Missouri University of Science & Technology   Department of Computer Science
**Fall 2023**   **CS 5408: Game Theory for Computing**

Homework 4: Dynamic Games

Instructor: *Sid Nadendla*   **Due:** *November 15, 2023*

Problem 1   Complete Extensive Games   *4 pts.*

Consider the following modified matching pennies game, played in extensive form, where Prisoner 1 plays first, followed by Prisoner 2. The main difference from the traditional mathcing pennies is that Player 1 can decide whether to play this game, or not. If he decides not to play, both players get nothing.
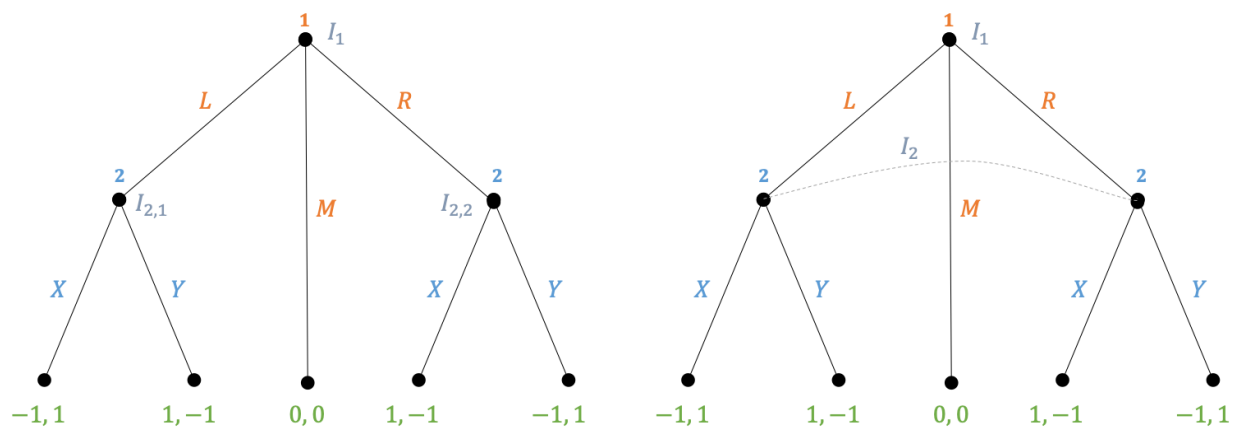

(a) Find the subgame perfect equilibrium for this game, when Player 2 can perfectly observe Player 1's choices as in the left figure.

(b) Find behavioral equilibria for this game, when Player 2 cannot observe Player 1's choices as in the right figure.

Problem 2 Perfect Bayesian Equilibrium   *3 pts.*

Prove that there is no separating equilibrium in the following two-player signaling game (as depicted in the figure below), where the player set is $\mathcal{N} = \{1, 2\}$, the choice sets at the corresponding players are $\mathcal{C}_1 = \{A, B\}$ and $\mathcal{C}_2 = \{X, Y\}$ respectively. Assume that Player 1 can take two types $\{L, R\}$, and Player 2's belief about Player 1's type is uniformly distributed across types.
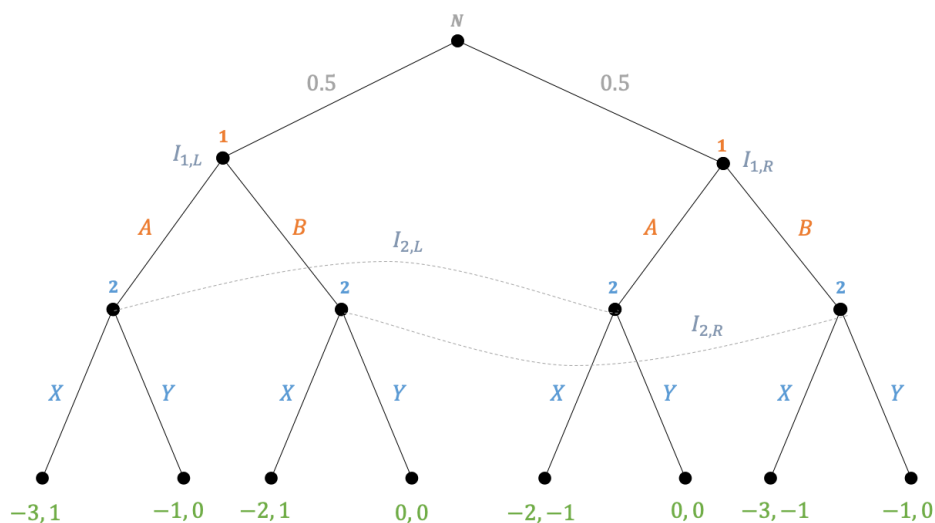
Problem 3 Repeated Games   *3 pts.*

Consider the following repeated prisoner's dilemma game, where players play the game over an infinite time horizon. Prove that Tit-for-Tat strategy (given below) is a Nash equilibrium to this game, only when the discounting factor $\beta \geq \frac{1}{2}$.