

Exam 1 - CS 682 - Fall 2014

Name:

Question	Awarded Points	Maximum Points
Question 1		5
Question 2		5
Question 3		5
Question 4		5
Question 5		5
Question 6		10
Question 7		10
Question 8		10
Question 9		15
Question 10		5
Question 11		5
Question 12		5
Question 13		10
Question 14		5
Total		100

1. (5 points) Recall that many of the systems we've discussed (Twitter, Pinterest) use a Service-Oriented Architecture (SOA). Define SOA.
2. (5 points) Discuss at least one advantage of using a SOA.
3. (5 points) Discuss one feature of a RESTful web service. Hint: think about how REST differs from SOAP.

4. (5 points) Briefly describe how a system would support partition tolerance and consistency by sacrificing availability. What will happen when a client performs a write on a replica if there is a network partition?
5. (5 points) Recall that Pinterest uses sharding. Briefly define *sharding*.
6. (10 points) Briefly explain at least **two** of the rules that define causality -- in other words, the *happens-before* relationship.

7. (10 points) Which level of consistency do you think is most appropriate for your Twitter service? Explain your answer.

8. (10 points) Explain **two** of the properties of a *synchronous* system. Remember, most systems are asynchronous systems.

9. (15 points) The following question refers to a system with three processes. The timestamps of the events at each process are as follows:

p1 = (1, 0, 0) (2, 3, 0) (3, 3, 4)

p2 = (1, 1, 0) (1, 2, 0) (1, 3, 0)

p3 = (0, 0, 1) (0, 0, 2) (1, 2, 3) (1, 2, 4)

(a) In total, how many messages are sent during the execution of the program?

(b) List the timestamps of all events that *happen-before* the event with timestamp (1, 2, 3).

(c) List the timestamps of all events that *happen-before* the event with timestamp (2, 3, 0).

10. (5 points) Compare the token ring algorithm for mutual exclusion with the central server algorithm. Which do you think is superior and why?

11. (5 points) In Paxos, if an acceptor has replied to a prepare with a promise message and has accepted an accept request, what will happen if it receives another prepare with a larger proposal number before the paxos instance has completed? Explain why this is the case.

12. (5 points) What is the purpose of multi-paxos?

13. (10 points) Consider Figure 11 from the Pileus paper below. If you were implementing a shopping cart service and you knew that all of your clients would initiate requests from the US, which system would you use: primary, random, closest, or Pileus. Justify your selection with relevant observations from the figure and paper.

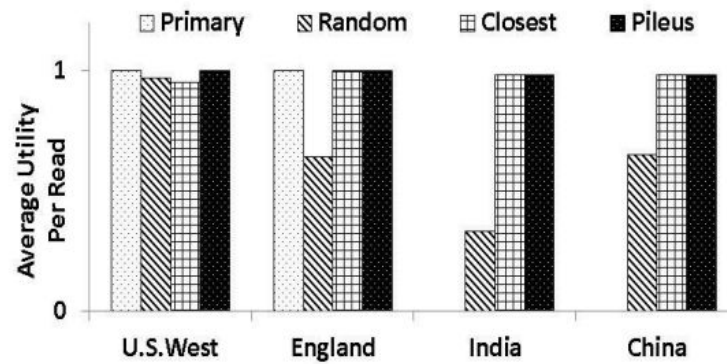


Figure 11. Utility of shopping cart SLA for clients in U.S., England, India, and China

14. (5 points) Write **and answer** a question about a topic that you studied that does not appear above.