Name

CWID

Homework Assignment 1

September 10th, 2013

CS425 - Database Organization

Please leave this empty!

1.1 1.2 1.3 1.4 1.5 1.6

1.7 1.8 1.9 1.10 1.11 1.12 Sum

Instructions

- Try to answer all the questions using what you have learned in class
- **When writing a query, write the query in a way that it would work over all possible database instances and not just for the given example instance!**
- Some questions are marked as bonus. You do not have to answer these questions to get full points for the assignment. However, you can get bonus points for these questions!

Consider the following database schema and example instance:

beer

bName	alcohol	type
Schmecks	5.9	wheat
Lecker	3.5	ale
Bass	4.6	IPA

wine

wName	alcohol	type	dryness
Enttaler	12.0	white	semi-dry
HippiHope	18.05	red	sweet

producesBeer

bName	cName
Schmecks	Beer Inc.
Lecker	Moselwine
Bass	Beer Inc.

producesWine

wName	cName
Enttaler	Moselwine
HippiHope	Caliwine

company

cName	country	numEmpl
Beer Inc.	USA	10,000
Caliwine	USA	5,500
Moselwine	Germany	3,000

Hints:

- Underlined attribute form the primary key of a relation
- The attribute *bName* of relation *producesBeer* is a foreign key to *bName* in relation *beer*. The attribute *cName* of relation *producesBeer* is a foreign key to *cName* in relation *company*.
- The attribute *wName* of relation *producesWine* is a foreign key to *wName* in relation *wine*. The attribute *cName* of relation *producesWine* is a foreign key to *cName* in relation *company*.

Part 1.1 Relational Algebra (Total: 100 Points)

Question 1.1.1 (7 Points)

Write a relational algebra expression that returns the names of all wheat beers.

Question 1.1.2 (7 Points)

Write a relational algebra expression that returns companies (their name and number of employees) from the USA.

Question 1.1.3 (7 Points)

Write a relational algebra expression that returns the names of wines that are red and sweet.

Question 1.1.4 (7 Points)

Write a relational algebra expression that returns the names of all red and white wines.

Question 1.1.5 (8 Points)

Write a relational algebra expression that returns the names of all beers produced by companies from Germany.

Question 1.1.6 (12 Points)

Write a relational algebra expression that returns the countries of all companies that produce both wine and beer.

Question 1.1.7 (8 Points)

Write a relational algebra expression that returns the names of all wines and beers.

Question 1.1.8 (7 Points)

Write a relational algebra expression that returns the number of beers per type (e.g., wheat or ale)

Question 1.1.9 (15 Points)

Write a relational algebra expression that returns the average alcohol content of all drinks sold by each company. For example, this expression should return tuples like $(BeerInc., 5.25)$.

Question 1.1.10 (10 Points)

Write a relational algebra expression that returns the number of companies that produce wine.

Question 1.1.11 (12 Points)

Write a relational algebra expression that returns the name of the company(ies) with the largest number of employees.

Question 1.1.12 (BONUS QUESTION) (10 Points)

Write a relational algebra expression that returns all companies that are producing less than 3 types of IPA beers.