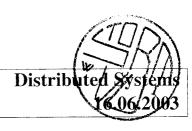
Department Computer Science Vrije Universiteit



1a	Explain what relocation transparency is and give a concrete example of its application.	5pt
1b	Caching and replication are generally applied as scaling techniques, but introduce another scaling problem. What is this problem and how can it be solved?	5pt
2a	What is isochronous transmission mode?	5pt
2 <i>b</i>	Give an example of a complex continuous data stream, and explain how synchronization in a such a stream is generally accomplished. Motivate why synchronization is done that way.	5pt
3	Sketch a simple solution for supporting migration transparency for mobile remote objects.	5pt
4a	Explain how a remote name space can be mounted.	5pt
4b	Recursive name resolution is more effective than iterative name resolution. Why?	5pt
4c	Explain the difference between a name service and a directory service, and why the latter is often more difficult to scale worldwide.	10pt
5a	Show that Lamport timestamps are insufficient for capturing causality.	5pt
5b	Explain how Lamport timestamps can be used to realize totally ordered multicasting.	5pt
5c	Consider a distributed system that promises to preserve causality in the delivery of messages. Explain what this promise means, and why the system cannot, in general, keep this promise.	5pt
6a	When is an execution of operations by concurrent processes sequentially consistent?	5pt
6b	What is the essential difference between data-centric and client-centric consistency models?	5pt
7a	Reliable multicasting is difficult to scale to very large groups of processes. Why?	5pt
7b	Consider the problem of reliably multicasting a message to a large group of processes. If it is required that the message is only <i>eventually</i> delivered to each process, what would your solution be?	5pt
7c	Explain what atomic multicasting is.	5pt
8	What is a piecewise deterministic execution model, and why is it so useful?	5pt

Grading: The final grade is calculated by accumulating the scores per question (maximum: 90 points), and adding 10 bonus points. The maximum total is therefore 100 points.