

Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich



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## Principles of Distributed Computing Exercise 2

## 1 Leader Election in an "almost anonymous" Ring

a) Is leader election possible in a synchronous ring in which all but one processors have the same identifier? Either give an algorithm or prove an impossibility result.

## 2 Distributed Computation of the AND

Consider an anonymous ring where processors start with binary inputs.

- a) Prove that there is no uniform synchronous algorithm for computing the AND of the input bits.
- b) Present an asynchronous (non-uniform) algorithm for computing the AND; the algorithm should send  $O(n^2)$  messages in the worst case.
- c) Present a synchronous algorithm for computing the AND; the algorithm should send O(n) messages in the worst case. What is the time complexity of your algorithm?