

## EE 693H Homework #2 due Thursday, 9/27/07

### QUESTIONS

1. Exercise 1.1 from Fudenberg and Tirole.
2. Exercise 1.2 from Fudenberg and Tirole.
3. Exercise 1.6 from Fudenberg and Tirole.
4. Exercise 1.7 from Fudenberg and Tirole.
5. Problem 2 from Başar & Olsder, page 205.
6. Problem 3 from Başar & Olsder, page 205.
7. Problem 4 from Başar & Olsder, page 206.
8. There are  $n$  potential buyers for an object to be sold in an auction. The potential buyers are indexed as  $\{1, \dots, n\}$ . The valuation of the  $i$ -th potential buyer for the object is  $v_i$  where  $v_1 > v_2 > \dots > v_n > 0$ . They simultaneously submit their bids  $b_i \geq 0$ ,  $i = 1, \dots, n$ . The winner is the one who has the lowest index among those who submitted the highest bid. If the  $i$ -th bidder wins he pays  $b_i$ , therefore, his net utility is  $v_i - b_i$ . Characterize all pure equilibria.
9. An object is wanted by two players. Player  $i$ 's valuation of the object is  $v_i > 0$ . Time is continuously running from 0 to  $\infty$ , and player  $i$ 's decision is when to concede. If player  $i$  concedes first, player  $-i$  gets the object. If they concede at the same time, they split the object. Each unit of time until one player concedes first costs one unit of utility to each player. Characterize all pure equilibria.
10. Consider a 2-player finite normal-form game with payoff matrices  $A$  and  $B$ . If player 1 and 2 choose the mixed strategies  $y$  and  $z$  respectively, their expected payoffs are  $y^T A z$  and  $y^T B z$  respectively. Assume that there is an inner equilibrium  $(y^*, z^*)$ . Show that  $(y^*, z^*)$  is the only inner equilibrium if and only if

$$\begin{bmatrix} N^T & \\ & N^T \end{bmatrix} \begin{bmatrix} B^T & \\ & A \end{bmatrix} \begin{bmatrix} N & \\ & N \end{bmatrix}$$

is nonsingular, where  $N$  represents a matrix whose columns span the null space of the all-ones row vector  $[1 \dots 1]$  of proper dimension.