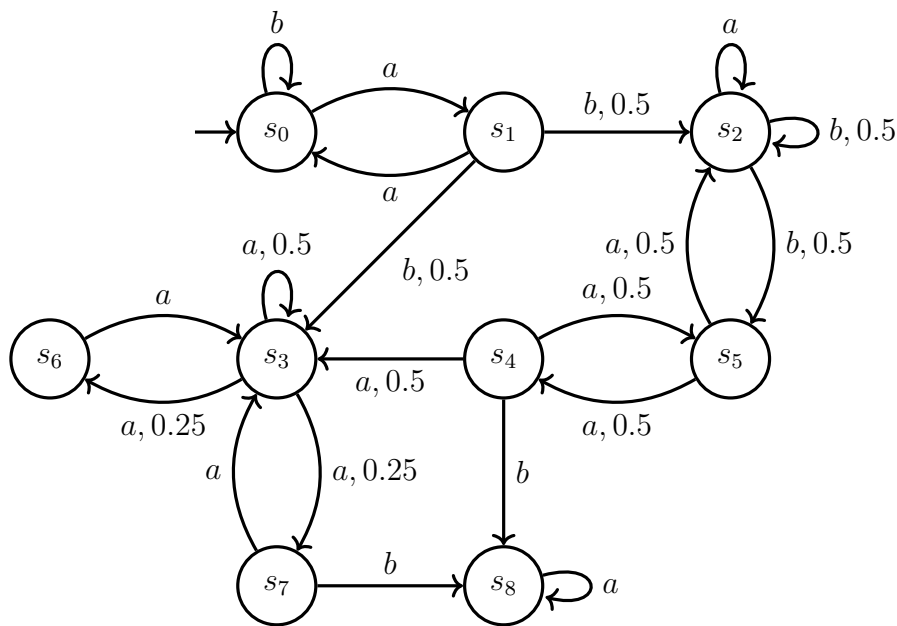# Quantitative Verification – Exercise sheet 11

Exercise 11.1

Compute the MECs (both states and actions) of the following MDP.

Exercise 11.2

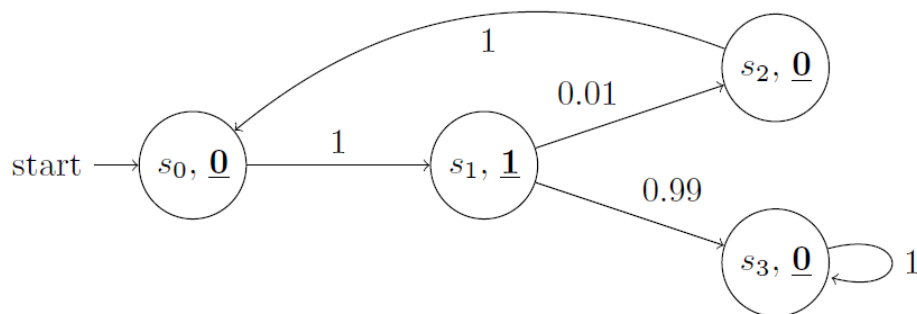On Figure 1, compute $R_{=?}[C \leq 4]$ and check whether $R_{\geq 1}[C \leq 2]$ holds. Also, compute $R_{=?}[I = 4]$.

Figure 1: State rewards are bold-faced and underlined.

Exercise 11.3

The *instantaneous reward* of a path at time t associates with a path, the reward in the state of that path when exactly t time units have elapsed. In general, *instantaneous reward* refers to the expected reward of a model at a particular instant in time. See lecture slides for more details. Are memoryless schedulers sufficient to obtain optimal instantaneous rewards? If yes, give a proof sketch. If no, give a counterexample.

Exercise 11.4

We have seen expected step-bounded reward and expected long-run average reward. How can you rephrase (bounded) reachability as an instance of these problems?