

Introduction to Model Checking

Winter term 2011/2012

– Series 4 –

Hand in on November 16th before the exercise class.

Exercise 1

(2 points)

Let P be an LT property. Prove: $\text{pref}(\text{closure}(P)) = \text{pref}(P)$.

Exercise 2

(2 points)

Let LT properties P and P' be equivalent, notation $P \cong P'$, if and only if $\text{pref}(P) = \text{pref}(P')$. Prove or disprove: $P \cong P'$ if and only if $\text{closure}(P) = \text{closure}(P')$.

Hint: you may use results from the previous exercise.

Exercise 3

(4 points)

Let P and P' be liveness properties over AP . Prove or disprove the following claims:

- (a) $P \cup P'$ is a liveness property,
- (b) $P \cap P'$ is a liveness property.

Answer the same question for P and P' being safety properties.

Exercise 4

(2 points)

Let P denote the set of traces of the form $\sigma = A_0 A_1 A_2 \dots \in (2^{AP})^\omega$ such that

$$\exists k. A_k = \{a, b\} \quad \wedge \quad \exists n \geq 0. \forall k > n. (a \in A_k \Rightarrow b \in A_{k+1}).$$

Consider the following fairness assumptions with respect to the transition system TS outlined on the right:

- a) $\mathcal{F}_1 = (\{\{\alpha\}\}, \{\{\beta\}, \{\delta, \gamma\}, \{\eta\}\}, \emptyset)$.
 Decide whether $TS \models_{\mathcal{F}_1} P$.
- b) $\mathcal{F}_2 = (\{\{\alpha\}\}, \{\{\beta\}, \{\gamma\}\}, \{\{\eta\}\})$.
 Decide whether $TS \models_{\mathcal{F}_2} P$.

Justify your answers!

