HELSINKI UNIVERSITY OF TECHNOLOGY
Networking Laboratory
S-38.145 Introduction to Teletraffic Theory, Spring 2005

Exercise 5
3.3.2005

Problems 2–3 are homework exercises. Mark the problems you have solved in the beginning of the exercise class.

1. *Demo*
   Buses are leaving from a bus stop regularly in every 15 minutes. Taxis pass by according to a Poisson process at rate once in 15 minutes. You arrive at the bus stop at a random time instant.

   (a) What is the expected waiting time before the first bus arrives?

   (b) What is the expected waiting time before the first taxi arrives?

   (c) What is the probability that you have to wait more than 10 minutes before the first taxi or bus passes by?

2. *Homework exercise (1 point)*
   A link in a packet switched network carries on average 10 packets/s. Assume that the packet arrive according to a Poisson process. Each packet is an acknowledgement independently of other packets with probability 30 %. Consider a random one second time interval.

   a) What is the probability that there is at least one "ack"-packet on the link?

   b) What is the expectation of total number of packets, if there was 5 "acks" during the interval?

3. *Homework exercise (1 point)*
   Connection requests arrive at a server according to a Poisson process with intensity λ. If the server is overloaded, its throughput collapses quickly. To prevent such incidents, server implements a congestion control system based on gapping. In this system after every accepted request the server refuses to accept any new connections during the following time period of lenght T. Assume that requests arriving during the gap interval are just discarded and they are not renewed. How many requests are accepted in a time unit on average? In particular, what is the rate of accepted connections in the extreme cases when T is very large or very small, respectively?