CSCE476/876 **Fall 2023**

Homework 5

Assigned on: Friday, October 20, 2023

Due: Friday, October 27, 2023

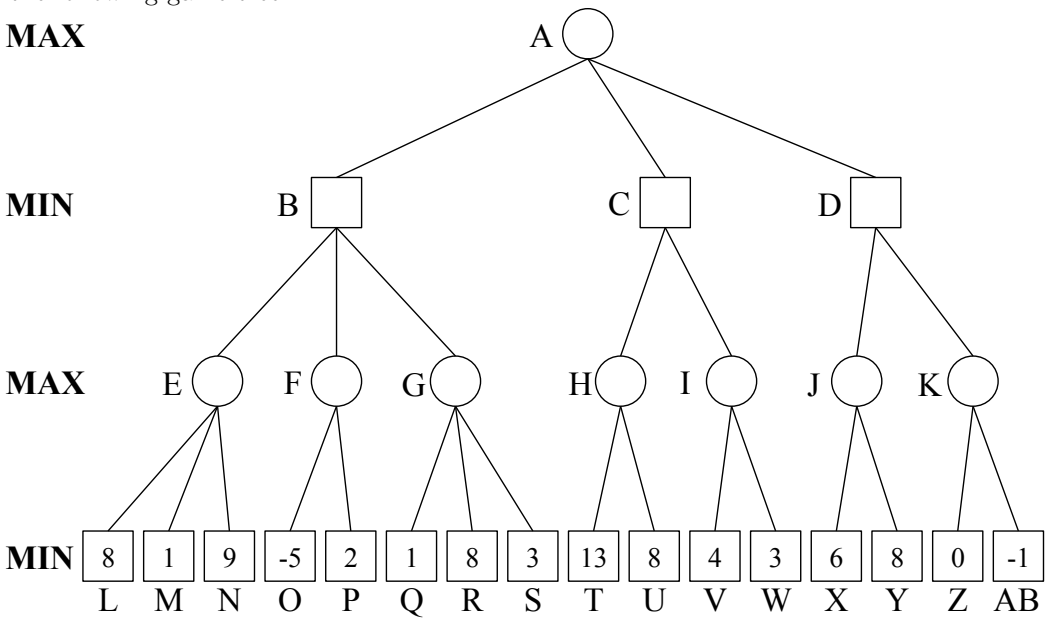
Do not hesitate to seek help during recitation and office hours. Programming assignment should be submitted with `handin`.

AIMA exercises are available online : "https://aimacode.github.io/aima-exercises"

Contents

1 Adverserial Search (Total 5 points)

Consider the following game tree:

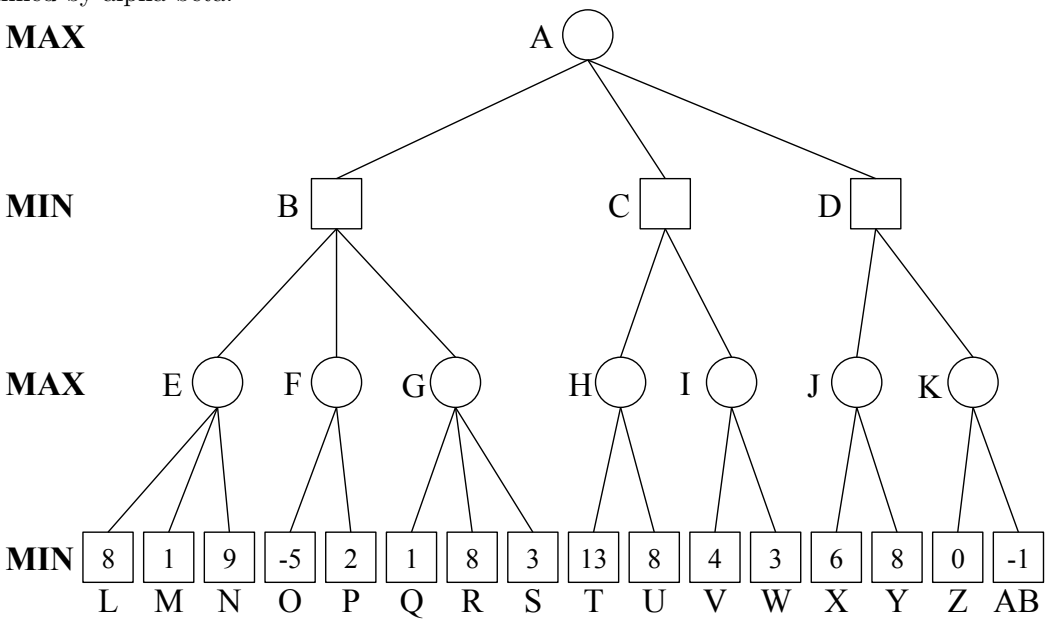


1. Compute the minimax decision. Show your answer by writing the values at the appropriate nodes in the above tree. 4 points

2. What move should Max choose? 1 point

2 Alpha-beta Pruning (Total 5 points)

Using the *alpha-beta pruning method*, with standard left-to-right evaluation of nodes, show what nodes are *not* examined by alpha-beta.



3 Chapter 5, Exercise 8 (Total 10 points)

Source: AIMA online site.

Consider the two-player game described in Chapter 5, Exercise 7.

1. Draw the complete game tree, using the following conventions:
   - Write each state as (s_A, s_B), where s_A and s_B denote the token locations.
   - Put each terminal state in a square box and write its game value in a circle.
   - Put *loop states* (states that already appear on the path to the root) in double square boxes. Since their value is unclear, annotate each with a "?" in a circle.
2. Now mark each node with its backed-up minimax value (also in a circle). Explain how you handled the "?" values and why.
3. Explain why the standard minimax algorithm would fail on this game tree and briefly sketch how you might fix it, drawing on your answer to part (2). Does your modified algorithm give optimal decisions for all games with loops?
4. This 4-square game can be generalized to n squares for any $n > 2$. Prove that A wins if n is even and loses if n is odd.