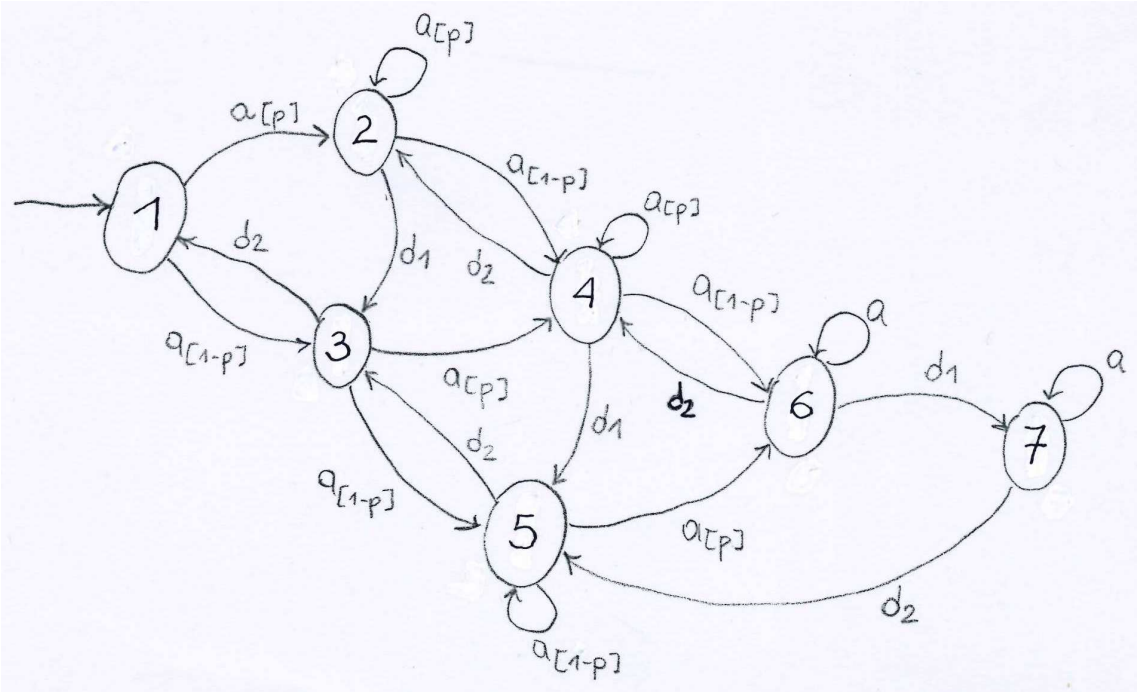
Test of Discrete Event Systems - 12.11.2019

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 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 follow uniform distributions over the intervals $[15, 25]$, $[12, 18]$, and $[16, 20]$ min, respectively.

2. The lifetimes of event a follow an exponential distribution with expected value 20 min, while for events d_1 and d_2 the lifetimes are generated as above.

3. The lifetimes of event a follow an exponential distribution with expected value 20 min, while d_1 and d_2 have deterministic lifetimes, all equal to 15 and 18 min, respectively.