Problem Set #2

You are encouraged to discuss all problems with other members of your group, and with other class members. Please turn in your own individual writeup of problems in Parts I and II. For part III, turn in only one copy for the entire group. Due in class Tuesday October 13.

Part I. Word Problems

1. Consider the following Extensive Form Games:

(a) For the game on the left, write out the strategic form. First list the players, then their strategies (add labels as necessary), then list the payoffs as a bimatrix.
(b) Do the same for the game on the right.

2. Which of the two games (possibly both or neither) has an IDSDS solution? A Nash equilibrium (in pure strategies)? Compute all such equilibria.

3. You (player #1) and four of your friends (#2,3,4,5) like the Zbox videogame console better than the Yii, but 5 other friends (players #6 - #10) like the Yii better. Everyone is better off when more friends use the same console because you can share games. Each of you buys one console or the other, not both. Using the notation \( I_e \) for the indicator function (it =1 if event e is true and otherwise =0), and \( x_i = Z \) (or Y) to denote the event that player i chooses console Zbox (or Yii), and \( n_{xi} \) = number of players choosing the same console as player i, the payoff function for players #1-5 is \( u_i = 10 I_{xi=Z} + 3n_{xi} \), while the other five players have payoff \( u_i = 7 I_{xi=Y} + 3n_{xi} \).
   a. Find all Nash equilibria (in pure strategies) for this game.
   b. Are any of them payoff dominant?
   c. Does this game have tipping or congestion (possibly both or neither)?

4. (Extra credit; this one is a challenge.) The professor of a MWF class announces that she will give a quiz next week, but the actual day (M, W, or F) will be a surprise. A student argues that surprise is impossible: if the quiz is given Friday that won’t be a surprise since no other options then are available. In that case, however, the quiz can’t be on Wednesday either, since it can’t be on Friday, so actually Wednesday would be the last option, hence no surprise. So it would have to be Monday, but now that isn’t a surprise either. So the student concludes that

Please turn over the page…
there won’t be an exam and doesn’t study. [Here’s what actually happened: the quiz was on Wednesday and the student was unpleasantly surprised!]

Philosophers and logicians have puzzled over this apparent paradox. Use game theory to resolve the paradox by
a. writing out in extensive form a two player zero-sum game in which player #1, the professor, chooses the day in advance, and player #2, the student, guesses each day just before class whether or not the quiz is today (T) or later (L). The payoff is +1 to the student and -1 to the professor each time the student guesses correctly, and the payoffs are reversed each time the student guesses incorrectly.
b. Write out the strategic form (a bimatrix) corresponding to this extensive form.
c. For even more extra credit, solve the bimatrix game by finding all Nash equilibria.

Part II. Textbook Problems
Write out your solutions to the following chapter-end exercises in Harrington.
Chapter 3: #3, 5, 18.
Chapter 4: #3, 11.

Part III. Team Games

1. What is the name of your team, and what is its number? Who are the members and what are their majors?
2. Write a paragraph or two explaining the top project idea your team is currently pursuing.
3. Write another sentence or two on a Plan B idea in case the top idea doesn’t pan out.