

## Assignment 4: Relational Algebra

**Schema 1:** Student(sID, surName, FirrstName, campus, cgpa)

sID	surName	FirstName	campus	cgpa
1001	Kumar	Krishna	A	6.5
1002	Gowda	Siddarth	B	8
1003	Reddy	Ramesh	C	7.5
1004	Kamat	Pooja	D	8
1005	Kapoor	Sneha	D	8.5

**Schema 2:** Course(dept, cNum, name, breadth)

Dept	cNum	name	Credit
CS	100	DBMS	4
CE	200	SOM	5
ME	205	Mechanics	4
EE	300	Electrical motors	4
HS	400	Psychology	5

**Schema 3:** Offering(oID, dept, cNum, term, instructor)

Oid	dept	cNum	term	instructor
500	CS	100	1	Dr. Rao
502	CE	200	2	Dr. Keshav
505	ME	205	1	Dr. John
507	EE	300	2	Dr. Manoj
509	HS	400	2	Dr. Mohamad

**Schema 4:** Took(sID, oID, grade)

sID	oID	marks
1001	500	92
1002	502	85
1003	505	79
1004	507	91
1005	509	80

**Exercises:**

Allocation of Exercises :	1,2,3	Student Ids: 1-6
Allocation of Exercises :	4, 5	Student Ids: 7-12
Allocation of Exercises :	5,6,7	Student Ids: 13-18
Allocation of Exercises :	7, 8, 9	Student Ids: 19-24
Allocation of Exercises :	9,10	Student Ids: 25-30
Allocation of Exercises :	11,12	Student Ids: 31 - 36
Allocation of Exercises :	12,1	Student Ids: 37-38

**Generate the result Table and Write a SQL query statements for each of the following:**

1.  $\pi_{sID} \sigma_{dept = "cs" \wedge cNum = 100} (Took \bowtie offering)$
2.  $Temp1(sID) := \pi_{sID} \sigma_{dept = "cs" \wedge cNum = 200 \wedge grade \geq 90} (Took \bowtie offering)$
3.  $\pi_{surname, firstName} (Temp1 \bowtie Student)$
4.  $Instruct(sID) := \pi_{sID} \sigma_{credit = 4 \wedge instructor = "Manoj"} (Course \bowtie offering).$   
 $Passers(sID) := \pi_{sID} \sigma_{grade \geq 50} (Instruct \bowtie Took).$   
 $Answer(surname, FirstName) := \pi_{surname, FirstName} (Passers \bowtie Student).$
5.  $(\pi_{sID} \sigma_{grade > 80} Took) \vee (\pi_{sID} \sigma_{grade < 50} Took)$

$$6. \quad \prod \text{term}(\sigma \text{ dept}="cs" \wedge \text{cNum}=205 \wedge (\text{instructor} = "Dr.Manoj" \vee \text{instructor} = "Dr.Keshav")) \text{Offering})$$

$$7. \quad (\pi \text{ term } \sigma \text{ instructor}="Dr.John" \text{Offering}) \cap (\pi \text{ term } \sigma \text{ instructor}="Dr.Rao" \text{Offering})$$

$$8. \quad \text{HaveHighGrade(sID)} = \prod_{sID} \sigma_{\text{grade} \geq 80} \text{Took}$$

$$\text{Passed(sID)} = \prod_{sID} \sigma_{\text{instructor}="Dr.Mohamad" \wedge \text{grade} \geq} (\text{Took} \bowtie \text{Offering})$$

$$\text{Answer(sID)} = \text{HaveHighGrade} \vee \text{Passed}$$

$$9. \quad (\prod_{\text{dept}, \text{cNum}} \text{Course}) - (\prod_{\text{dept}, \text{cNum}} \text{Offering})$$

$$10. \quad (\prod_{\text{term}} \text{Offering}) - (\prod_{\text{term}} \sigma_{\text{dept}="cs" \wedge \text{cNum}=200} \text{Offering})$$

$$11. \quad \text{Pairs(sID1, sID2)} := \prod_{T1.sID, T2.sID} \sigma_{T1.sID < T2.sID \wedge T1.oID = T2.oID} [(q_{T1}^{\text{Takers}}) \times (q_{T2}^{\text{Takers}})]$$

$$\text{OneName(sID1, sID2, name1)} := \prod_{sID1, sID2, \text{surNames}} \sigma_{ID1=sID} (\text{Pairs} \times \text{Student})$$

$$\text{Answer(sID1, sID2, name1, name2)} := \prod_{sID1, sID2, \text{name1}, \text{surNames}} \sigma_{ID2=sID} (\text{OneName} \times \text{Student})$$

$$12. \quad \text{AtLeastTwice(sID)} := \prod_{T1.sID} \sigma_{T1.oID <> T2.oID \wedge T1.sID = T2.sID \wedge T1.\text{grade} = 100 \wedge T2.\text{grade} = 100} [(q_{T1}^{\text{Takers}}) \times (q_{T2}^{\text{Takers}})]$$