Universität Koblenz-Landau

FB 4 Informatik

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Exercises for "Non-Classical Logics"
Exercise sheet 11

Exercise 11.1: (*4 P*)
Prove that the following formulae are valid using the tableau calculus presented in the lecture.

(1) $\Diamond(P \vee Q) \rightarrow (\Diamond P \vee \Diamond Q)$
(2) $(\Diamond P \vee \Diamond Q) \rightarrow \Diamond(P \vee Q)$
(3) $\Diamond(P \wedge Q) \rightarrow (\Diamond P \wedge \Diamond Q)$

Exercise 11.2: (*2 P*)
Prove that the formula A is satisfiable using the tableau calculus presented in the lecture:

$$A: \quad \neg((\Diamond P \wedge \Diamond Q) \rightarrow \Diamond(P \wedge Q))$$

and construct a Kripke model $\mathcal{K} = (S, R, I)$ and a state $s \in S$ such that $(\mathcal{K}, s) \models A$ using a saturated tableau for A.

Exercise 11.3: (*2 P*)
Construct a saturated or closed tableau starting from the following prefixed formula:

$$T((\Box\Diamond P \wedge \Diamond P) \rightarrow \Diamond\Box P)$$

Exercise 11.4: (*2 P*)
Compute the translation into first order logic used for checking the validity of a modal formula Φ (of the form $\exists x P_{\neg\Phi}(x) \wedge \mathsf{Rename}(\neg\Phi)$) for the following formulae:

(1) $\Phi_1: \quad \Diamond(P \wedge Q) \rightarrow (\Diamond P \wedge \Diamond Q)$
(2) $\Phi_2: \quad (\Diamond P \vee \Diamond Q) \rightarrow \Diamond(P \vee Q)$
(3) $\Phi_3: \quad ((\Box\Diamond P \wedge \Diamond P) \rightarrow \Diamond\Box P)$

Please submit your solution until Tuesday, January 21, 2014 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.