### Course: CS420 - Artificial Intelligence

02 – Adversarial Search

**Question 1.** Consider the game search tree shown below, in which a square denotes MAX’s move and a circle for MIN’s move.

A diagram of mathematical equations

Description automatically generated

Note the minimax value for each node of the tree using Minimax algorithm without pruning.

Then, show where alpha-beta pruning occurs by crossing out corresponding branches. Briefly explain each case.

**Question 2.** Consider the following game tree.

A diagram of a triangle with numbers and lines

Description automatically generated

The expectimax values are noted aside the nodes.

Now assume that the value at each node is at most 2. Identify and mark any branches that can be pruned, and provide an explanation for each pruned branch.

The right subtree of the right chance node can be pruned. At the right chance node, the value rolled back from the left child (which is a min node) is 0. Even when the value from the right child (which is another min node) is maximum (i.e., 2), the right chance node only gets a value of 1.

**Question 3.** Consider the following game tree. Calculate the UCB1 values for the nodes in the tree using the formula given in the lecture) with C = 2.

Assume that a roll-out is performed on the given tree, resulting in a value of 20. Please update the statistics for the corresponding nodes in the tree.

A group of circles on a black background

Description automatically generated

From S0, evaluate S1 and S2

Thus, choose S1

From S1, evaluate S3 and S4

Thus, choose S3

Update the value 20 for all the nodes on the path.

