Universität Koblenz-Landau

FB 4 Informatik

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Exercises for "Non-Classical Logics"
Exercise sheet 2

Exercise 2.1: (*2 P*)
Assume $S \succ P \succ Q \succ R$. Let N be the following set of clauses:

$$\begin{array}{ll} (1) & \neg Q \vee \neg P \\ (2) & R \vee P \\ (3) & Q \vee S \\ (4) & \neg Q \vee \neg S \end{array}$$

(1) Which literals are maximal in the clauses of N?

(2) Let S be the selection function which selects the negative literal $\neg Q$ in the clauses (1) and (4). Which inferences are possible in the ordered resolution calculus with selection $\mathsf{Res}^{\succ}_{S}$?

Exercise 2.2: (*4 P*)
Use a tableau procedure to prove the satisfiability or unsatisfiability of the following formulae:

(1) $(Q \to P) \wedge (P \to Q) \wedge (R \to Q) \wedge (Q \to \neg R)$

(2) $(R \to (P \vee Q)) \wedge (Q \to (P \wedge R)) \wedge (R \vee Q) \wedge (P \to \neg R)$

Exercise 2.3: (*1 P*)
Let $\Sigma = (\Omega, \Pi)$ be a signature, where $\Omega = \{f/2,\ g/1,\ a/0,\ b/0\}$ and $\Pi = \{p/2\}$; let X be a set of variables containing $\{x, y, z\}$. Which of the following expressions are terms over Σ and X, which are atoms/literals/clauses/formulae, which are neither?

(a) $\neg p(g(a), f(x, y))$

(b) $f(x, x) \approx x$

(c) $p(f(x, a), x) \vee p(a, b)$

(d) $p(\neg g(x), g(y))$

(e) $\neg p(f(x, y))$

(f) $p(a, b) \wedge p(x, y) \wedge y$

(g) $\exists y(\neg p(f(y, y), y))$

(h) $\forall x \forall y(g(p(x, y)) \approx g(x))$

Please submit your solution until Tuesday, November 5, 2013, at 16:00. Joint solutions prepared by up to three persons are allowed. Please do not forget to write your name(s) on your solution.

Submission possibilities:

- By e-mail to `sofronie@uni-koblenz.de` with the keyword "Homework Non-Classical Logics" in the subject.
- Put it in the box in front of Room B 222.