Group: _____ Assignment 10

Name: _____ **Formal Models**

Matr.Nr.: _____ Summer Semester 2010

Points: _____ **Due: 17.06.2010 08:30**

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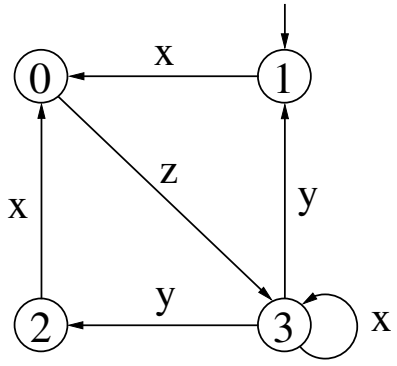
Exercise 37

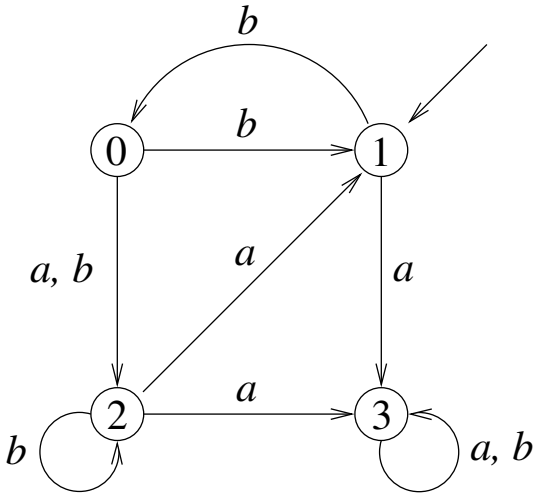
Given LTS L as shown on the right. For each state s of L, determine which of the following CTL/HML formulae hold in s.



1. $\mathbf{EX}(\langle x \rangle\, 1)$
2. $\mathbf{AX}([y]\, 0)$
3. $\mathbf{AG}(\langle z \rangle\, 1 \rightarrow \langle y \rangle\, 1)$
4. $\mathbf{E}[\langle x \rangle\, 1\ \mathbf{U}\ \langle z \rangle\, 1]$
5. $\mathbf{EG}(\langle y \rangle\, 1)$
6. $\mathbf{EF}(\mathbf{EG}\, \langle x \rangle\, 1)$

Exercise 38

Draw the Kripke structure for the LTS as shown below.



Exercise 39

Draw a computation tree for each of the following CTL formulae (see also lecture slides 63-65).

1. **EF** p 2. **EX** p 3. **EG** p
4. **AX** p 5. **A**$[p$ **U** $q]$ 6. **E**$[p$ **U** $q]$

Exercise 40

Given Kripke structure K as shown below. For each of the following CTL formulae f, determine whether $K \models f$ or not. *Note* that there are two initial states. *Justify your answers* by referring to the semantical definitions, i.e. name paths and/or states sufficient to explain your answers.

For example, $K \not\models$ **AX** $(q \vee s)$ because for initial state 0, path $\pi = 0, 1, \ldots$ is a counterexample for that property: $\pi(1) = 1$ and $1 \not\models (q \vee s)$.

1. **AG** $(q \rightarrow r)$
2. **E** $(r$ **U** $s)$
3. **AG** $((p \wedge r) \rightarrow$ **EG** $p)$
4. **AG** $((p \wedge r) \rightarrow$ **EG** $s)$
5. **EF** $(s \rightarrow$ **EX** $s)$