

Tutorial 5.5 (Week 8)

Relational Algebra

Classroom Exercise

- 1 The schema of a database containing university-type data is given below. Primary key is underlined for each relation.

```

STUDENT(Sid, Sname, Sex, Age, Year, GPA)
DEPT(Dname, Numphds)
PROF(Pname, Dname)
COURSE(Cno, Cname, Dname)
MAJOR(Dname, Sid)
SECTION(Dname, Cno, Sectno, Pname)
ENROLL(Sid, Grade, Dname, Cno, Sectno)

```

Write the following queries in relational algebra.

- (i) Find the names of professors who work in departments that have fewer than 50 PhD students.
- (ii) Find the name(s) of student(s) with the lowest GPA.
- (iii) Find the names and majors of students who have taken the 'Database System' course.
- (iv) Find the ids, names, and GPAs of the students who have taken all courses from the 'Civil Engineering' department.

- 2 Consider the following schema for a railway database. Foreign keys in one table refer to primary keys in other tables which have same attribute names.

```

TRAINS(train_num, source_city, destination_city)
DEPARTURES(train_num, date, train_type)
PASSENGERS(passenger_ssn, passenger_name, address)
RESERVATIONS(passenger_ssn, train_num, date, seat_number)

```

Express the following queries using Relational Algebra.

- (i) Find the Cities that have direct (non-stop) trains to both Minneapolis and San Francisco.
- (ii) Find the train_num and date of all trains for which there are no reservations.

- 3 The following questions are to be answered on the following simplified soccer relational schema.

```
Teams (name, groupname, teamid);
Players (name, teamid, matches, numgoals);
Results (teamid-one, teamid-two, scoreone, scoretwo,
matchdate);
```

Express the following queries using Relational Algebra.

- (i) Lists all the pairs of teamids such that all the matches between each pair of teams that ended in a tie. For simplicity, you can assume that teamid-one is always smaller than teamid-two.
- (ii) Find the "names" (not "teamids") of the teams that lost every game they played.

- 4 Give a relational algebra expression to find the maximum value in the relation R(A) without using aggregate operations.

- 5 Given the following relations, where a, b, c are integer attributes: R(a, b), S(b, c), Write relational algebra expression for the following queries.

Find the top 2 values of a present in R.