Name _____

ID# _____

CSCI 5582 Exam 2

1. These questions address the topic of Planning.

    (a) **5 Points**

    True or False: If you think of the POP algorithm as a search technique, it would be considered an *uninformed* search technique.

    (b) **5 Points**

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

    (c) **15 Points**

    Describe *three* ways that the POP algorithm recovers from or deals with potential clobbering situations?

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

   (a) **5 Points**

   Give the equation for which the Rev. Thomas Bayes became famous.

   (b) **10 Points**

   Consider the following (made up) facts from a mythical hospital emergency room. The chances of any given patient coming in the door having a heart attack are 1/1000 and almost all, 9 out of 10, heart attack patients visiting the ER experience chest pain. You also know that fully half the people visiting the emergency room complain of chest pain.

   A patient comes in with chest pain. What is the probability that they are having a heart attack?

(c) **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).

Smoking can lead to heart attacks, as does high cholesterol. Heart attack victims exhibit chest pain, shortness of breath, and will test positive when given a blood enzyme test. People with heartburn also exhibit chest pain.

(d) **5 Points**

Show using your net (ie the tables attached to it) the method you would use to assess $P(ChestPain \wedge Shortness \wedge Cholesterol)$.

(e) **10 Points**

Show using your net that your belief net will allow you to assess the probability of heart attack if you are told only that the patient has a chest pain.

3. These questions address the topic of Learning.

    (a) **15 Points**

    Characterize the decision tree learning algorithm as an example of a state-space search algorithm. In particular, describe how the following ideas are instantiated in it: the search space and its component states, the goal test, the search strategy, and any heuristics that are used in it.

(b) **10 Points** Consider the training set given in the following table from a loan approval application. The ten training examples are characterized in terms of three attributes. The final column gives the correct answer: whether or not a loan is approved. All the possible values for each attribute are in the table.

No.	Credit History	Debt	Income	Loan Approved?
1	Bad	High	Low	No
2	Unknown	High	Middle	No
3	Unknown	Low	Middle	Yes
4	Unknown	Low	Upper	Yes
5	Unknown	Low	Upper	Yes
6	Bad	Low	Low	No
7	Good	Low	Middle	Yes
8	Good	High	Upper	Yes
9	Good	Low	Low	Yes
10	Bad	High	Upper	No

Given this data, which attribute would the decision tree learning algorithm put at the top of the tree? (Justify your answer with some math).

(c) **5 Points**

Give a 2-DL decision list that correctly classifies the training data in the previous example.

(d) **10 Points**

The decision list learning algorithm discussed in class (and in the book) doesn't specify exactly how the tests to be included in the list are chosen. Consider a domain where you are to use a decision list approach to create a classifier as a diagnostic test for some rare disease to be used on the diverse general population. By rare, I mean that the vast majority of training examples will be negative with only a few positive tests expected.

Describe a reasonable strategy to use in this case for choosing tests to include in the classifier to be learned.