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:

\[
\begin{align*}
edge(3,2). \\
edge(2,6). \\
edge(2,5). \\
edge(5,3). \\
p(path(X,Y)) & : - edge(X,Y). \\
p(path(X,Y)) & : - edge(X,Z), path(Z,Y). 
\end{align*}
\]

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

Exercise 3
Provided is following $Datalog^{neg}$ program:

\[
\begin{align*}
q(1,2). \\
q(2,3). \\
s(1,3). \\
r(X,Y) & : - s(X,Y). \\
p(X,Y) & : - q(X,Y), - r(X,Y). \\
p(X,Y) & : - q(X,Y), - s(X,Y). \\
p(X,Y) & : - p(X,Y), p(X,Y). 
\end{align*}
\]

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 $\mathcal{P} := \mathcal{P}_0 \cup \ldots \cup \mathcal{P}_0$ (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)