CS 188 Midterm

12:40pm–2:00pm Oct 17, 1995

Please try to be precise in your answers. The maximum possible score on this exam is 80 points. Good Luck!

1 Resolution Proof [20 pts]

Formulate as predicate-calculus expressions the facts given in the following puzzle. Use the resolution method to prove that if a course has a final, no students are happy. Remember to convert to Conjunctive Normal Form before starting the proof!

1. If a course is easy, some students are happy..

2. If a course has a final, no students are happy.

Use the following predicates: course (x), easy (x), has-final(x), student(x,y) for "x is a student in y"

2 Ambiguity in English [20 pts]

Whether or not an argument is valid often hinges on how some ambiguous statement in English is to be translated into logic. Here are some premises and a purported conclusion:

1. Everyone admires someone who has red hair.

2. Anyone who admires himself is conceited.

3. *Conclusion:* Someone with red hair is conceited.

Translate these into predicate calculus twice, corresponding to the ambiguity in the first premise. Under one translation, the conclusion follows. Prove it, using resolution. Under the other translation, it does not. Describe a situation in which the premises are true (with this translation) but the conclusion is false.

3   Search [20pt]

In each of the following situations, choose one search technique that best solves the problem. Also, give the expected running time and memory requirements. If the search is a knowledge-based search, give an appropriate heuristic (you need not prove it correct). Choose from *only* the searches listed below:

- A* search

- breadth-first search

- exponential search

- depth-first search

- linear search

- iterative-deepening search

- bidirectional search

The situations:

1. You are in a programming competition. You must write a search to find a path through a maze without any loops. Minimize programming time and final memory requirements.

2. Same as above, only the maze may contain loops.

3. There is a game as follows: A piece of paper is put on each square of a chessboard. On the underside of one of the pieces of paper is a star. All other pieces of paper are blank on both sides. Write a search to find the star.

4. Same as above, except each piece of paper without the star has written on its underside the number of squares it is (in Manhattan distance) away from the piece with the star.

4　Alpha–Beta Search [20 pts]

Explore the tree using the alpha-beta procedure. Assume that the top level is a maximizing level. Cross out all nodes where static evaluation need not occur. Indicate the winning path or paths.