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COEN 280 - Spring 2023
Assignment 1

1) **Show the name and phoneNo of all employees who work for the Department with DeptName,"R&D".**

Step 1: theta-join the Employee and Department relations to combine the relevant data

$$R1 = Employee \bowtie_{Employee.DeptNo=Department.DeptNo} Department$$

Step 2: select only the tuples (rows) that have employees working in the R&D department

$$R2 = \sigma_{DeptName="R\&D"}(R1)$$

Step 3: display only the name and phone number of the employees who work in R&D

$$Ans = \pi_{EmpName,PhoneNo}(R2)$$

2) **For every project located in "Santa Clara", show the project number, projectName, controlling Department Number and the name of the manager of that department.**

Step 1: theta-join the Project and Department relations to combine relevant data

$$R1 = Project \bowtie_{Project.DeptNum=Department.DeptNo} Department$$

Step 2: theta-join the R1 and Employee relations to combine relevant data

$$R2 = R1 \bowtie_{Department.ManagerSSN=Employee.SSN} Employee$$

Step 3: select only the tuples (rows) that have Projects in Santa Clara

$$R3 = \sigma_{location="Santa\ Clara"}(R2)$$

Step 4: pick only the project number, project name, department number, and manager name attributes from the R3 relation

$$R4 = \pi_{ProjNumber,ProjectName,DeptNum,EmpName}(R3)$$

Step 5: change the schema by renaming EmpName to ManagerName for formatting purposes

$$Ans = \rho_{Ans(ProjNumber,ProjectName,DeptNum,ManagerName)}(R4)$$

3) **Find the names of all employees who work on all projects located in "Santa Clara"**

Step 1: select the Projects located in Santa Clara, then only pick the project number attribute

$$ProjLoc = \pi_{ProjNumber}(\sigma_{location="Santa\ Clara"}(Project))$$

Step 2: theta-join the ProjLoc and Works_On relations to combine relevant data

$$SCProjects = ProjLoc \bowtie_{Project.ProjNumber=Works\_On.ProjNumber} Works\_On$$

Step 3: pick only the EmpSSN attribute from the SCProjects relation

$$EmpWorksOn = \pi_{EmpSSN}(SCProjects)$$

Step 4: theta-join the Employee and EmpWorksOn relations, then only show the employee names

$$Ans = \pi_{EmpName}(Employee \bowtie_{Employee.SSN=Works\_On.EmpSSN} EmpWorksOn)$$

4) Show the names of employees with two or more dependents.

Step 1: group the Dependent relation by EmployeeSSN, then count the dependentName and store the result into numDependents

$$T1 = \gamma_{EmployeeSSN,COUNT(dependentName)\rightarrow numDependents}(Dependent)$$

Step 2: select only the tuples (rows) that have two or more dependents

$$T2 = \sigma_{numDependents \geq 2}(T1)$$

Step 3: theta-join the T2 and Employee relations, then only show the employee names

$$Ans = \pi_{EmpName}(T2 \bowtie_{Dependent.EmployeeSSN=Employee.SSN} Employee)$$

5) Show the names of employees with no dependents.

Step 1: pick only the SSN attribute from the Employee relation

$$AllEmps = \pi_{SSN}(Employee)$$

Step 2: pick only the EmployeeSSN attribute from the Dependent relation

$$Temp1 = \pi_{EmployeeSSN}(Dependent)$$

Step 3: change the schema by renaming EmployeeSSN to SSN

$$EmpsDeps = \rho_{EmpsDeps(SSN)}(Temp1)$$

Step 4: apply the set difference operation to retrieve the employee SSNs with no dependents

$$Temp2 = AllEmps - EmpsDeps$$

Step 5: change the schema by renaming SSN to ESSN

$$EmpsNoDeps = \rho_{EmpsNoDeps(ESSN)}(Temp2)$$

Step 6: theta-join the EmpsNoDeps with Employee, and then only show the employee names

$$Ans = \pi_{EmpName}(EmpsNoDeps \bowtie_{Employee.ESSN=Employee.SSN} Employee)$$