

COS 470/570 – Prelim I – Spring, 2014

18 February 2012

Put your name on the back of all the pages. Answer the questions in the space provided. If you need additional space, answer on the back of the test, but make sure that you clearly label your answers. Total points: 85. Good luck!

1. Critique the following statements (5 points each):
 - (a) Simulated annealing is almost the same as steepest ascent (or descent) hill-climbing.

 - (b) The primary advantage of alpha-beta (α - β) minimax over regular minimax is that it saves space, though the game tree is searched to the same depth per a given amount of time.

(c) A production system is a physical symbol system, hence intelligent.

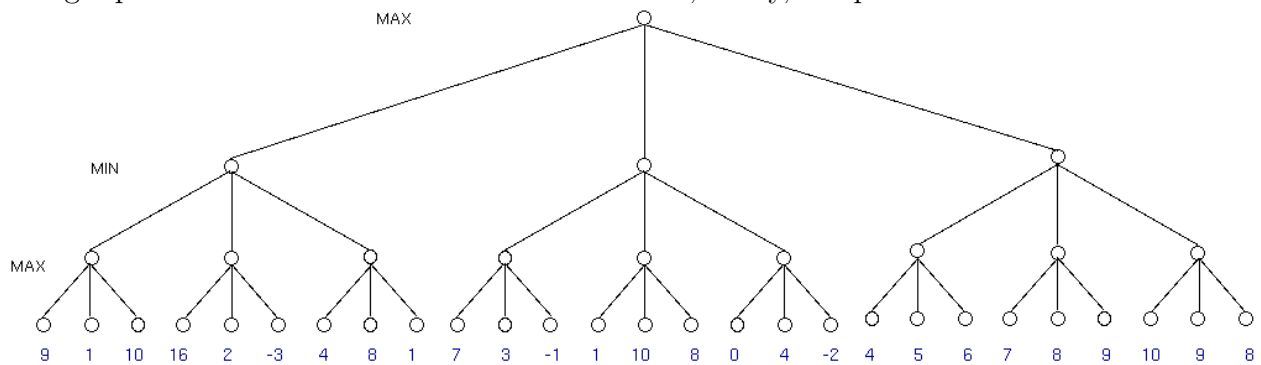
(d) The Turing Test is a good way of judging if a program is intelligent. (Graded on your arguments only, not your conclusion.)

2. [5pts] Compare and contrast a *reflex agent* and a *goal-based agent*.

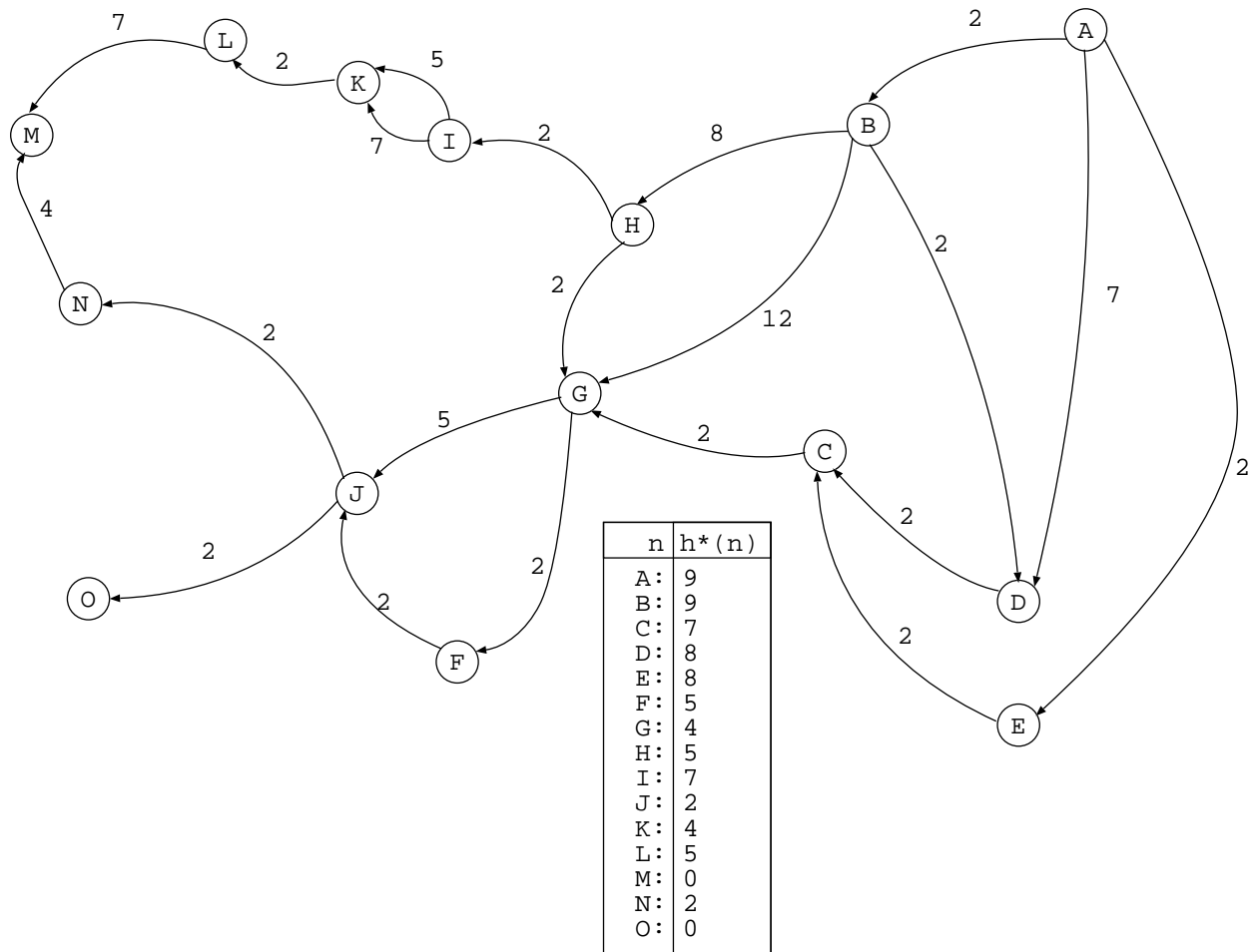
3. [5pts] Suppose you are lost in the woods and want to find the ocean. There is a river nearby. Describe: (a) the initial state; (b) the goal state (or goal test); (b) the operators available to you; and a good heuristic function.

4. [5pts] Define *constraint* with respect to how the term is used in AI.

5. [5pts] Given the game tree below, which move will the player make if the player is using alpha-beta minimax? Show which branches, if any, are pruned.



6. For the following questions, use the graph below, along with the table of heuristics (h^* values) given. Node A is the start node for all problems, and node M is the goal node. When there is a choice to be made between two children of a node, and all else is equal (with respect to the search algorithm), choose the node whose name comes first in the alphabet.



- (a) [5pts] What path would breadth-first search return? Is it optimal? What is the cost?

- (b) [5pts] What path would depth-first search return? What is its cost? Is it optimal with respect to path length? With respect to cost?
- (c) [5pts] What path would iterative-deepening depth-first search return?
- (d) [10pts] What path would uniform-cost search return? Is it optimal? Were any nodes *not* expanded, and if so, which ones?
- (e) [10pts] Show the search tree for an A* search of the graph, clearly indicating the order in which nodes were expanded. What path would A* return? Is it optimal? Were any nodes *not* expanded, and if so, which ones?

7. [10pts] Make the constraint graph below arc consistent. Show your work. (The constraints are shown as tables rather than sets of tuples for clarity. The rows of a table show the valid combinations of values for the variables.)

