CISC 3410 Fall 2010, Homework 6

1. Using the predicates $P(x)$ to denote "x is a politician", $R(x)$ to denote "x is rich", $L(x)$ to denote "x is a lobbyist" and $K(x, y)$ to denote "x knows y", write down first order logic, complete with variables and quantifiers to express:

   (a) All lobbyists are rich.

   (b) Some politicians are rich.

   (c) All politicians know a rich lobbyist.

   (d) Some lobbyists know a rich politician

   (e) Everyone knows a rich politician or a rich lobbyist.

   (30 points)

2. Translate the following lines into first order logic, complete with variables and quantifiers:

   (a) There is a house in New Orleans, they call the Rising Sun.

   (b) Everything you've got is hoi-poloi like.

   (c) There is a secret chord that David played and it pleased the Lord.

   (30 points)

3. Consider the problem of devising a plan for a kitchen-cleaning robot.

   (a) Write down a set of logical predicates that can be used to desribe a kitchen which includes a stove, a sink, a refrigerator, counters and a floor, each of which can be clean or dirty. The kitchen also contains a garbage bin which can be full or empty.

   (b) Write a description of a kitchen that has a dirty stove, refrigerator, counters, and floor. (The sink is clean, and the garbage has been taken out.)

   (c) Write a description of a goal state where everything is clean and there is no garbage in the bin.

   (d) Write a set of STRIPS-style operators that might be used. When describing these, take into account that:

      i. Cleaning the stove or the refrigerator will get the floor dirty.

      ii. Cleaning the refrigerator generates garbage and messes up the counters.

      iii. Washing the counters or the floor gets the sink dirty.

   (e) Use the POP algorithm (explaining how it works) to find a plan that achieves the above goal.

   (40 points)