

cs348-hw1

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Part1

For the Course Registry database given below –
Students(snum, sname, major, standing, age, gpa)
Faculty(fid, fname, deptid)
Courses(cnum, cname, course_level, credits)
Offerings(onum, cnum, day, starttime, endtime, room, max_occupancy, fid)
Enrolled(snum, onum)

1. (20 Points) (RA,TRC,DRC,QBE) Write a query which displays the student names and the courses (course name) which the student has taken.

RA $\prod_{sname, cname} Students \bowtie Enrolled \bowtie Offerings \bowtie Courses$

TRC

$t | \exists s, e, o, c : s \in Students \wedge e \in Enrolled \wedge o \in Offerings \wedge c \in Courses \wedge$
 $(t[sname] = s[sname] \wedge s[snum] = e[snum] \wedge e[onum] = o[onum] \wedge o[cnum] = c[cnum]) \wedge t[cname] = c[cname])$

DRC $\{ \langle sname, cname \rangle \mid \exists snum, major, standing, age, gpa, cnum, course_level, credits,$
 $onum, cnum, day, starttime, endtime, room, max_occupancy, fid$
 $\langle snum, sname, major, standing, age, gpa \rangle \in Students$
 $\langle snum, onum \rangle \in Enrolled$
 $\langle onum, cnum, day, starttime, endtime, room, max_occupancy, fid \rangle \in Offerings$
 $\langle cnum, cname, course_level, credits \rangle \in Courses \}$

QBE

Students	snum	sname	major	standing	age	gpa
	_snum	P.				

Enrolled	snum	onum
	_snum	_onum

Offerings	onum	cnum	day	starttime	endtime	room	max_occupancy	fid
	_onum	_cnum						

Courses	cnum	cname	course_level	credits
	_cnum	P.		

2. (20 Points) (RA,TRC,DRC,QBE) Find the names of students who are not enrolled in any course.

RA $\prod_{sname} ((\prod_{snum} Students - \prod_{snum} Students \bowtie Enrolled) \bowtie Students)$

TRC $\{t | \neg(\exists s, e : s \in Students \wedge e \in Enrolled \wedge t[sname] = s[sname] \wedge s[snum] = e[snum])\}$

DRC $\{ \langle sname \rangle \mid \neg(\exists snum, major, standing, age, gpa, onum : \langle snum, sname, major, standing, age, gpa \rangle \in Students \wedge \langle snum, onum \rangle \in Enrolled) \}$

QBE

Students	snum	sname	major	standing	age	gpa
	_snum	P.				

Enrolled	snum	onum
\neg	_snum	

3. (20 Points) (RA, TRC,DRC,QBE) Find the courses taught by faculty from more than two departments.

RA $\rho_{result} cnum \text{ g count}(\text{distinct}(\text{deptid}))(\text{Offerings} \bowtie \text{Faculty})$

TRC $\{t | \exists o1 \in Offerings \exists o2 \in Offerings \exists f1 \in Faculty \exists f2 \in Faculty : o1 \neq o2 \wedge o1[cnum] = o2[cnum] \wedge o1[fid] = f1[fid] \wedge o2[fid] = f2[fid] \wedge f1[deptid] \neq f2[deptid]\}$

DRC $\{ \langle cnum \rangle \mid \exists cnum, onum1, day1, starttime1, endtime1, room1, max_occupancy1, fid1, onum2, day2, starttime2, endtime2, room2, max_occupancy2, fid2, fname1, deptid1, fname2, deptid2 : \langle cnum, onum1, day1, starttime1, endtime1, room1, max_occupancy1, fid1 \rangle \in Offering \wedge \langle cnum, onum2, day2, starttime2, endtime2, room2, max_occupancy2, fid2 \rangle \in Offering \wedge \langle fid1, fname1, deptid1 \rangle \in Faculty \wedge \langle fid2, fname2, deptid2 \rangle \in Faculty \wedge deptid1 \neq deptid2 \}$

QBE

Offerings	onum	cnum	day	starttime	endtime	room	max_occupancy	fid
		P.G._cnum						_fid

Faculty	fid	fname	deptid
	_fid		_deptid

conditions
CNT.UNQ._deptid>2

4. (10 Points) (DRC, QBE) Find the name of the course with the highest total maximum occupancy (over all course offerings).

DRC

$$\{ \langle cnum, cname \rangle \mid \exists max_occupancy1 = \sum \langle occupancy_t : \exists onum_t, day_t, starttime_t, endtime_t, room_t : \langle cnum, onum_t, day_t, starttime_t, endtime_t, room_t \rangle \in Offerings \rangle \wedge \neg(\exists max_occupancy2 = \sum \langle occupancy_t : \exists onum_t, day_t, starttime_t, endtime_t, room_t : \langle cnum2, onum_t, day_t, starttime_t, endtime_t, room_t \rangle \in Offerings \rangle \wedge max_occupancy2 > max_occupancy1) \wedge (\exists course_level, credits : \langle cnum, cname, course_level, credits \rangle \in Courses) \}$$

QBE

Offerings	onum	cnum	day	starttime	endtime	room	max_occupancy	fid
		G._cnum P.G._cnum					SUM._max0 SUM._max1	

Courses	cnum	cname	course_level	credits
	_cnum	P.		

conditions
MAX.SUM._max0 = SUM._max1

5. (10 Points) (RA,TRC) Find the courses that have been taken by all students.

RA $\prod_{cnum, cname} (\prod_{cnum, cname, snum} (Enrolled \bowtie Offerings \bowtie Courses)) \div \prod_{snum} Student$

TRC $\{t \mid \exists c \in Courses : t[cnum] = c[cnum] \wedge t[cname] = c[cname] \wedge (\forall s \in Students \exists o \in Offerings \exists e \in Enrolled : s[snum] = e[snum] \wedge e[onum] = o[onum])\}$

6. (10 Points) (RA,DRC) Find students with a GPA > 3.0 that are taking exactly two courses.

RA $\prod_{snum, sname} ((\sigma_{count(onum)=2}(snum \text{ g } count(onum) \sigma_{GPA>3.0} Students \bowtie Enrolled)) \bowtie Students)$

DRC $\{ \langle snum, sname \rangle \mid \exists major, standing, age, gpa : \\ \langle snum, sname, major, standing, age, gpa \rangle \in Students \wedge \\ \exists onum1, onum2 : onum1 \neq onum2 \wedge \\ \langle snum, onum1 \rangle \in Enrolled \wedge \\ \langle snum, onum2 \rangle \in Enrolled \wedge \\ \neg(\exists onum3 : onum3 \neq onum1 \wedge onum3 \neq onum2 \wedge \langle snum, onum3 \rangle \in Enrolled) \}$

7. (10 Points) (TRC, QBE) Find courses taught by only one faculty member.

TRC $\{ t \mid \exists c \in Courses : t[cnum] = c[cnum] \wedge \\ t[cname] = c[cname] \wedge \\ (\exists o1 \in Offerings : o1[cnum] = c[cnum] \wedge \\ \neg(\exists o2 \in Offerings : o2[cnum] = c[cnum] \wedge \\ o1[fid] \neq o2[fid])) \}$

QBE

Offerings	onum	cnum	day	starttime	endtime	room	max_occupancy	fid
\neg		_cnum						\neg _fid _fid

Courses	cnum	cname	course_level	credits
	P_cnum	P.		