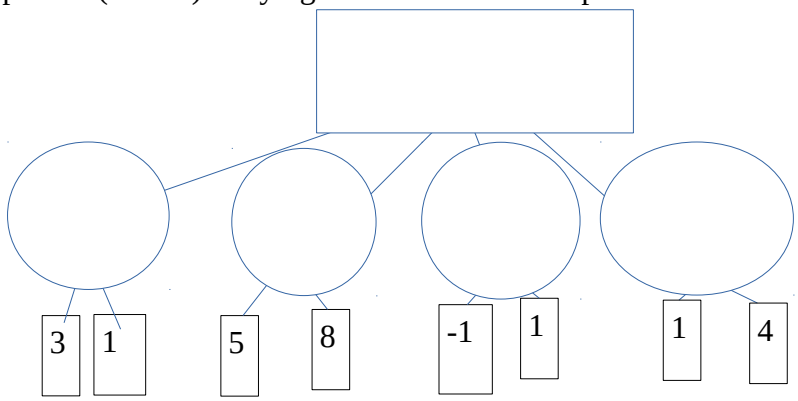
CS 461 NAME:_____
Final Exam – Spring 2017

1. A particular virus is present in 2% of patients arriving at a clinic. The test for the virus has a 99.9% accuracy and 99.8% specificity. That is, 99.9% of those having the virus test positive for it, with 0.1% of those with the virus having a negative test. Of those who do not have the virus, 0.2% will test positive. Using Bayes' Theorem, determine the probability that someone with a positive test result does in fact have the virus. (It is only necessary to set up the problem algebraically; you do not need to compute a numeric answer.)

2. Name and briefly describe one method for preventing overfitting in a neural network.

3. A game search is in progress. The player moving (squares) is trying to maximize the score; the opponent (circles) is trying to minimize it. Complete the search tree below to show the minimax score.



4. Consider the following list of students. (All names have been changed to protect the guilty.) L indicates the student laughs at the professor's jokes. S indicates the student studies hard. P indicates the student makes a serious effort at the project. The outcome is the student's class performance.

Model this situation using a decision tree to predict a student's likely performance in the course and estimate the probability of passing for the students in each leaf. Show what order you select items for inclusion in the tree and why they are selected.

Name	L	S	P	Outcome
Alice	T	F	T	Fail
Bob	F	T	T	Pass (A)
Charlie	T	T	F	Pass (C)
Doug	T	F	F	Fail
Eunice	F	T	T	Pass (A)
Franklin	T	F	T	Pass (C)
Georgia	T	F	F	Fail
Harry	T	T	T	Pass (A)
Irving	F	T	F	Fail
Jack	T	F	T	Fail

5. Define *mutation* and *crossover* and how they are combined to carry out a genetic algorithm.

6. In the basement of an apartment building, there is a meter that senses the concentration of carbon monoxide, and an alarm that sounds when the concentration exceeds a certain threshold. Consider the multivalued variables CO (actual concentration of carbon monoxide) and MR (meter reading), and the boolean variables Fm (meter is faulty), Fa (alarm is faulty), and A (alarm sounds).

A. Draw a Bayesian network for this domain.

B. Is your network a polytree? Why or why not?

7. Using an example (or examples) from an AI system that is already in use or expected to come into use soon, discuss two areas in which artificial intelligence can pose ethical challenges.