# EECS341 Homework 3 Solutions

September 30, 2015

Consider the Teachers-Students-Courses Database with the following 5 relations:

Professors (pid, pname, dept, ext.)
Students (sid, sname, major-dept, year)
Courses (cid, cname, dept, credithours)
Enrollment (sem-year, sid, cid, grade)
Teach (pid, cid, sem-year, class-size)

where Professors have id$'$s (pid), names (pname), dept that they work (dept), and a telephone extension (ext). Similary, Students have id, name, major-dept and year (i.e, freshman, sophomore, etc). Attributes of Courses and Enrollment are self explanatory. Attributes "dept" in relations Professors, and Courses, and attribute "major-dept" in relation Students have the same domain, and have values like "CS", "CE", "EE", "ME", etc. Attribute "sem-year" has values like "Spring2016", "Fall2015", etc. Assume that cid$'$s are unique, i.e. if there are multiple sections of a course, each section has a unique cid.

**Express the queries below using RA.**

1. Find cid and cname of courses that are offered by "CS" department that are taught by professors who are from another department in "Fall2015".

$\Pi_{(cid,cname)}(\sigma_{dept=\text{“}CS\text{”}}(Courses \bowtie \Pi_{cid}(\sigma_{dept\neq\text{“}CS\text{”}}(Professors \bowtie (\sigma_{sem-year=\text{“}Fall2015\text{”}}Teach)))))$

2. Find sid$'$s, names and major-dept of students who enrolled in a course that is taught by a professor Smart.

$\Pi_{sid,sname,major-dept}(Students \bowtie Enrollment \bowtie Teaches \bowtie (\sigma_{pname=\text{“}Smart\text{”}}Professors))$

3. Find pid and names of professors who teachno courses in "Fall2015".

$\Pi_{pname,pid}(Professors) - \Pi_{pname,pid}(Professors \bowtie \sigma_{sem-year=\text{“}Fall2015\text{”}} Teach)$

4. Findpid and names of professors who teach only courses offered by "CS" department.

$\Pi_{pid,pname}((\Pi_{pid}(Teaches) - \Pi_{pid}(Professors \bowtie \Pi_{pid}(Teaches \bowtie \sigma_{dept \neq \text{“}CS\text{”}} Courses))) \bowtie Professor)$

5. Find pnames and pids of professors who teach every course offered by "CS" department.

$\Pi_{pname,pid,cid}(Professors \bowtie Teach) / \Pi_{cid}(\sigma_{dept=\text{“}CS\text{”}} Courses)$

6. Find sid′s of students who enrollin "Fall2015" every 3 credit hr course offered by "CS" department.

$\Pi_{sid,cid}(\sigma_{sem-year=\text{“}Fall2015\text{”}} Enrollment) / \Pi_{cid}(\sigma_{credithours=3 \wedge dept=\text{“}CS\text{”}} Courses)$

7. Find cid′s and names of courses in which every student majoring in "CS" enrolled in "Fall2015".

$\Pi_{cid,name,sid}(Courses \bowtie \sigma_{sem-year=\text{“}Fall2015\text{”}} Enrollment) / \Pi_{sid}(\sigma_{dept=\text{“}CS\text{”}} Students)$