Project 1: Interpretation of Propositional Formulae

INSTRUCTIONS

1. This project must be done and submitted individually.

2. Submit one ZIP file, called `<student number>.zip` to the folder "Project 1 Submissions" in Luminus by **Monday 11 February midnight**.

3. The ZIP file contains the file `<student number>.pl`, a prolog program with your answer (modify the name and content of the template program `project1.pl`).

4. After the deadline and until Friday 16 February at midnight, you can submit to the folder "Project 1 Late Submissions" in Luminus (penalties apply).

Question 1 [2 marks]

Write a Prolog procedure `interpretation(+GFormula, ?TruthValue)` that succeeds when `TruthValue` is the truth value of the ground logical formula `GFormula`. The formula is ground: it does not contain any propositional variable but only the connectives: `top`, `bot`, `implies`, `and`, `or` and `xor`.

For example, the goal `interpretation(not(top and not bot), T)` succeeds with `T = false`.

Question 2 [2 marks]

Write a Prolog procedure `propositions(+Formula, ?ListofPropositions)` that succeeds when `ListOfPropositions` is the list of propositions in the logical formula `Formula`.

For example, the goal `propositions(not(x1 and not x2), L)` succeeds with `L = [x1, x2]`.

You may need to write an ancillary procedure to avoid duplicate answers in the list `ListOfPropositions`.

Question 3 [3 marks]

Write a Prolog procedure `assign(+Formula1, +Proposition, +TruthValue, ?Formula2)` that succeeds when the logical formula `Formula2` is the logical formula `Formula1` in which the occurences of the proposition `Proposition` have been replaced by `top` if `TruthValue` is true and `bot` if `TruthValue` is false.

For example, the goal `assign(not(x1 and not x2), x1, true, F)` succeeds with `F = not(top and not x2)`.

Question 4 [3 marks]

Write a Prolog procedure `assignment(+Formula, ?TruthValue, -ListofAssignments)` that succeeds when `TruthValue` is the truth value of the interpretation of the logical formula `Formula` with the assignment `ListofAssignment` of the propositions in the formula to `true` or `false`.

For example, the goal `assignment(not(x1 and not x2), false, L)` succeeds with `L = [[x1, true], [x2, false]]`.

You may need to use the other procedures that you have written.

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