

Student name: \_\_\_\_\_

Student ID: \_\_\_\_\_

**Note: The assignment should be submitted via “Assignments >> Homework 4” on den.usc.edu**

**Question 1a (Inference of First Order Logic) (13 points)**

The Morphing Robotics Laboratory has been researching transforming humans into robots. The scientists have discovered the following facts:

All humans that are made of steel are robots.

All desks are made of steel.

You(Y) have the same weight as a desk(D).

Anything having the same weight as a desk is made of steel.

You have to show the facts in FOL and CNF and use unification and resolution to prove “You are a robot”.

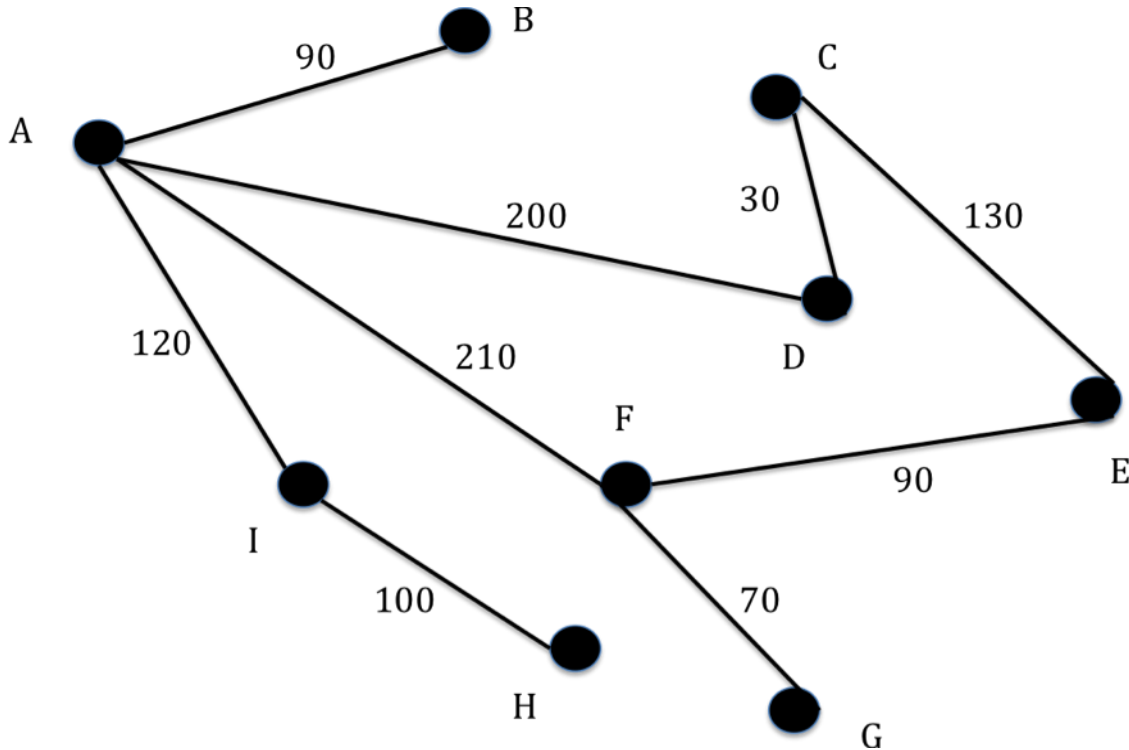
**Question 1b (13 points)**

“For every 2 friends, there is some hobby of one friend that the other does not like. Ken is Ryu's friend.” Show that Ken does not like all of Ryu's hobbies using resolution as seen on section 9.5 of the text book.

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**Question 2 (Knowledge Representation) (12 points)**



Consider an agent walks on the above map by planning a path from one city to another. The available action of the agent is  $Go(x,y)$ . This action takes the agent from city  $x$  to city  $y$  if  $DirectEdge(x,y)$  return true. This predicate is true if and only if there is a direct edge between city  $x$  and city  $y$  in the map. These facts are in the KB and the agent begins in city  $A$  and must reach city  $G$ .

- a. [4 points] Describe the initial situation of the agent using a suitable logical description.
- b. [4 points] Provide a logical query that returns all possible paths to the destination.
- c. [4 points] Describe the  $Go$  action with a logical sentence.

**BONUS (10 points):**

- d. [10 points] Now suppose that following the direct route between two cities consumes an amount of fuel equal to the distance between the cities. The robot starts with fuel at full capacity (defined as  $N$ ). Augment your representation to include these considerations. Your action description should be such that the query you specified earlier will still result in feasible plans.

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**Question 3 Planning (STRIPS) (12 points)**

Given the following 8-puzzle problem with starting and goal configurations:

Starting Configuration

1	4	7
8		6
5	2	3

Goal Configuration

8	1	7
5	4	6
2	3	

Use STRIPS to formulate the problem including specifying the starting state, goal state and the operator schemata and provide an action sequence to solve the puzzle.