Note: Problem 3 is a homework exercise. Deliver your answer sheet (labelled with your student id, name, and signature) into the mail box of the course, or directly to the course assistant *before* the next exercise class on 11 October.

1. Consider the following (very simple) circuit switched trunk network. There are three nodes connected in a tandem by two links:

   a — b — c

   There are three traffic classes:

   - Class 1 uses link a — b
   - Class 2 uses link b — c
   - Class 3 uses both link a — b and link b — c

   Assume further that there are two parallel channels in each link. a) Determine the state space of this system. b) Determine the blocking states for each class.

2. Consider still the circuit switched trunk network defined in the previous problem. Assume that, for each class r, new calls arrive according to a Poisson process at rate λ_r. Let $\lambda_1 = \lambda_2 = 1/3$ calls per minute and $\lambda_3 = 2/3$ calls per minute. Call holding times (for all classes) are assumed to be independently and identically distributed with mean $h = 3$ min. a) Calculate the end-to-end blocking probabilities for each class with the exact formula. b) Determine the intensity of carried traffic for each class. c) Approximate the end-to-end blocking probabilities for each class with the Product Bound method.

3. *Homework exercise* (deadline 11 October at 9 o'clock): Consider the circuit switched trunk network defined in slides 9 and 11 of lecture 3 (with 3 links and 2 classes). Denote by a_r the traffic intensity of class r, and assume that $a_1 = 1$ erlang and $a_2 = 2$ erlang. Approximate now the end-to-end blocking probabilities for each class with the Product Bound method.