. Consider the following schema:

```
Transcript(StudId, CrsCode, Semester, Grade)
Teach(ProfId, CrsCode, Semester)
Professor(ProfId, ProfName, Dept)
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Write the following queries in relational algebra or pseudo-SQL:

- Find all students who have received a grade of "A" in CS417 from Professor Kelliher, showing their id number and the semester in which they received the grade.
- Find the Ids of all students who have taken a course from each professor in the the CS department. (Relational algebra has the / operator for division. For pseudo-SQL, you may assume that there is a DIV operator for division.)

4. Design a relational database schema for this E-R diagram:



5. Design a relational database schema for this E-R diagram:

