

CS550 “Advanced Operating Systems”

Fall 2017 - Homework 4

Submission:

This is an INDIVIDUAL written assignment.

Due by 11:59pm of 11/27/2017

Total points 130 - Late penalty: 10% penalty for each day late

Please upload your assignment on Blackboard with the following name:

CS550_SectionNumber_LastName_FirstName_HW4.

Please do NOT email your assignment to the instructor and/or TA!

1. **Read Chapter 6, 7, 8,9**
2. **(5 points)** What are the design issues of distributed scheduling?
3. **(5 points)** Why is message logging useful in Checkpointing? Discuss.
4. **(5 points)** What is Byzantine failure? How many replicas are needed to survive a k component fail in Byzantine failure?
5. **(5 points)** In the Bully algorithm, a recovering process starts an election and will become the new coordinator if it has a higher identifier than the current incumbent. Is this a necessary feature of the algorithm? Explain.
6. **(5 points)** Suppose that two processes detect the demise of the coordinator simultaneously and both decide to hold an election using the bull algorithm. What happens?
7. **(5 points)** Explain why there are two campus of file systems, represented by Parallel File Systems and Hadoop File Systems?
8. **(10 points)** What kind of consistency would you use to implement an electronic stock market? Explain your answer.
9. **(10 points)** Consider a personal mailbox for a mobile user, implemented as part of a wide-area distributed database. What kind of client-centric consistency would be most appropriate? Explain.
10. **(10 points)** Give an example where client-centric consistency can easily lead to write-write conflicts.
11. **(10 points)** A file is replicated on 10 servers. List all the combinations of read quorum and write quorum that are permitted by the voting algorithm.
12. **(10 points)** Explain the difference between linearizability and sequential consistency, and why the latter is more practical to implement, in general.
13. **(10 points)** Consider a Web browser that returns an outdated cached page instead of more recent one that had been updated at the server. Is this a failure, and if so, what kind of failure?
14. **(10 points)** In reliable multicasting, is it always necessary that the communication layer keeps a copy of a message for retransmission purposes?
15. **(10 points)** In the two-phase commit protocol, why can blocking never be completely eliminated, even when the participants elect a new coordinator?
16. **(10 points)** The totally-ordered multicasting using Lamport’s logical clocks does not scale. Explain why.
17. **(10 points)** Devise a simple authentication protocol using signatures in a public-key cryptosystem.

Note: We encourage collaboration between you and your classmates. Discuss various approaches and techniques to better understand the questions. However, we do NOT allow copying solutions or code. This is considered as cheating and falls under IIT code of honor. Penalties will be enforced. Please make sure you write your own solutions.

GOOD LUCK!