Coursework #3

Deadline: Tuesday, 3 April 2007, 11:15am

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. For each of the following questions, give either a proof or a counterexample.

(a) Does $(x \prec_G^{bo} y)$ entail $(x \prec_G^{discr} y)$?

(b) Does $(x \preceq_G^{bo} y)$ entail $(x \preceq_G^{discr} y)$?

(c) Does $(x \prec_G^{discr} y)$ entail $(x \prec_G^{lex} y)$?

(d) Does $(x \preceq_G^{discr} y)$ entail $(x \preceq_G^{lex} y)$?

Question 2 (10 marks)

In the context of representing utility functions by means of weighted propositional formulas, show that the languages based on positive formulas is strictly more succinct than the language based on positive cubes. That is, prove that $\mathcal{U}(pcubes, all) \prec \mathcal{U}(positive, all)$.

Question 3 (10 marks)

Show that MAX-UTILITY(*k-clauses*, *all*) is NP-complete (for arbitrary k). What is the least fixed $k \in \mathbb{N}$ for which we get NP-completeness?

Hints: Even if you are not that familiar with complexity theory, this is not too difficult a question. Argue for both NP-hardness and NP-membership. For the former, search the literature for a suitable reference problem to reduce to this one.