Exercise Sheet 03

(Datalog Basics)

Please note: The exercises will be neither collected, nor corrected, or graded.

Exercise 1 – TITLE

The following Boolean formula is given:

$W \equiv (\neg x1 \vee x2 \vee \neg x3) \wedge x2 \wedge x4 \rightarrow x5 \wedge x4 \wedge \neg x5 \wedge x6 \wedge x7 \wedge x6 \vee \neg x2 \wedge (x1 \wedge x3)$

Is W satisfiable or not? If so, provide a substitution which satisfies it.

Exercise 2 – TITLE

a) What does it mean if "A W formula is not decidable within a Theory (deductive system) T" ?
b) What are $Datalog_f,_{neg}$, $Datalog_f$, $Datalog_{neg}$ and $Datalog$ in comparison?
c) What is "stratification"? Why is it needed? Which problem does it address?
d) Stratify the following rules:

```
grandmother(X,Y) :- parent(X,Z), parent(Z,Y), female(Y).
mother(X,Y) :- parent(X,Y), female(Y).
father(X,Y) :- parent(X,Y), not(mother(X,Y)).
```

Exercise 3 – TITLE

Download and install DES (http://des.sourceforge.net) to your computer. Using Datalog in DES, solve the following exercises. Submit your programs, queries and results via **email**.

Assume the bike manufacturer "Grasshopper". Grasshopper has a database with two predicates for base products it buys externally and products which can be constructed out of others. Please download the database from http://www.ifis.cs.tu-bs.de/webfm_send/138.

```
baseproduct(name, price, weight)
product(name, componentname, amountOfComponents)
```

Grasshopper actually produces two bike models, the "cityliner" and the "climber".

Extend the database with additional rules/predicates/etc such that it is possible to return the price and the weight for each product.

How expensive and how heavy are "cityliner" the "climber"?

Exercise 4 – TITLE

Download and install DES (http://des.sourceforge.net) to your computer. Using Datalog in DES, solve the following exercises. Submit your programs, queries and results via email.
Write a Datalog program computing the Ackermann function.

$$A(m,n) = \begin{cases} n+1 & \text{if } m = 0 \\ A(m-1,1) & \text{if } m > 0 \text{ and } n = 0 \\ A(m-1,A(m,n-1)) & \text{if } m > 0 \text{ and } n > 0. \end{cases}$$

Which value has *A(3,4)?*