MS&E 235: Internet Commerce

Problem Set 1, Due April 16, 2009

1. Consider the following game:

   There is a team of 2 members working on a project. Every member can give either a small (25%), medium (50%), or large (100%) effort; which they view as a cost to themselves of $25, $50, or $100 respectively and individually.

   The total revenue generated by the project is twice the sum total effort (percentages converted into dollars). The incentive structure is such that the first member gets 60% of the total revenue. While the second member gets 40% of the revenue if the revenue is above $201. (Otherwise 40% of revenue is "lost")

   - Organize this problem into a formal game: identify the strategy sets and payoff functions of each player
   - Is there a dominant strategy for player 1, player 2, both, or neither? Defend your answer with two proofs (one for each player). Is there a dominant strategy equilibrium? Explain why briefly.
   - Is there a pure Nash equilibrium? If yes, find them all, and motivate and defend one of them. If no explain why briefly.
   - Is there a mixed Nash equilibrium? If yes, find one. If no, explain why briefly.

2. Consider a first price auction for a single good, where there are n bidders. Assume that bidder i has valuation v_i and bid b_i. Bids are said to be in Nash equilibrium if no bidder can immediately benefit by changing his bid. Give an example where bidding the true values is not a Nash equilibrium. Argue that there exists a set of bids in the first price auction where the bids are in Nash equilibrium and the auctioneer generates the same revenue as would be generated if everyone bids truthfully in a second price auction. This phenomenon is known as revenue equivalence. Assume that bidding is done in increments of cents; assume that no two valuations are the same; also ignore the difference of 1 cent when comparing the revenue of different auctions.

3. Consider three merchants A, B, and C having a valuation-per-click of 50, 48, and 10 cents respectively bidding for two slots on a keyword. Assume that each merchant has a CTR of 0.2 in position 1 and a CTR of 0.15 in position 2. Compute the total revenue earned by the next price auction if each merchant bids truthfully. Identify the merchant which can immediately profit by changing her bid. Identify two different Nash equilibria in this setting. What does this imply for the stability of the system?

4. Consider an online stock broker and a soft drink company. Which of the two would find it more beneficial to buy online banner advertisements as opposed to a TV advertisement? Why? Please write your answer concisely in 3 sentences or less.

5. Write a 500 word essay on current state and trends in social network monetization and any insights about future directions.