July 1st, 2014
Exam of Switch and router architectures

Rules for the exam. It is forbidden to use notes, books or calculators. Use only draft paper provided by the professor. When needed, use approximations. Time available: 70 minutes.

PROBLEM A.
Consider a $4 \times 4$ Cantor network.

1. Draw it.
2. Discuss its properties in terms of blocking.
3. Describe the routing algorithm to configure the network.
4. Show the connections to support the following input-output couples: $1 \rightarrow 4$, $2 \rightarrow 3$, $3 \rightarrow 1$ and $4 \rightarrow 2$.
5. Apply Lee’s method to evaluate the blocking probability of the network.
6. Is the blocking probability evaluated by Lee’s method compatible with the blocking properties of the network? Why?
7. Is there any alternative switching architecture based on $2 \times 2$ modules, with the same blocking properties of Cantor network, but lower complexity? If yes, which one?
PROBLEM B.
Consider a Bloom filter of 10 bits and 3 hash functions.

1. Which kind of data structure does the Bloom filter implement?
2. Describe some possible scenarios in networks where bloom filters are adopted.
3. Write in pseudocode the operations of “write” and “read” in a bloom filter.
4. Show an example of “false positive” event.
**PROBLEM C.**
Consider an input queued switch fed by variable size packets.

1. Describe the overall architecture highlighting all the involved queuing systems.
2. Describe in pseudocode a “packet mode” scheduler.
3. Discuss its performance in terms of throughput and delays.