S-38.110 Telecommunication Switching Technology I, Exercise 6

Brax/Ilvesmäki, 16.3.2000

The answers are to be returned before the exercise begins either to the exercise assistant (in person or via email to lynx@tct.hut.fi) or to a box underneath the lab's noticeboard.

Please note that you may use the Laplace-transforms table distributed from the course web-page.

Task 1

There is a single component system with a constant failure rate λ and a repair rate $\mu = 0$. Write the differential equations by using a Markov model, and solve then the mean time to failure MTTF.

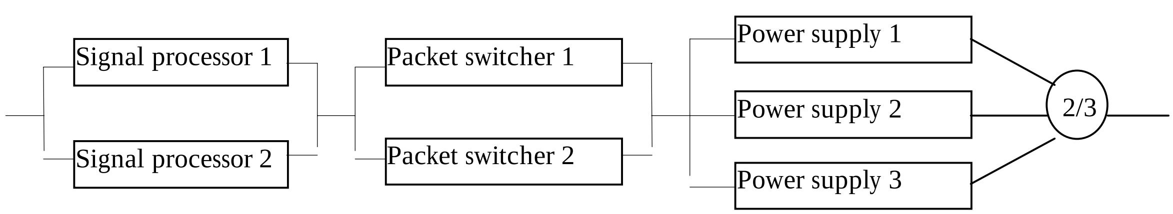
Task 2

a) Let's look at the Power Supply –system in the next task (figure below). We assume it to be in working condition when 2 of the three systems are operational (m=3, k=2). The reliability of a single component is marked with p_a, p_b or p_c respectively. Using combinatorial calculations derive the probability of functioning for the power supply system.

b) Assuming that $p_a = p_b = p_c$ use the binomial distribution and Bernoulli equation to derive the probability of functioning for the power supply –system. Explain what you do.

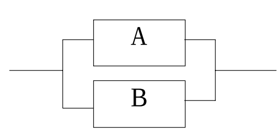
Task 3

Calculute the reliability of an STP signaling node by using the following diagram. (Reliabilities of the elements are: Signal processor 0.955, Packet switcher 0,985 and Power supply 0,915)



Task 4

Standby passive redundancy revisited: In the normal case the both sides A and B are working parallely so, that another of the sides, A or B, is taking care of the whole load, and the other one is standing by. For both sides is the failure rate = λ and the repair rate is μ. When the active side fails, and the standby side takes care of the load. When both sides are failed, the system is failed. When the whole system is failed, there is no repair function done. Draw the Markow state model for the system.



Write the differential equations by using the state model, and solve the avaibility of the system as a function of λ and μ. The system availability is the complement of the probability that the system is in failure.