Assignment 2

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March 17, 2022

II. Relational Algebra (30 marks)

q1)

$\Pi_{FirstName,\ LastName,\ SalaryPerMonth,\ YearsOfService}\ (\sigma_{SalaryPerMonth>12000\ \wedge\ YearsOfService>=10}$ (Employees))

q2)

$\Pi_{FirstName,\ LastName}\ (\sigma_{FirstName\ Like\ 'C\%'\ Year(BirthDate)>1970}$(Employees))

q3)

$\gamma_{AVG(SalaryPerMonth)\rightarrow AVGSALPERMONTH}\ (\sigma_{Gender='F'}$(Employees))

q4)

$\delta(\Pi_{GroupName}(\sigma_{ResearchGroups.ID=Rooms.ResearchGroupID\ \wedge\ Buildings.ID=Rooms.BuildingID\ \wedge\ Buildings.Name='JohnHodginsBuilding'}(ResearchGroups \times Rooms \times Buildings)))$

q5)

$\Pi_{E1.LastName,\ E2.FirstName}(\tau_{E1.LastName}(\gamma_{E1.LastName,\ E1.FirstName}\ (\sigma_c(\rho_{E1}$(Employees) $\times\rho_{E2}$(Employees)))))
c = $E1.LastName = E2.LastName\ \wedge\ E1.FirstName <> E2.FirstName$

q6a)

$\gamma_{Buildings.Name,\ count(*)\rightarrow NumOfElevators}(\sigma_c$(Buildings $\bowtie_{Buildings.ID=hasarea.BuildingID}$ hasArea))

c = $hasArea.BuildingAreaTypeID = 2$

q6b)

$\pi_{Buildings.Name,\ NumOfElevators}(\sigma_b(\gamma_{Buildings.Name,\ count(*)\rightarrow NumOfElevators}(\sigma_c(\text{Buildings} \bowtie_{Buildings.ID=hasarea.BuildingID} \text{hasArea}))))$
b = $count(*) > 2$
c = $hasArea.BuildingAreaTypeID = 2$

q7)

$\delta(\pi_{Buildings.Name,\ BuildingAreaType.TypeName}((\sigma_c(\text{Buildings} \bowtie_{Buildings.ID=hasarea.BuildingID} \text{hasArea}) \bowtie_{hasArea.BuildingAreaTypeID=BuildingAreaType.ID} \text{BuildingAreaType})))$

c = $(BuildingAreaType.TypeName =' FoodArea' \vee BuildingAreaType.TypeName =' Lobby') \wedge (hasArea.BuildingAreaTypeID = 4 \vee hasArea.BuildingAreaTypeID = 8)$

q8)

R1:= $\delta(\pi_{ChairEmpID}(\sigma_{Departments.ID=ResearchGroups.DepartmentID}(Departments \times ResearchGroups)))$

R:=$\pi_{Employees.ID,\ LastName,\ FirstName}(\sigma_{Departments.ChairEmpID=Employees.ID(R)}(Employees \times Departments))$
R3:=$(\pi_{ChairEmpID}(\rho_{R2(ChairEmpID,\ LastName,\ FirstName)}(R))) - R1$
Answer:=$\pi_{Employees.ID,LastName,FirstName}(Employees \bowtie_{ChairEmpID=Employees.ID} R3)$

q9)

R:=$\gamma_{Meters.ID,\ ((Max(Rel\_MeterInstalledInRoom.Reading)-Min(Rel\_MeterInstalledInRoom.Reading))*0.129)\rightarrow Hydrobill}(\sigma_c(a \times b))$
a=(Meters $\bowtie_{Meters.MeterTypeID=MeterType.ID}$ MeterType) $\bowtie_{MeterType.RateID=Rates.ID}$Rates
b=(ResearchGroups $\bowtie_{ResearchGroups.ID=Rooms.ResearchGroupID}$ Rooms) $\bowtie_{Rel_MeterInstalledInRoom.RoomID=Rooms.ID}$Rel_MeterInstalledInRoom
c = $ResearchGroups.ID = 4 \wedge Meters.MeterTypeID = 1 \wedge (Month(DateOfRecord) = 1 \vee (Month(DateOfRecord) = 2 \wedge Day(DateofRecord) = 1)) \wedge Meters.ID = Rel\_MeterInstalledInRoom.MeterID$

Answer:=$\gamma_{SUM(Hydrobill)\rightarrow HydroBill}(R)$

q10)

R:=$\gamma_z(\sigma_c(a \times b))$
a=(Meters $\bowtie_{Meters.MeterTypeID=MeterType.ID}$ MeterType) $\bowtie_{MeterType.RateID=Rates.ID}$Rates
b=(ResearchGroups $\bowtie_{ResearchGroups.ID=Rooms.ResearchGroupID}$ Rooms) $\bowtie_{Rel_MeterInstalledInRoom.RoomID=Rooms.ID}$Rel_MeterInstalledInRoom
c=$Meters.MeterTypeID = 1 \wedge (Month(DateOfRecord) = 1 \vee (Month(DateOfRecord) = 2 \wedge Day(DateofRecord) = 1)) \wedge Meters.ID = Rel\_MeterInstalledInRoom.MeterID$
z=$ResearchGroups.GroupName,\ Meters.ID,\ ((Max(Rel\_MeterInstalledInRoom.Reading) - Min(Rel\_MeterInstalledInRoom.Reading)) * 0.129) \rightarrow Hydrobill$

Answer:=$\sigma_{GroupName,\ HydroBill}(\tau_{HydroBill\ desc}\ (\gamma_{GroupName,\ SUM(Hydrobill) \rightarrow HydroBill}(R)))$