Universität Koblenz-Landau

FB 4 Informatik

Prof. Dr. Viorica Sofronie-Stokkermans **November 27, 2013**

Exercises for "Non-Classical Logics"
Exercise sheet 6

Exercise 6.1: (*3 P*)
Use the semantic tableau calculus for the many-valued logic $\mathcal{L}_3$ to prove that the following formula is an $\mathcal{L}_3$ tautology:

$$\neg(\exists x(p(x) \wedge q(x))) \;\mathsf{id}\; \forall x(\neg(p(x) \wedge q(x))).$$

(*Hint:* To avoid the problem of having to use the definition of the operator id the truth table of id can be used for devising suitable expansion rules for the tableau calculus.)

Exercise 6.2: (*4 P*)
Use the optimized translation to clause form described in the course for computing the CNF for the following signed formulae:

(a) $\{0\}{:}(P \supset Q)$

(b) $\{u\}{:}(P \supset Q)$

(c) $\{1\}{:}(P \supset Q)$

(d) $\{0, 1\}{:}(\sim (P \Rightarrow Q))$

Exercise 6.3: (*3 P*)
Check the unsatisfiability of the set $\{C_1, C_2, C_3\}$ of signed clauses by using the signed propositional resolution calculus (with truth values as signs).

$$\begin{aligned} C_1 &= P^0 \\ C_2 &= Q^0 \vee Q^u \vee P^1 \\ C_3 &= Q^1 \vee R^u \\ C_4 &= R^0 \vee R^1 \end{aligned}$$

(here P^v and $\{v\}{:}P$ are different notations for the same signed literal; similarly for Q and R).

Exercise 6.4: (*2 P*)
Check the unsatisfiability of the set $\{C_1, C_2, C_3\}$ of signed clauses by using the signed propositional resolution calculus (with sets of truth values as signs).

$$
\begin{array}{ll}
C_1 & \{0\}{:}P \\
C_2 & \{0, u\}{:}Q \vee \{1\}{:}P \\
C_3 & \{1\}{:}Q \vee \{u\}{:}R \\
C_4 & \{0, 1\}{:}R
\end{array}
$$

Please submit your solution until Tuesday, December 3, 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.