CS345A PROBLEM SET #3

Due in class, Wednesday, April 27, 1994

1) (15 points) Find the modularly stratified model for the following program and EDB:

```
p(X) :- a(X,Y) & q(X) & not p(Y)
q(X) :- b(X,Y) & not q(Y)
q(X) :- c(X)
```

with EDB facts $a(1,2)$, $a(2,3)$, $a(3,1)$, $b(2,1)$, $b(3,2)$, $c(1)$. Indicate the locally stratified model for each module.

2) (20 points) Here are some recursive datalog rules.

```
p(X,Y) :- a(X,Z) & q(Z,Y)
q(X,Y) :- b(X,Z) & p(Z,W) & p(W,Y)
q(X,Y) :- c(X,Y)
```

Write in pseudo-Pascal and relational algebra a program that performs seminaive evaluation of these rules.

3) (20 points) For the rules of Problem 2 and the EDB $a(1,2)$, $a(3,4)$, $a(5,6)$, $b(2,3)$, $c(4,5)$, and $c(6,7)$, show what new facts are added to Δp and Δq at each round of seminaive evaluation.

4) (15 points) Construct the rule/goal graph for the rules of Problem 2 and the initial goal p^{bf}.

5) (20 points) Construct the rule/goal graph for the following rules:

```
p(X,Y) :- q(X,Y)
p(X,Y) :- p(X,Z) & p(Z,W) & p(Y,W)
```

with the initial goal p^{bf}. In this example, to avoid having to deal with a goal p^{ff} we must consider the order of subgoals for the second rule. The matter is discussed in general in Section 12.10, although in this case, common sense tells us the proper order to use. Note that different uses of the same rule can expand goals in different orders.

6) (15 points) Rectify the following rules.

```
p(X,Y) :- q(X,X,Z,Y) & q(X,Z,W,a)
q(A,B,C,D) :- p(A,B) & p(C,D)
q(A,B,C,D) :- b(A,B,C,D)
```