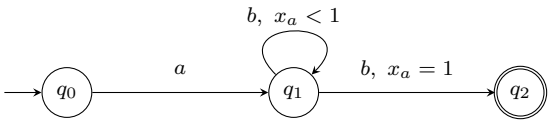
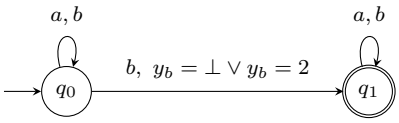
1. Complement the following event-clock automaton:



2. Consider the following event-clock automaton:



   (a) Give an equivalent deterministic event-clock automaton.

   (b) Convert the above ECA into an equivalent timed automaton.

3. Let Σ and Γ be two finite alphabets. A *homomorphism* is a function $h : \Sigma \mapsto \Gamma$. This can be extended to timed words as follows:

$$h(\ (a_1 a_2 \dots a_k, t_1 t_2 \dots t_k)\ ) = (h(a_1)h(a_2)\dots h(a_k), t_1 t_2 \dots t_k)$$

   Similarly, for a timed language L, we define $h(L) := \{\ h((w,t)) \mid (w,t) \in L\ \}$.

   Call a timed language L to be an *event-clock language* if there is an ECA accepting L.

   Given timed language L over Σ, and homomorphism $h : \Sigma \mapsto \Gamma$.

   (a) Are event-clock languages closed under homomorphisms? That is, if L is an event-clock language, is $h(L)$ also an event-clock language?

   (b) If $h(L)$ is an event-clock language, is L an event-clock language?