

A2[22 points]. Consider the example form Assignment 1 about soccer players and teams. Assume you have the following tables. I have abbreviated the names of some tables and fields to make writing relational algebra shorter.

```
CREATE TABLE Team (  
  name VARCHAR(45) NOT NULL,  
  city VARCHAR(45) NOT NULL,  
  PRIMARY KEY (name) );
```

```
CREATE TABLE SP (  
  id INT NOT NULL,  
  name VARCHAR(45) NOT NULL,  
  tName VARCHAR(45) NOT NULL,  
  PRIMARY KEY (id,teamName),  
  FOREIGN KEY (teamName) REFERENCES team(name));
```

```
CREATE TABLE Game (  
  id INT AUTO_INCREMENT,  
  hTeam VARCHAR(45) NOT NULL,  
  aTeam VARCHAR(45) NOT NULL,  
  hGoals INT NOT NULL,  
  aGoals INT NOT NULL,  
  date DATE NOT NULL,  
  PRIMARY KEY (id),  
  FOREIGN KEY (hTeam) REFERENCES team(name),  
  FOREIGN KEY (aTeam) REFERENCES team(name));
```

```
CREATE TABLE P (  
  id INT AUTO_INCREMENT,  
  spID INT NOT NULL,  
  spTeam VARCHAR(45) NOT NULL,  
  gameID INT NOT NULL,  
  goals INT NOT NULL,  
  PRIMARY KEY (id),  
  FOREIGN KEY (spID,spTeam) REFERENCES SP(id,tName),  
  FOREIGN KEY (gameID) REFERENCES game(id));
```

Write the solution to the following queries in **relational algebra** (2 points per query). Go over the slides and make sure you follow proper syntax. A common mistake is to project an attribute that doesn't exist. Feel free to introduce as many intermediate tables as you like.

- a) Print the names of soccer players that have scored a hat-trick (3 or more goals in a game).

- b) Print the names of teams that have one or more players that have scored a hat-trick.
- c) Print the names of teams that have scored more than 3 goals in a single game.
- d) Suppose that "Cal Poly" is one of the teams. Print the names of all teams that Cal Poly has beaten. Cal Poly has beaten an opponent if we have scored more goals than the opponent in a single game.
- e) How many goals has Cal Poly scored on average? Easiest way is to create two intermediate tables: goals scored in home games, and goals scored in away games, respectively.
- f) On what date(s) did Cal Poly score the most goals? You can create intermediate tables as previous question, but store date of game. Also create an intermediate table to store just the max number of goals scored.
- g) Which team has scored the most total goals? Create intermediate tables that store the total number of goals for the home teams and the total number of goals for the away teams. Aggregate the data by creating a table that stores the total number of goals for each team.
- h) Which team has scored the most goals in a single game? Create intermediate tables for goals scored for home teams (team name and goals), away teams, and for union of two tables. Create another table that stores just the number of most goals scored.
- i) Which soccer player has scored the most total goals? Create an intermediate table that stores the number of goals scored by each soccer player. Remember that a soccer player is identified by id and team name. Also create an intermediate table that stores the max number of goals from the previous intermediate table.
- j) Which soccer player has scored the most goals in a single game? Create an intermediate table that stores the maximum number of goals scored in a single game.
- k) Which team has the most wins? Create an intermediate table that stores the number of wins for each team. Also create an intermediate table that stores the number of wins of the team with the most wins.