Concordia University
Concordia Institute for Information Systems Engineering

INSE 6441 Game Theory, Winter 2017

Assignment 1, Due Feb 14, 2017

Each question is worth 25 percent.

1. Consider the two-player game:

	A	B	C
X	0, 2	1, 0	0, 0
Y	0, 1	0, 0	1, 1
Z	0, 1	0, 1	0, 1

   - What strategies are dominated for each player?
   - Suppose that we perform iterated elimination by weak dominance, whereby each player eliminates at most one strategy in each iteration. What strategy profiles remain?
   - What happens when each player eliminates as many strategies as possible in each iteration?
   - What are the pure Nash equilibria of this game?

2. Tatonnement for Cournot duopoly. Suppose that the best response for Firm 1 is $q_1^*(q_2) = e^{-q_2}$, and conversely, $q_2^*(q_1) = e^{-q_1}$. What happens in the following cases? You can answer by computer simulation or drawing by hand.

   - Asynchronous tatonnement, starting from an arbitrary initial strategy profile, where each firm takes turn responding to the other firm's last strategy.
   - Synchronous tatonnement, starting from an arbitrary initial strategy profile, at each iteration, both firms simultaneously respond to the other firm's last strategy.
   - Asynchronous tatonnement with respect to averages, starting from an arbitrary initial strategy profile, each firm (in turn) responds to the average of the other firm's past strategy.

3. Tragedy of the commons. Exercise 1.10 of Fudenberg and Tirole.

4. Dynamic games. Model the conversation between an academic advisor and a student as a dynamic game[1]. Nature first determines if the student is on probation or not, only the student knows this private information. The student and advisor take turns saying sentences (questions from advisor (e.g., Do you want a technical job later?), answers from student (e.g., yes, no)).

   - Describe the game tree, the information sets (maximum 20 sets), the payoff values for both players at all terminal nodes. In the last step for the advisor, a course recommendation is made: either a demanding course or a non-demanding course. The student has a higher probability of failing a demanding course. Passing a demanding course gives a higher payoff to the student than passing a non-demanding course. The advisor gets a high payoff for assigning non-probation students to demanding courses.
   - What's a good pure strategy for the advisor?
   - In what conversation games would it be beneficial for the advisor to use a behavior strategy?

5. (Bonus question) Write a computer program for a chatbot taking the role of the advisor in the game above. You can use various existing software packages and API available online. Submit an interactive demo.

[1] See `http://www.esi.uem.es/jmgomez/papers/cisis12.pdf` for an actual application.