CSCI-561 University of Southern California
Homework 3 - Due Date 11/11/2003

Question 1 (10 points)
Represent the following in first-order logic. Make sure to use a reasonable set of primitive predicates that capture the basic concepts and clearly describe the meanings of predicates that are non-obvious.

1) Every graduate student is committed to academic honesty.
2) Only Bill can get his car started.
3) Things near the earth fall to the ground unless something holds them up.
4) Dinner is available only if booked in advance for at least two persons.
5) No man helps another without helping himself.

Question 2 (8 points)
You are given the following predicate symbols:
Mother(x,y) , Father(x,y), Female(x), Sister(x,y), Brother(x,y), Cousin(x,y)
Using these predicates, encode the following sentences;
   a. Not every one has a brother
   b. If someone has a sister, the sister is female
   c. If one has the same mother and father as some other person that person is either one's brother or one's sister
   d. One's cousin is some one whose father or mother is a sister or brother of one's mother or father

Question 3 (18 Points Total)
Consider the following sentences in FOL (E is existential quantifier and A is universal quantifier):

Ax ice-cream(x) => food(x)
Ax fudge(x) => food(x)
Ax Ay food(x) ^ food(y) ^ cold(x) ^ combine(x, y) => cold(y)
Ex Ey ice-cream(x) ^ cold(x) ^ fudge(y) ^ combine(x, y)

   a. **(8 Points)** Convert the FOL sentences back to English statements.
   b. **(10 Points)** Use resolution with refutation to prove the following:
                    Ex (fudge(x) ^ cold(x))

Reminder: we eliminate E by replacing Ex ice-cream(x) with ice-cream(FlavorX) where FlavorX is a constant term that does not appear anywhere else in the KB

Question 4 (15 points)

Certain of the logical connectives can be defined in terms of others. For examples,
(p => q) can be defined as an abbreviation for (~p v q), since the two statements are
logically equivalent. Hence, all formulas containing the connectives => could be replaced
by formulas containing ~ and v.

    a. Define => in terms of ^ and ~
    b. Define ^ in terms of v and ~
    c. Define <=> in terms of => and ~

Question 5 (50 points)

You are to implement the agent design you did in Homework 2. You will be supplied
some sample Java Agents on Oct.23. When they arrive, detailed instructions will be given
about their operation and how you are to proceed.

Question 6 (10 points)
Please install Jena and do the tutorial. Remember that on homework 4 you will have to write an RDF ontology that will be queried in Jena. If you follow these instructions please answer YES and you will receive full credit. If you don't, please answer NO and you will get no points.

Jena 2.0 Installation Instructions:
The following instructions are modifications of those found at
http://www.hpl.hp.com/semweb/

1. Download the http://jena.sourceforge.net/downloads.html for Jena version 2.0 to your home directory.
2. Unzip the distribution file. It will create a directory structure: /home/scf-08/nrane/Jena-2.0 (For you it will create directory /yourpath/Jena-2.0 where yourpath refers to /home/.../../ part)
3. Include the following at the end of your .cshrc file (of course, use your own home path name):

    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/jena.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/antlr.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/junit.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/concurrent.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/xercesImpl.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/icu4j.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/jakarta-oro-2.0.5.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/rdf-api-2001-01-19.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/log4j-1.2.7.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/lib/xmlParserAPIs.jar:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/src/com/hp/hpl/jena/tutorial:$CLASSPATH
    setenv CLASSPATH /home/scf-08/nrane/Jena-2.0/doc/tutorial/RDQL:$CLASSPATH

4. Type "source .cshrc" on command-prompt for new classpath to take effect.

5. Create a working directory named "tutorial" under Jena-2.0/src/com/hp/hpl/jena. If it already exists do not create again.

6. You will doing your tutorial work in the directory
        Jena-2.0/src/com/hp/hpl/jena/tutorial

    Download tutorials from site
    http://jena.sourceforge.net/tutorial/RDF_API/index.html into tutorial directory mentioned above.

    For example. When the tutorial shows you the code for Tutorial01.java
        a. Create an empty file: Jena-2.0/src/com/hp/hpl/jena/tutorial/Tutorial01.java
        b. Copy the code into this file.
        c. Compile it with: javac Tutorial01.java
        d. Run it with: java Tutorial01