

Department of Mathematics and Statistics

Stokastiset prosessit

Exercises 6

13.06.2008

1. Consider the following queueing model: the customers arrive to the system according to the Poisson process with 50 customers/hour in the average. There is always a free customer service desk so no one has to wait for the service. The service times are exponentially distributed and independent. Furthermore, a single customer stays in the system for half an hour in the average. Let $X(t)$ denote the number of customers in the system at the time $t \geq 0$.

- a) What kind of Markov process is this model? Determine also the transition intensities.
- b) Determine the stationary distribution.
- c) When the system is in the stationary state, determine the average number of customers.

2. How the model in the previous exercise changes, if we assume that there are just d customer service desk?

3. Continuation of the exercise 2. Suppose that the system is the stationary state.

- a) For what probability every customer service desk is free?
- b) For what probability the customer service person in the first desk can rest if we assume that the customers choose completely randomly to which of the free desks (if there are any) they go for service.

4. Let $X(t)$ be a MP with state space $S = \{0, 1\}$ and transition intensities $q_{01} = a$ and $q_{10} = b$.

- a) Write down the equation for the state distribution matrix $P(t)$.
- a) Solve this equation.