

CSE 460 Assignment1

Due 10/19/2017 in-class

Date 10/09/2017

Submission: Submit hardcopy in-class on 10/19/2017, a printed copy is preferred. If you want to submit hand written answers, please DO NOT use a pencil, please ensure the readability of your answers, answers should be stapled (if you have more than one page).

This is **individual work**. Copied solutions will be considered violations of academic integrity. Please write your name, UBIT, UB person# and the text “The submitted solutions are my individual work.” at the beginning of the submitted answer.

A list of relational algebra symbols is as following, you can copy and paste the symbols if you can't find a way to type them using your text editor (A recommended text editor is ShareLatex).

Operation	Symbol
Selection	σ
Projection	π
Join	\bowtie
Cross-product	\times
Set-difference	$-$
Union	\cup
Intersection	\cap
Renaming	ρ
Distinct	δ
Division	$/$

Problem You are given a database with following relational schema:

Student(sid, sname, dept)

Enroll(StuId, cid, grade)

Course(cid, dept)

Primary keys are underlined, the column Enroll.StuId is a foreign key referencing to Student.sid, Enroll.cid is a foreign key referencing to Course.cid, Enroll.grade is a decimal representing the GPA. Course ids(Course.cid) are strings, e.g. 'CSE462', the column Course.dept contains just the departmental acronym,

e.g., 'CSE', indicating the departments of courses (i.e. the departments offering the courses). Write following queries using relational algebra, you can assume that there's no *null*, **NO AGGREGATE FUNCTION SHOULD BE USED**, you are encouraged to use linear notation for complex queries.

(1) Find the names of all the students who received both A grade and A-grade.(10 points)

sol:

$\pi_{sname}(Student \bowtie_{sid=StuId} (\pi_{StuId}(\sigma_{grade=4.0}(Enroll)) \cap \pi_{StuId}(\sigma_{grade=3.66}(Enroll))))$

(2) Find the sids and names of all the students who are enrolled in at least one course provided by CSE department.(20 points)

sol:

$CSEEnroll := Enroll \bowtie (\sigma_{dept='CSE'}(Course))$
 $Res := \pi_{sid,sname}(Student \bowtie_{sid=StuId} CSEEnroll)$

(3) Find the names of all the students who are enrolled in and only enrolled in the courses provided by CSE department.(30 points)

sol:

$CSEEnroll := \pi_{StuId}(Enroll \bowtie (\sigma_{dept='CSE'}(Course)))$
 $NonCSEEnroll := \pi_{StuId}(Enroll \bowtie (\sigma_{dept \neq 'CSE'}(Course)))$
 $OCSEEnroll := CSEEnroll - NonCSEEnroll$
 $Res := \pi_{sname}(Student \bowtie_{sid=StuId} OCSEEnroll)$

(4) Find the names of all the students who are enrolled in at most one course provided by CSE department.(40 points)

sol:

$CSEEnroll := \pi_{StuId, Enroll.cid, grade}(Enroll \bowtie (\sigma_{dept='CSE'}(Course)))$
 $NOCSEEnroll := \pi_{StuId}(Enroll) - \pi_{StuId}(CSEEnroll)$
 $E1 := \rho_{S1, C1, G1}(CSEEnroll)$
 $MTT := \pi_{StuId}(CSEEnroll \bowtie_{stuId=S1 \wedge cid <> C2} E1))$
 $Res := \pi_{sname}(Student \bowtie_{sid=StuId} ((\pi_{StuId}(CSEEnroll) - MTT) \cup NOCSEEnroll))$