Deductive Database Exercise (33 points)

Due May 17th

1 Tracking the Sorcerers

In this exercise a mythical village is modeled as a graph with various huts, crossing points and stores representing vertices and various path segments representing edges. Packages are transported over this network of paths from a store to a hut. Packages consists of a set of items. Unfortunately guards confiscate certain items at given crossings points. Finally there are a set of recipes that tell what types of magic potions may be made out of various sets of items.

The LDL binary is available at ~mjm/LDL/LDL++5.1. It only runs under Solaris. LDL documentation is available on the course web-page.

2 The Extensional Database

2.1 The Schema

The following EDB contains information on the layout of the village, the position and policies of the guards, the ingredients of magic potions and a set of actual deliveries.

```prolog
database({
  point(id:number),
  path(id1:number, id2:number),
  hut(owner:String, pid:number),
  store(name:String, pid:number),
  guard(name:String, pid:number, confiscate:any),
  recipe(name:String, item:any),
  delivery(sender:String, receiver:String, route:any, package:any)
}).
```

2.2 Some Facts

```prolog
point(1).
point(2).
point(3).
point(4).
point(5).
point(6).
```
point (7).
path (1, 2).
path (2, 3).
path (6, 7).
path (4, 3).
path (5, 4).
path (1, 4).
path (5, 7).
path (7, 3).
store ('Alberichs supply', 3).
hut ('Merlin', 5).
hut ('Rincewind', 1).
hut ('Gandalf', 6).
guard ('Grunt', 2, {'Sugar', 'Black powder'}).
guard ('Gnarly', 4, {'Coffee beans', 'Firey extract'}).
guard ('Scrubs', 7, {'Quicksilver', 'Blood root'}).
recipe ('Fireball', {'Firey extract', 'Black powder', 'Dragon breath'}).
recipe ('Coffee', {'Coffee beans', 'Sugar'}).
recipe ('Healing potion', {'St. Johns Wort', 'Blood root', 'Ginger'}).
recipe ('Rejuvenating potion', {'Coffee beans', 'Firey extract'}).
recipe ('Poison', {'Quicksilver', 'Blood root'}).
delivery ('Alberichs Supply', 'Merlin', [3, 2, 1, 4, 5], {'Dragon breath'}).
delivery ('Alberichs Supply', 'Merlin', [3, 7, 5], {'Firey extract'}).
delivery ('Alberichs Supply', 'Merlin', [3, 7, 5], {'Black powder'}).
delivery ('Alberichs Supply', 'Merlin', [3, 4, 5], {'Coffee beans', 'sugar'}).

Note that a 'bad route' will simply lose a package and paths may be traveled in both directions.

3 The Intensional Database

Build IDB predicates to answer the following queries.

1. List the names of all the stores.
2. List the names of guards who confiscate 'Blood root'.
3. List all the potions with the ingredient 'Ginger'.
4. List all the stores reachable from the hut owned by 'Gandalf'.
5. List all of the objects that were delivered to the hut owned by ‘Merlin’.
6. Based on the deliveries, list all the potions that may be mixed up at the hut of 'Merlin'.
7. Based on the deliveries, list all the huts that have the ingredients necessary to make ‘Fireball’.
8. List all the huts that could, in the future, be able to make ‘Fireball’.

3.1 Extra Credit

Build the PGPSQL code to calculate answers 4-8 in PostgreSQL. Be sure to document query run-times. Each questions 4,5,6,7 worth 3 points each. Query 8 worth 5 points.
4 What to hand-in

Several days before the due date I will make available a new, larger data file. Via email, simply send the answers to the above queries, their run times, and your code to Mårten Forsmark at forsmark@cs.umu.se.