

# Advanced Data Modeling

Summer Semester 2009

- Exercises 4 -

To be handed in before **2009-06-08, 23:59** via e-mail to [bercovici@uni-koblenz.de](mailto:bercovici@uni-koblenz.de) And [dividino@uni-koblenz.de](mailto:dividino@uni-koblenz.de), subject line: [ADM] ...

1) Which of the following programs are definite program? Give a minimal Herbrand model of the following program when possible. (4 points)

1.  $p(a).$   
 $w(a).$   
 $m(X) :- p(X), \text{ not } w(X)$   
 $w(X) :- p(X), \text{ not } m(X)$
2.  $p(a).$   
 $m(X) :- p(X,Y).$   
 $p(X,Y) :- w(X).$   
 $w(X) :- m(X), \text{ not } u(b).$   
 $u(X) :- m(a), p(X,Y)$
3.  $p(X) :- q(X), w(X).$   
 $q(X) :- \text{ not } u(X,Z), p(Z).$   
 $w(X) :- \text{ not } p(X), q(X).$
4.  $\text{group}(X) :- \text{subGroupOf}(X,Y).$   
 $\text{subGroup}(X,Z) :- \text{subGroupOf}(X,Y), \text{subGroupOf}(Y,Z).$   
 $\text{group}(X) :- \text{hasAdministrator}(X,Y).$   
 $\text{group}(X) :- \text{hasMember}(X,Y).$   
 $\text{person}(X) :- \text{hasPhoto}(X,Y).$   
 $\text{photo}(X) :- \text{hasAnnotation}(X,Y).$   
 $\text{tag}(Y) :- \text{hasAnnotation}(X,Y).$   
 $\text{group}(\text{summerKoblenz}) :- \text{subGroup}(X,\text{summer}).$   
 $\text{person}(\text{john}).$   
 $\text{group}(\text{summer}) :- \text{hasMember}(X, \text{john}).$

2) Proof the following Lemme (2 points)

Let  $P$  be a normal program and  $\text{comp}(P)$  its completion. Prove that  $P$  is a logical consequence of  $\text{comp}(P)$ . Hint:  $P$  is a logical consequence of  $\text{comp}(P)$

if  $I \models \text{com}(p) \rightarrow I \models p$

3) Program Completion (4 points)

$\text{mother}(a,b).$   
 $\text{father}(c,b).$   
 $\text{sister}(d,a).$   
 $\text{sister}(X,Y) :- \text{sister}(X,Z), \text{sister}(Z,Y).$   
 $\text{parent}(X,Y) :- \text{mother}(X,Y).$   
 $\text{parent}(X,Y) :- \text{father}(X,Y).$   
 $\text{aunt}(X,Y) :- \text{sister}(X,Z), \text{parent}(Z,Y).$   
 $\text{uncle}(X,Y) :- \text{not } \text{sister}(X,Z), \text{parent}(Z,Y), \text{sibling}(X,Z) .$

1. Give a model for  $p$ .
2. Give a completion of  $p$ .
3. Give a model for the completion of  $p$