1. *12 marks*

   In the State machine approach for replication each replica processes the stable request with the least unique id. What is the definition of stable request? How can a replica use logical clocks to determine the stability of a request in a fail-stop system?

2. *10 marks*

   Describe an implementation of a distributed Linked-List that tolerates 2 replica crashes for all operations (*insert, delete* and *find*). Your implementation should take care that the memory needed in each node does not increase all the time.

3. *6 marks*

   Three computers together provide a replicated service. The manufacturers claim that each computer has a mean time between failures of five days; a failure typically takes four hours to fix. What is the availability of the replicated service?

4. *17 marks* Prove that it is impossible to solve the Byzantine Generals problem in a system with three processes, one of which is faulty. Generalize this result for a system with n processes.

5. *15* Describe an algorithm that solves the problem of mutual exclusion on a general network. Your algorithm should not use time-stamp or logical or physical clocks. Provide a correctness proof and also a complexity analysis of your algorithm.