Name _____

ID# _____

CSCI 5582 Exam 2

1. These questions address the topic of Logic.

   (a) **10 Points**

   Consider a knowledge-based agent that has the following two propositions in its current knowledge-base:

   i. $((Smoke \Rightarrow Fire) \vee (Heat \Rightarrow Fire))$
   ii. $Fire \Rightarrow Danger$

   Assume that the propositions $Smoke$ and $Heat$ take on their respective values directly from information provided by the agent's sensors. Show formally the circumstances under which the agent can logically conclude proposition $Danger$.

(b) Consider the following set of facts.

All people that are not sick and are smart are happy. People that read are smart. Happy people have exciting lives. Healthy people are not sick.

John is a person. John is healthy. Helen is a person. Helen reads and is healthy.

i. **10 Points**
Convert the statements given in the first paragraph into a set of First Order Logic sentences.

ii. **10 points**
Illustrate precisely how your set of rules could be used in a backward-chaining manner to find out if some particular person has an exciting life.

(c) **5 Points**

True or False: Implementing a Situation Calculus solution requires additional mechanisms beyond those found in ordinary First Order Logic (Note: Implementing any solution in FOL requires you to represent facts about the domain. That's not what I mean by "additional mechanisms".)

2. The following questions address the topic of Planning.

   (a) **15 Points**

   Characterize the POP algorithm as a example of state-space search algorithm. In other words, describe how the following ideas are instantiated in POP: states, operators, goal test, and search strategy.

(b) **5 Points**

What does the term *clobber* mean in terms of a planning system?

(c) **5 Points**

True or False: A plan returned from a successful run of the POP algorithm necessarily consists of a totally ordered sequence of steps.

3. The following questions address the topic of Uncertain Reasoning.

   (a) **5 Points**

   Which of the following people is responsible for the equation $P(A|B) = \frac{P(B|A)P(A)}{P(B)}$?

   a. Regis Philbin
   b. Isacc Newton
   c. Rev. Thomas Bayes
   d. Alan Turing

   (b) **10 Points**

   Consider the following fictional facts. On any given trip on the highway, the chances of having a tire blowout are 1/1,000,000. Tires made by the tire company GoodStone account for 10% of the tires on the road, and the chances of having a blowout given that you have GoodStone tires are 1/100,000.

   Now imagine you're sitting by the side of a highway and you see a car have a blowout. Assess the probability that the tire was a GoodStone tire (show your reasoning as well as the answer).

   (c) **5 Points**

   Should you buy GoodStone tires? Why?

(d) **10 Points**

Draw a Bayesian Belief Net labeled with all of the appropriate conditional probability tables for the following problem (Assume that the facts given below are the only relevant facts).

Patients with Meningitis may exhibit high fever, rash, and stiff neck. Patients with the Flu may exhibit high fever and chills.

(e) **10 Points**

Show that the tables from your belief net allow you to assess the probability of Meningitis if you are told only that the patient has a rash.

(f) **10 Points**

Qualitatively describe over time what should happen to you beliefs in Flu and Meningitis given that you are told first that the patient has a fever, and then later that the patient has chills.