Coursework #5

Deadline: Friday, 21 April 2006, 3:15pm

Question 1 (10 marks)

Given a goal base G of prioritised goals, let $\preceq_G^{bo}$ be the *best-out* ordering, $\preceq_G^{discr}$ the *discrimin* ordering, and $\preceq_G^{lex}$ the *leximin* ordering with respect to that goal base, as defined in class.

(a) Show that $(x \prec_G^{bo} y)$ entails $(x \prec_G^{discr} y)$.

(b) Show that $(x \prec_G^{discr} y)$ entails $(x \prec_G^{lex} y)$.

(c) Does $(x \preceq_G^{bo} y)$ entail $(x \preceq_G^{discr} y)$? Give either a proof or a counterexample.

(d) Does $(x \preceq_G^{discr} y)$ entail $(x \preceq_G^{lex} y)$? Give either a proof or a counterexample.

Question 2 (10 marks)

Restricting attention to valuations that are both normalised and monotonic, prove that the OR language can represent all supermodular valuations, and only those.

Question 3 (10 marks)

(a) For $K \in \mathbb{N}$, the *K-budget valuation* is defined as $v(X) = \min\{K, |X|\}$. Give a succinct representation of this valuation in the OR/XOR language.

(b) Express the monochromatic valuation in the OR* bidding language. How many dummy items are required?

(c) Give two examples for (classes of) valuations that are both monotonic and dichotomous. One of these should be representable in the OR language in polynomial space; the other one should be a valuation that requires exponential space in the OR language.