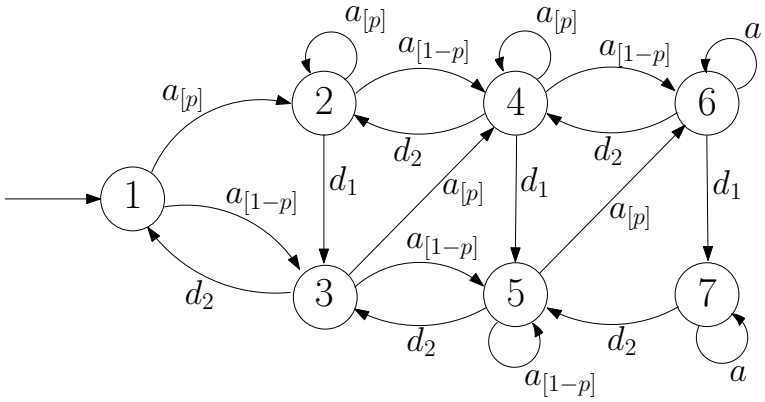
Homework of Discrete Event Systems - 07.12.2020

Exercise 1

Consider the stochastic timed automaton represented in the figure,



where $\mathcal{E} = \{a, d_1, d_2\}$, $\mathcal{X} = \{1, 2, 3, 4, 5, 6, 7\}$, $p = 3/5$, and the initial state is $x_0 = 1$. Using Matlab, simulate the model and estimate (if they exist) the limit probabilities

- $\lim_{k\to\infty} \mathrm{P}(X_k = x)$
- $\lim_{k\to\infty} \mathrm{P}(E_k = e)$

for all states $x \in \mathcal{X}$ and events $e \in \mathcal{E}$, under the following different assumptions on the stochastic clock structure.

1. The lifetimes of events a, d_1 and d_2 have exponential distributions with expected values 20, 18.5 and 21 min, respectively.

2. The lifetimes of events a and d_2 have uniform distributions over the intervals $[15, 25]$ and $[18, 24]$ min, respectively, while d_1 has deterministic lifetimes, all equal to 18.5 min.

Moreover, in order to check the correctness of the implementation, compare the probabilities estimated in point 1 with the true values that can be computed analytically.