CS345A PROBLEM SET #2

Due in class, Monday, April 18, 1994

1) (20 points) For the following problem, it helps if you look at the examples of circuits in the survey of negation that was distributed electronically. A *NAND gate* has inputs X and Y; its output Z is 0 (false) if and only if both X nor Y are 1. We can represent a NAND-gate circuit by the EDB predicate $t0(Z)$, meaning wire Z is a circuit input set to 1 (true), and $g(X,Y,Z)$ meaning that there is a NAND-gate in the circuit with input wires X and Y and with output wire Z. The rules describing a circuit are thus

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t(Z) :- t0(Z)
t(Z) :- g(X,Y,Z) & ¬t(X)
t(Z) :- g(X,Y,Z) & ¬t(Y)
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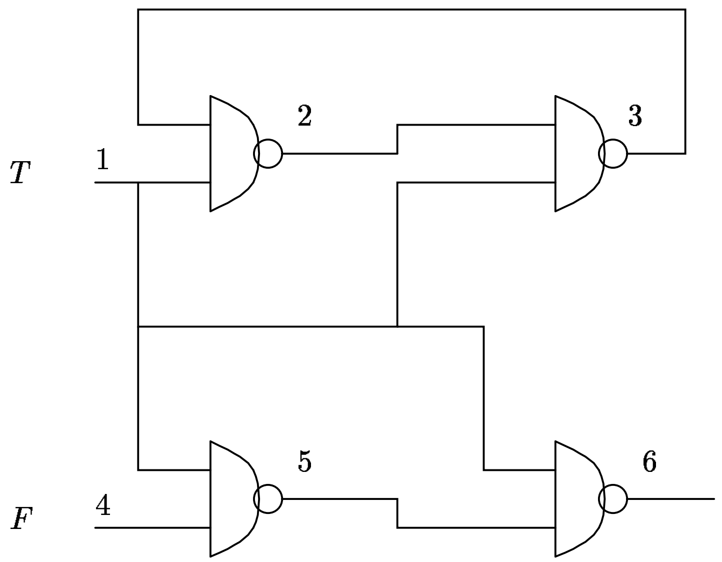
Here is a NAND-gate circuit represented by the EDB: $t0(1)$, $g(3,1,2)$, $g(2,1,3)$, $g(1,4,5)$, and $g(1,5,6)$.



For this EDB and the logic program above it, find the well-founded model by repeatedly making positive inferences and looking for unfounded sets.

2) (10 points) For the same EDB and program as Problem 1, find the well-founded model by the alternating fixedpoint method.

3) (20 points) For the EDB and program of Problem 1, find all the stable models. Is there a stable semantics for this EDB and program?

4) (10 points) Suppose we change the input of terminal 1 to be false; i.e., the relation for $t0$ is made empty instead of $\{1\}$. Show that this EDB plus the program from Problem 1 is modularly stratified. What are the "modules"?

5) (10 points) The program and EDB of Problem 4 is not locally stratified. Explain why. Suggest a simple generalization of the definition of "locally stratified" that this EDB

and program would meet.

6) (15 points) Compare the well-founded and stable approaches on the following rules of propositional calculus.

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p :- not q
q :- not r
r :- not s
s :- not p
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