LTL Exercises

Deadline: 22/05 09:00

Exercise 1

Which of the following biimplications are valid. If the formula is not valid, is one of the two implications valid?

1. $\mathsf{G}\,\phi \wedge \mathsf{G}\,\psi \leftrightarrow \mathsf{G}\,(\phi \wedge \psi)$

2. $\mathsf{G}\,\phi \vee \mathsf{G}\,\psi \leftrightarrow \mathsf{G}\,(\phi \vee \psi)$

3. $\mathsf{F}\,\phi \wedge \mathsf{F}\,\psi \leftrightarrow \mathsf{F}\,(\phi \wedge \psi)$

4. $\mathsf{F}\,\phi \vee \mathsf{F}\,\psi \leftrightarrow \mathsf{F}\,(\phi \vee \psi)$

5. $\mathsf{F}\,\mathsf{G}\,\phi \leftrightarrow \mathsf{G}\,\mathsf{F}\,\phi$

6. $\phi\,\mathsf{U}\,\psi \leftrightarrow \psi \vee (\phi \wedge \mathsf{X}\,(\phi\,\mathsf{U}\,\psi))$

Exercise 2

Let $P = \{p, q\}$. Give the LTL formulas recognizing following languages over $\Sigma = 2^P$, where $a = \varnothing$, $b = \{p\}$, $c = \{q\}$

1. $a^* b^* c^* \Sigma^\omega$

2. $(\Sigma^* a \Sigma^* b \Sigma^* c)^\omega$

3. $\{w \in \Sigma^\omega \mid |w|_a = \infty \Rightarrow |w|_b = \infty\}$

Exercise 3

Give a VWABA equivalent to $\mathsf{G}\,((\mathsf{F}\,\mathsf{X}\,q)\,\mathsf{U}\,\neg q)$.