STS 350

Exam #3

Name _____

Friday, April 28
100 pts.

Since the last exam we have discussed a number of technical issues: Expert systems (in the form supported by CLIPS), connectionist architectures, and an effort to define what we mean by "computational" in the statement "Cognition is computational."

I. Expert Systems

a. (5 pts.) What is a rule / production in an expert system?

b. (10 pts.) Define a CUSTOMER template with slots for customer name, amount owed, and account status.

(continuation of problem I)

c. (10 pts) Write a rule that says that if a customer status is DEFAULT for some customer, we should assert (or print - your choice) a statement to the effect that this customer (be sure to include the customer's name) should be sent a letter.

II. Connectionism

a. (10 pts) What do we mean by the connectionist approach? As a part of your answer to this question, contrast the connectionist approach with the symbolic approach.

b. (10 pts.) It is desired to construct a perceptron satisfying the following truth table:

X	Y	Out
1	1	1
1	0	0
0	1	1
0	0	1

Find appropriate weights to make this work, and sketch a picture of the perceptron. One way to approach might be to draw the appropriate line first - see part (c) below.

c. (5 pts.) Associated with each two-input perceptron is a straight line. Write the equation of the line associated with the perceptron in part (b) and give a quick sketch of the graph of the line.

d. (10 pts.) What is a feed-forward network? How does training with backpropagation work? A brief diagram might be useful in explaining this.

III. Computation

a. (5 pts.) What is a finite state automaton (machine)?

b. (5 pts.) What is a push-down automaton (machine)?

c. (10 pts.) What is a Turing machine?

d. (10 pts.) Consider the Finite State Machine whose state-transition table is given below:

State\input	a	b	c
State 1	goto 2	error	error
State 2	error	goto 2	goto 3
State 3	error	error	goto 3

State 1 is the start state, and state 3 is the only final state. This problem will be continued on the next page.

1. Sketch the finite state machine from the state-transition stable. Be sure to sketch the complete machine, and use appropriate notation for the initial and final states.

(continuation of problem III.d)

2. give an example of a string of a's, b's and c's **accepted** by the machine and a non-trivial example of a string of a's, b's and c's **rejected** by the machine.

e. (10 pts.) What is the Turing-Church hypothesis and what is its relation to cognitive science?