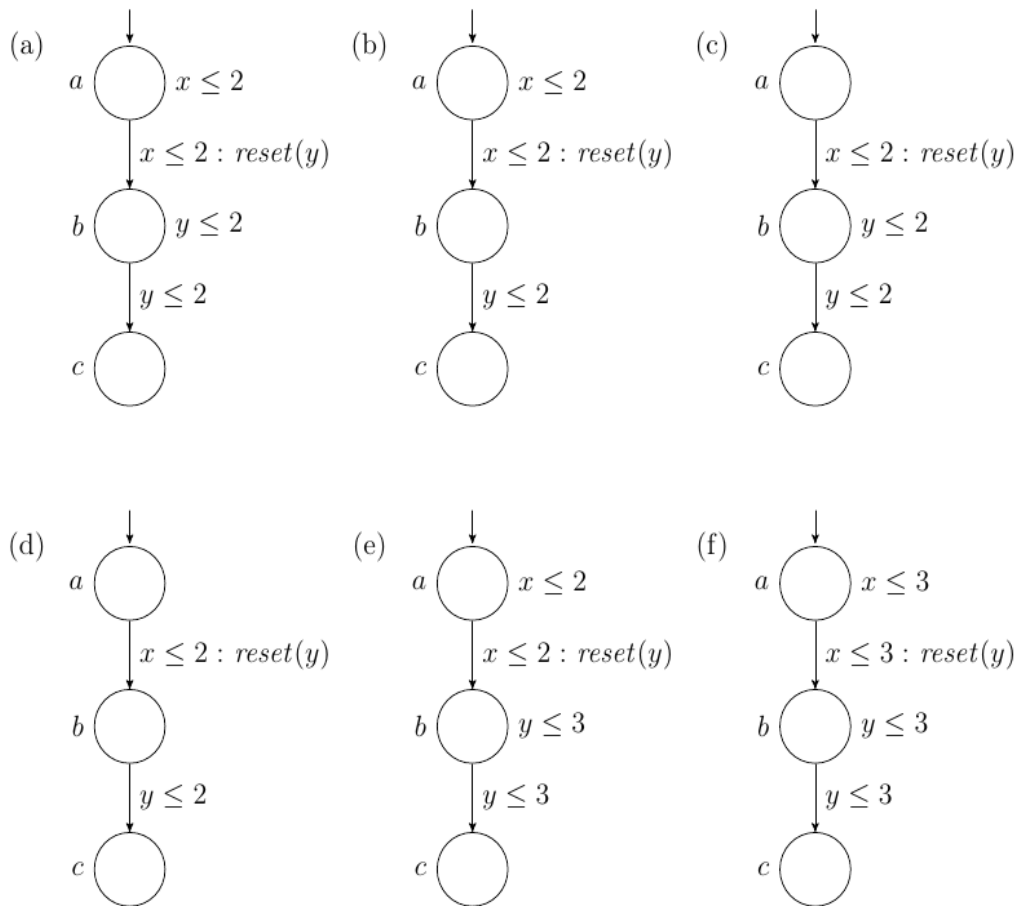## Tutorials for Cyber-Physical Systems - Hybrid Models
Exercise sheet 3

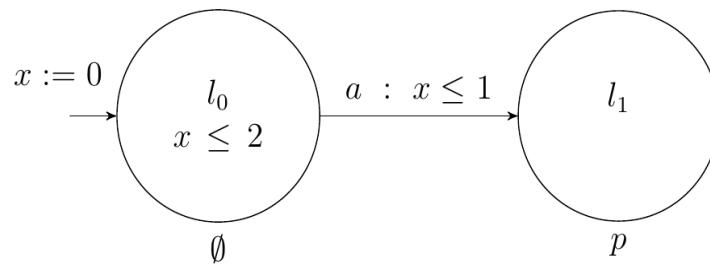**Exercise 1: TCTL Formulae**

Consider the following six timed automata:

For each automaton, one of the TCTL formula below distinguishes it from all other ones. Map every automaton to a corresponding formula.

(a) $\mathsf{AF}^{\leq 4}\, c$

(b) $\mathsf{A}\,\mathsf{F}\,\mathsf{E}\,\mathsf{G}\, b$

(c) $(\mathsf{AF}^{\le 5}\, c) \wedge (\mathsf{EG}^{\le 5}\, \neg c)$

(d) $(\mathsf{E\,G}\, a) \wedge (\mathsf{E\,F\,E\,G}\, b)$

(e) $(\mathsf{E\,G}\, a) \wedge (\neg\, \mathsf{E\,F\,E\,G}\, b)$

(f) $(\mathsf{AF}^{\le 6}\, c) \wedge (\mathsf{EG}^{\le 6}\, \neg c)$

Exercise 2: Region Transition Systems

Consider the following timed automaton $\mathcal{T}$.

(a) Please determine $RTS(\mathcal{T}, true)$.

(b) Does $\mathcal{T}$ have a time-lock path? If so, how can we recognize it on $RTS(\mathcal{T}, true)$?

(c) Please denote all the states of $RTS(\mathcal{T}, true)$ which satisfy the formula $\Phi = \mathsf{A\,F}\, p$.