Prof. Dr. Jürgen Giesl

Carsten Otto

Notes:

- Solve these exercises in **groups of three**! For other group sizes **less points** are given!
- The solutions must be handed in **directly before (very latest: at the beginning of)** the exercise course on Wednesday, 19.06.2013, in lecture hall **AH 2**. Alternatively you can drop your solutions into a box which is located right next to Prof. Giesl's office (this box is emptied **a few minutes before** the exercise course starts).
- Please write the **names** and **immatriculation numbers** of all (three) students on your solution. Also please staple the individual sheets!

Exercise 1 (SLD tree): (9+1=10 points)

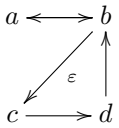
Consider the following logic program $\mathcal{P}$:

```
path(X, X, Y).
path(X, Y, s(Z)) :- edge(X, A), path(A, Y, Z).
path(X, Y, Z) :- eps(X, A), path(A, Y, Z).

edge(a, b).
edge(b, a).
edge(c, d).
edge(d, b).

eps(b, c).
```

The predicates `edge` and `eps` define the following graph $\mathcal{G}$:



Furthermore, `path(X, Y, Z)` is true iff there is a path from `X` to `Y` in $\mathcal{G}$ where at most `Z` non-ε-edges are used along the path. As an example, `?- path(a, X, s(0))` gives the solutions `X = a`, `X = b`, and `X = c`.

a) Please give a graphical representation of the (finite) SLD tree for the query `?- path(a, a, s(s(0)))`.

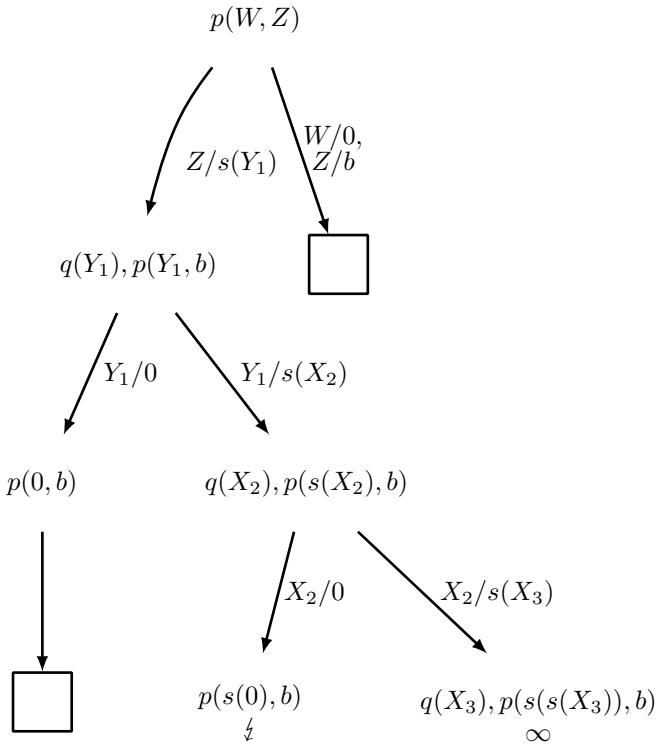
b) Change the order of exactly two literals in the clauses of $\mathcal{P}$ such that for the query from the first exercise part the resulting SLD tree is infinite.

Exercise 2 (SLD tree): (2 points)

Consider the following logic program $\mathcal{P}$:

```
p(X, s(Y)) :- q(Y), p(Y, b).
p(0, b).
q(0).
q(s(X)) :- q(X).
```

Below the corresponding SLD tree for the query `p(W, Z)` is shown. Here, ∞ indicates nodes leading to an infinite computation and $\lightning$ marks nodes that cannot be evaluated further.



Give the answer substitutions in the order Prolog finds them. Explain your answer.