

Exam Solutions

CS 247: Principles of Distributed Computing
Spring 2020

1.

RB:

(a) RB4 agreement is violated

p1 is crashed and has sent a message to p2 but not p3. Because of the incompleteness of the failure detector, p2 is never informed of the crash of p1 and does not rebroadcast the message. Therefore, p3 never receives it.

(b) Correct but may be inefficient

URB:

(a) URB1 validity and URB4 agreement are violated.

The process may wait for a crashed process for ever.

p3 crashes and can send a message to p1 but not p2. P1 delivers the message.

Since the failure detector is not complete it does not inform p2 about the crash of p3. P2 waits for p3 for ever and does not deliver the message.

(b) URB4 agreement is violated. The broadcasting process p1 thinks that all others are crashed and delivers only to itself and then crashes.

2.

a) >

(1) Causal order is not violated.

(2) Eventual delivery is violated.

b) <=

(1) Causal order is violated.

(2) Eventual delivery is not violated.

3.

In a diagram with 5 processes, the first write can finish with acks from the processes 1, 2, and 3 and the second write can finish with acks from the processes 1, 4 and 5. Then, the write messages from the first write can be delivered to processes 4 and 5 and overwrite 0 with 1. Then a read finish with acks from the processes 2, 3, and 4.

4.

The algorithm still correct. The last process has adopted the values of the previous processes and broadcasting its value does not change their values.