CSE 486/586 Non-Graded Practice Problem Set 2

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1. You are designing a new kind of electronic voting machine. These machines (i.e., clients) will report each vote made at them to the server via an RPC. Discuss the pros and cons of using each of the following semantics for the RPC in this system: (a) maybe, (b) at least once, (c) at most once. Which would you recommend and why?
2. Problem 16.2
3. Problem 16.3
4. Problem 16.10
5. Problem 16.12
6. Problem 16.14
7. Problem 17.1
8. Problem 17.2
9. Problem 17.4
10. Problem 18.4
11. Problem 18.5
12. Problem 18.6
13. Problem 18.9
14. Problem 18.10
15. Problem 18.18
16. Problem 18.19
17. Explain why the following sequence is allowed for a causally-consistent storage, but not with a sequentially consistent storage. Note that W(x)a denotes a write operation on variable x that writes value a and R(x)a denotes a read operation on variable x that returns a. There are 4 processes, P1 - P4.

P1: W(x)a			W(x)c		
P2:	R(x)a	W(x)b			
P3:	R(x)a			R(x)c	R(x)b
P4:	R(x)a			R(x)b	R(x)c

18. Suppose there are three processes, among which one process is faulty. Using Paxos, describe the steps the three processes can take in order to agree on a value.
19. Problem 15.23
20. (a) Consider a PBFT system with 2 faulty nodes. What is the minimum number of non-faulty nodes required in the system to support Byzantine fault tolerance? (b) In this system, a client issues a request to the primary and the primary starts the three phase protocol (you can assume that the primary is non-faulty). Calculate the total number of messages exchanged by the non-faulty replicas until all of them reply to the client. It is given that the system only supports unicast messages.

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