Networks: Spring 2009	**Practice Midterm**
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The midterm is **Monday, March 2, in class**. It will be a closed-notes exam. The best guide to the coverage of the midterm is the contents of the course lectures up through the end of the network exchange theory topic (Chapter 11). It is also useful to review the homeworks, and the exercises in the book provide a good source of additional questions for review.

To help in studying, we are providing the following practice midterm below. It is structured to approximately resemble the real midterm, although of course the actual questions on the real midterm may cover topics from the course that are not explicitly the focus of any question here. The practice midterm questions are not meant to be handed in; rather, we will discuss them at the prelim review session in class on Friday, February 27, and also hand out solutions then. You can also discuss the questions with us in office hours.

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(1) Say whether the following claim is true or false, and provide a brief (1-3 sentence) explanation for your answer.

> *Claim: If player A in a two-person game has a dominant strategy s_A, then there is a pure strategy Nash equilibrium in which player A plays s_A and player B plays a best response to s_A.*

(2) Suppose we have a set of 2 sellers labeled a and b, and a set of 2 buyers labeled x and y. Each seller is offering a distinct house for sale, and the valuations of the buyers for the houses are as follows.

Buyer	Value for a's house	Value for b's house
x	7	5
y	4	1

Describe what happens if we run the bipartite graph auction procedure to determine market-clearing prices, by saying what the prices are at the end of each round of the auction, including what the final market-clearing prices are when the auction comes to an end.

(3) In the social network depicted in Figure 1 with each edge labeled as either a strong or weak tie, which two nodes violate the Strong Triadic Closure Property? Provide an explanation for your answer.

(4) Consider a second-price, sealed-bid auction with one seller who has one unit of the object which he values at s and two buyers $1, 2$ who have values of v_1 and v_2 for the object. The values s, v_1, v_2 are all independent, private values. Suppose that both buyers know that the seller will submit his own sealed bid of s, but they do not know the value of s. Is it optimal for

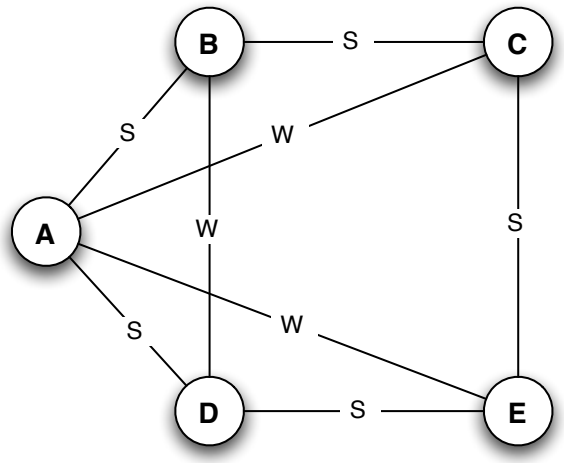

Figure 1: The graph for the strong/weak labeling in Question 3.

the buyers to bid truthfully; that is should they each bid their true value? Give an explanation for your answer.

(5) Consider a trading network in which there are two buyers (B1 and B2), two sellers (S1 and S2) and one trader (T1). All of the buyers and the sellers are allowed to trade with the trader. The sellers each have one unit of the object and value it at 0; the buyers are not endowed with the object, but they each want one unit; buyer B1 attaches a value of 1 to one unit, while buyer B2 attaches a value of 2 to one unit.

(a) Draw the trading network, with the trader as a square, the buyers and the sellers as circles, and edges representing pairs of people who are able to trade with each other. Label the nodes as T1, B1, B2, S1, and S2. Find Nash equilibrium bid and ask prices. (You do not need to provide an explanation for your answer.)

(b) Suppose now that we add a second trader (T2) who can trade with each seller and each buyer. In the new network is there a Nash equilibrium in which each trader's bid price to each seller is 1; each trader's ask price to buyer B1 is 1; each trader's ask price to buyer B2 is 2; one unit of the good flows from S1 to B1 through trader T1; and, one unit of the good flows from S2 to B2 through trader T2? Draw the new trading network and give a brief (1-3 sentence) explanation for your answer.

(6) Suppose a network exchange theory experiment is run on the graph depicted in Figure 2 using the one-exchange rule with \$10 placed on each edge.

(a) Say which node or nodes you would expect to make the most money (i.e. receive the most favorable exchanges), and give a brief (1-3 sentence) explanation for your answer. You do not need to give actual numbers for the amounts of money the nodes would receive.

(b) Now the experimenters vary the network: they introduce a sixth node f, which is attached by a single edge to just the node c. A new person is brought in to play the role of f, and a new round of experiments is performed with this new six-node network.

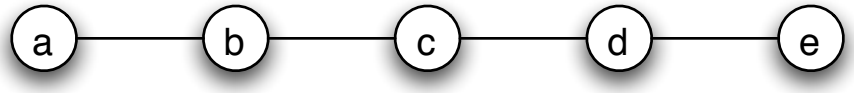

Figure 2: The graph used for the network exchange theory experiment in Question 6.

Explain what you think will happen to the relative power of the participants, compared to the situation in (a), and give a brief (1-3 sentence) explanation for your answer. Again, you do not need to give actual numbers for the amounts of money the nodes would receive.