CS-133 — Database and Knowledgebase Systems

Homework 3: Relational Calculi

Due 5:00pm, Friday February 25, 2000

The purpose of this homework is to give you practice with the two relational calculi.

Part I

The first part of the assignment is to provide Domain Relational Calculus and Tuple Relational Calculus queries for problems 1a – 1g,1i,1j, 2a, and 2b of Homework 2. You should use the versions of the calculi discussed in class —i.e. without bounded quantification. The problems are:

1. Use the schema of the animal shelter database to construct the following relations:

   (a) All pets adopted by John and their types.

   (b) Names of all cats in the database.

   (c) Names of all adopted cats in the database.

   (d) Telephone numbers of owners who adopted cats.

   (e) Names of owners who adopted short-hair stray cats.

   (f) Names and telephone numbers of owners whose pets are not fixed yet.

   (g) Names of owners who adopted two or more pets of the same type.

   (i) Names of owners who adopted both cats and dogs.

   (j) Names of owners who adopted at least one of each type of animal in the shelter.

2. Given the **parent**(pname,cname) relation, construct queries which return relations for:

   (a) **grandparent**(gpname,gcname)

   (b) **greatgrand**(ggpname,ggcname)

Part II

For this part of the assignment you are to give a proof that Relational Calculus is at least as powerful as Relational Algebra. That is, that for any relational algebra query there is a relational calculus query that produces the same result. The proof is by induction on the number of operators in the RA expression.

Note, you do not have to actually prove that each conversion rule actually generates the corresponding results. Just show the rules for each case.

You may use either domain or tuple relational calculus as the target of the proof.