

Part I

This part covers the same material as the midterm exam.

- 1a Explain the principle of a system that supports message-oriented persistent communication. 5pt
- 1b What would be an important drawback of using an e-mail system as the technology for implementing a message-queuing system? 5pt
- 1c Sketch a design of an RPC-based system that supports data streams for isochronous transmission mode. 5pt

- 2a Why is using DNS for locating objects that change location regularly not such a good idea? 5pt
- 2b When using forwarding pointers to locate mobile objects, we need to keep chains short. How can this be accomplished? 5pt
- 2c Explain how hierarchical location services exploit locality by considering the general implementation of update and lookup operations. 10pt

- 3a Consider a single-threaded object server. How would you implement a remote object that is to be hosted by this server such that remote invocations are atomic? 5pt
- 3b Answer the same question as in (a), but now for a multi-threaded object server. 5pt

Part II

- 4a Explain what is meant by active replication. 5pt
- 4b Active replication generally requires a totally-ordered execution of update operations. Explain when such an ordering requirement can be relaxed. 5pt
- 4c Explain how replicated invocations are caused and how they can be avoided. 10pt

- 5a Explain the principle of subject-based addressing, and sketch its implementation in TIB/Rendezvous. 5pt
- 5b Sketch two alternatives for implementing a distributed version of JavaSpaces, and explain how read and write operations would work for each. 10pt

- 6a Alice can delegate access rights to Bob by means of a certificate. How can a server verify whether Bob received the certificate in a legitimate way without the server having to contact Alice? 5pt
- 6b To protect a mobile agent against a malicious host, Ajanta uses a log to which servers can append information allowing an agent's owner to detect whether the log has been tampered with. Explain how this works. 5pt

Final grade: (1) Add, per part, the total points. (2) Let T denote the total points for the midterm exam ($0 \leq T \leq 45$); $D1$ the total points for part I; $D2$ the total points for part II. The final number of points E is equal to $\max\{T, D1\} + D2 + 10$.