Artificial Intelligence: Assignment 3

Due date: February 23 (Wednesday)

Problem 1 (3 points)
Read Chapters 4 and 5 of the textbook and answer the following questions:

(a) Explain the main differences between puzzle-solving search and game playing.

(b) Argue that game playing is inherently more difficult than solving one-player puzzles.

(c) Take the opposite position and argue that developing efficient techniques for solving puzzles is usually no easier than designing effective strategies for game playing.

Problem 2 (5 points)
The *hexagon game* involves two players, who gradually construct a six-vertex undirected graph, with solid and dashed edges. Player 1 adds solid edges, whereas Player 2 uses dashes.

The players begin with a six-vertex graph that has no edges (see Figure 1), and add new edges, one by one; Player 1 makes the first move. At each move, a player has to add a new edge, between two vertices that are not connected by any old edge. Figure 2 is an example of a mid-game position, where Player 1 has to make the next move.

If Player 1 constructs a solid-line triangle, he loses the game. Similarly, a dashed triangle means a loss of Player 2. For example, if the game ends as shown in Figure 3, then Player 2 has lost, since he has constructed the dashed triangle “3-5-6.”

Implement a program for playing the hexagon game. Your program should prompt the user to enter a player number (1 or 2), and then act as the specified player. For example, if the user enters “1,” the program should make the first move.

Problem 3 (2 points)

(a) Prove that the hexagon game never results in a draw, that is, the players cannot add all fifteen edges without constructing any solid or dashed triangle.

(b) If the players use the optimal strategy, who of them wins? Give the answer and briefly explain how you found it.

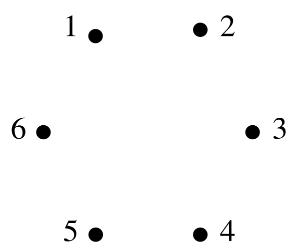

Figure 1: Initial state.

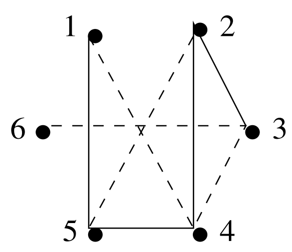

Figure 2: Mid-game position; Player 1 makes the next move.

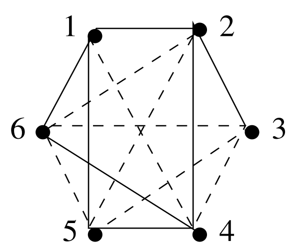

Figure 3: Player 1 has won.