Resit Distributed Algorithms

Vrije Universiteit Amsterdam, 6 July 2022, 18:45-21:30

(You may use the textbook Distributed Algorithms: An Intuitive Approach*. Use of slides, solutions to exercises, notes, laptop, calculator is* not *allowed.)*

(The exercises in this exam sum up to 90 points; each student gets 10 points bonus.)

1. Propose an adaptation of the Lai-Yang snapshot algorithm in which basic messages may be buffered at the receiving processes and in which the channel states of the snapshot are always empty. (15 pts)

2. In the Bracha-Toueg deadlock detection algorithm, can also noninitiators, after having received a **done** from the neigbors to which they sent a **notify**, see from their *free* field whether they are deadlocked? Explain your answer. (10 pts)

3. Suppose that in Rana's termination detection algorithm, processes can take part in a wave tagged with t if they have been quiet from some time $\leq t + 5$. Give an example to show that then termination could be detected prematurely. (10 pts)

4. Give a Monte Carlo algorithm for election in anonymous networks of unknown size, and analyze the success probability of your algorithm. (15 pts)

5. Explain how the Ricart-Agrawal mutual exclusion algorithm could be adapted to make it fault-tolerant. (15 pts)

6. Sketch how the AODV protocol can be adapted to allow a node to look for multiple minimum-hop paths to different destinations with the broadcast of a single RREQ message. (15 pts)

7. Suppose a one-time signature *sig* is placed in the fourth leaf of a binary Merkle tree of depth 4 and used by Alice in a Merkle signature of a message to Bob. Explain what the signature looks like and how this signature is employed by Bob to verify whether the public key is genuine. (10 pts)