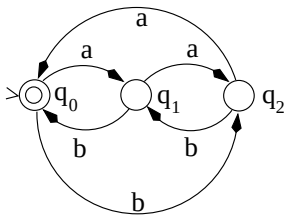
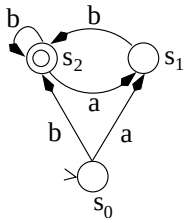
T-79.186 **Spring 2004**
Reactive Systems
Home Exercise 1
Deadline 4.2 16.15
Return your answers by email to Timo.Latvala@hut.fi, or on paper to the lecture.

1. Consider the three following finite state automata, where $\Sigma_1 = \Sigma = \{a, b\}$.

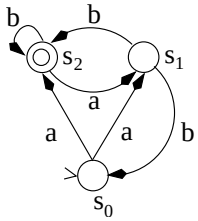
   Automaton $\mathcal{A}_1$:



   Automaton $\mathcal{A}_2$:



   Automaton $\mathcal{A}_3$:



   (a) Construct the finite state automaton $\mathcal{A}_a = \mathcal{A}_1 \cup \mathcal{A}_2$.

   (b) Construct the finite state automaton $\mathcal{A}_b = \mathcal{A}_1 \cap \mathcal{A}_2$.

   (c) Is the language accepted by $\mathcal{A}_b$ non-empty? If not, give a word accepted by $\mathcal{A}_b$.

(d) Complement the deterministic automaton $\mathcal{A}_1$, and give the resulting automaton $\mathcal{A}_d$.

(e) Give a deterministic finite state automaton $\mathcal{A}_e$, which accepts the same language as $\mathcal{A}_3$.

(f) Describe the language accepted by $\mathcal{A}_1$ as a function of the number of occurrences of a and b.