Homework 3

CSCE689 Algorithmic Game Theory

Due: Tuesday, October 31, 2023 9:35 am

1. (10 points.) Show that the definition of general mechanism (Definition 9.24) generalizes direct-relevation mechanism (Definition 9.14).

2. (10 points.) (Bilateral Trade). A seller holds an item and values it at $0 \leq v_s \leq 1$; and a potential buyer values it at $0 \leq v_b \leq 1$. The possible outcomes are $A = \{\text{no-trade, trade}\}$. Social efficiency implies that trade is chosen if $v_b > v_s$ and no-trade otherwise. Show that

   - Using VCG payments and decreeing that no payment is made in case of no-trade, implies that in the case of trade, the buyer pays v_s and the seller is paid v_b.

3. (10 points.) In the proof of Lemma 9.11, show that the extension F of incentive compatible social choice function f is not a dictatorship if f isn't.

4. (10 points.) In Vickrey's second price auction, explain how "Pay your bid" and "No payment" can both be manipulated (i.e. not incentive compatible). Formally show that paying the second highest bid is an instantiation of the Clarke Pivot rule.

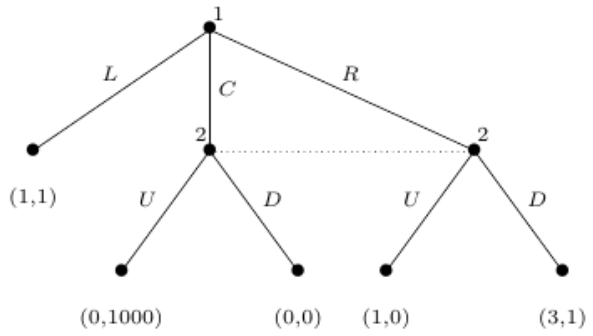

Figure 1: An extensive-form game.