Practice Questions on FSM Testing

Answer the following questions for FSM M in Figure 1.

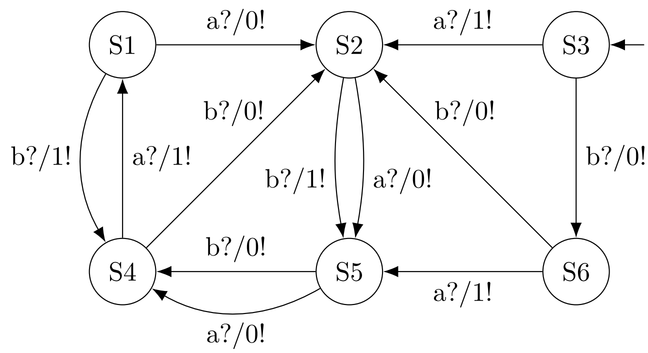

Figure 1: FSM M

1. Calculate λ^* (S3, a? a? a? b? a? a? b?).
2. Provide a state tour (i.e., a sequence that reaches all states), or explain why it does not exist.
3. Provide a transition tour (i.e., a sequence that reaches all transitions), or explain why it does not exist.
4. Provide a synchronising sequence to each state.
5. Provide a distinguishing sequence, or explain why it does not exist.
6. Provide Unique Input/Output sequence(s) for each state.
7. A *homing sequence* is a sequence of input symbols such that the final state after applying it can be determined by looking at the outputs.[1] Formally, a sequence $x \in I^*$ is *homing* if, for every pair of states q, q', $\delta^*(q,x) \neq \delta^*(q',x) \;\Rightarrow\; \lambda^*(q,x) \neq \lambda^*(q',x)$. Like synchronising sequences, homing sequences are used for constructing test suites for FSMs without reset. Show that every synchronising sequence is a homing sequence, but that the converse is not true. Provide a homing sequence for FSM M containing at most 4 input symbols.
8. Make tests for state S3, and explain why these tests test S3.
9. Make tests for transition S4 $\xrightarrow{b?/0!}$ S2.
10. Consider an implementation i which passes all tests (as made above) for all states and transitions in the FSM. Under which conditions can we conclude that i is correct with respect to the FSM?

[1] In contrast, a distinguishing sequence is a sequence of input symbols such that the state *before* applying it can be determined by looking at the outputs.