

## Deductive Databases & Knowledge Based Systems

### Sheet 5

#### Exercise 1

1. What is a least Herbrand model? (1p)
2. What are minimal Herbrand models? (1p)
3. What are perfect Herbrand models? (1p)
4. In general, why aren't there least Herbrand models for  $atalog^{neg}$ ? (1p)

#### Exercise 2

Provided is following  $Datalog^f$  program:

```
edge(3,2).
edge(2,6).
edge(2,5).
edge(5,3).
path(X,Y) : - edge(X,Y).
path(X,Y) : - edge(X,Z), path(Z,Y).
```

Compute the least model step by step using the fixpoint iteration. (4p)

#### Exercise 3

Provided is following  $Datalog^{neg}$  program:

```
q(1,2).
q(2,3).
s(1,3).
r(X,Y) : - s(X,Y).
p(X,Y) : - q(X,Y), -r(X,Y).
p(X,Y) : - q(X,Y), -s(X,Y).
p(X,Y) : - p(X,Y), p(X,Y).
```

1. Provide all minimal Herbrand models of the program. (2p)
2. Provide a program connection graph and stratification for the program. (2p)
3. Partition the program according the stratification into  $\mathcal{P} := \mathcal{P}_0 \cup \dots \cup \mathcal{P}_0$  (1p)
4. Compute the perfect model step by step using the iterated fixpoint iteration. (4p)
5.  $Datalog^f$  is supposed to be computationally complete. Thus, the above program should be able to be expressed in  $Datalog^f$ . Provide an equivalent version of the program without negation. (3p)