Coursework #2

Deadline: Wednesday, 18 March 2009, 15:00

Question 1 (10 marks)

Prove that the Copeland rule is easy to manipulate. This is in fact a corollary to a more general result by Bartholdi, Tovey and Trick (1989). Do not refer to their general result in your answer, but rather give a direct proof for the Copeland rule only.

(See J.J. Bartholdi III, C.A. Tovey, and M.A. Trick. The Computational Difficulty of Manipulating an Election. *Social Choice and Welfare*, 6(3):227–241, 1989.)

Question 2 (10 marks)

Recall the framework for representing utility functions over subsets of PS by means of weighted propositional formulas. Let $n = |PS|$. A *complete cube* is a conjunction of literals of length n that includes exactly one of p and $\neg p$ for every $p \in PS$. Establish the relative succinctness of $\mathcal{L}(pcubes, \mathbb{R})$, the language of positive cubes, and $\mathcal{L}(ccubes, \mathbb{R})$, the language of complete cubes.

Question 3 (10 marks)

A *weak Condorcet winner* is a candidate that will win or draw against any other candidate in a pairwise majority contest. Show that a weak Condorcet winner always exists when voters express their preferences using the *language of single goals* introduced in the lecture on voting in combinatorial domains.