Computer Science 431

Third Hour Exam

Name ____________________

Friday, Nov. 5
90 pts. (will be adjusted to 100 in the gradebook).

1. (10 pts.) Draw a picture of a two-input, one output feed-forward network with two nodes in the hidden layer. Don't forget the bias elements in the input and hidden layers.

2. (10 pts.) Suppose that we have a node h with inputs $x_0 = 1$, $x_1 = 2$, $x_2 = -1$ and corresponding weights -1, 1, 1. What is the output of h? You should not need your calculator for this one.

3. (10 pts.) Explain (with a sketch if possible) how an IS-A hierarchy supports default reasoning.

4. (10 pts.) Fill in the following truth table:

P	Q	P => Q

5. (10 pts.) Referring back to problem 4 (the one just before this one), explain how the truth-table shows the validity of the following argument:

P => Q
P

□ Q

5 (20 pts.) Consider the following argument:

P □ Q
R
(Q □ R) □ S
P

□ S

a. Convert the above statements into statements involving only OR and unary negation (i.e., convert the above into conjunctive normal form).

b. Negate the conclusion (S) and arrive at a contradiction (i.e., prove the argument using resolution).

c. You can also prove the validity of the argument using a truth-table. Why might you not want to do this? How many rows in the truth table would be required?

6. (10 pts.) An agent in Wumpus world steps into square (3, 2) and detects a foul smell and a glitter.

a. State the corresponding predicate in the Wumpus-world knowledge base, and say what the KB now knows about the location of the Wumpus.

b. What action should the agent take?

7. (10 pts.) Translate the following into English (only 4 points for a transliteration):

a. $\square x \square y(Student(x) \square Exam(y) \square StudiesHard(x,y) \square \; DoesWell(x,y)$

b.
$$\begin{aligned}&\square x \square y(po\,\mathrm{int}(x) \square po\,\mathrm{int}(y) \square (x \neq y)) \square \\ &(\square l(line(l) \square on(x,l) \square on(y,l) \square \\ &(\square z(line(z) \square on(x,z) \square on(y,z) \square \; l = z))\end{aligned}$$