Grading policy on last page

1. **No, Mutual exclusion can be violated.**

Liveness is guaranteed. No deadlock or starvation, since once a process p exit, p will reply to all the queued requests.

Example:
Say there are 3 processes requesting for access to the Critical Section
The following table shows a scenario where mutual exclusion can be violated. Q contains the queued messages.

P0	P1	P2
req	req	req
Q:{P1,P2}	Reply to P0 **Received a reply from P2, waiting for a reply from P0** Q:{P2}	Reply to P0, P1 **Waiting for replies from P0 and P1**
Enter CS		
Exit CS and Reply to P1, P2		
	Received reply from P0 Enter CS	**Received Reply from P0, Waiting for a reply from P1,**
Req	Q:{P2, P0}	
Received reply from P2		Reply to P0
Received reply from P1	Exit CS and Reply to P2 and P0	**Received reply from P1**
Enter CS		Enter CS

2. NO, it is not possible to solve the problem with 4 nodes. For instance, suppose nodes 0,1,2,3 have input 0,1,2,3. Since f=1 (one node may be faulty), it is potentially possible that any of the four nodes is faulty, thus each possible input is potentially the input of ONLY a faulty node, and hence not a valid output. This problem was also discussed in class on March 29, 2018 (please see lecture video at the beginning of the lecture).

3. NO, it will not work correctly. We give an example where mutual exclusion is violated.

Consider the following scenario for n=2.
Both p0 and p1 initiate entry at the same time, and they both read Number[0] = Number[1] = 0.

p1 completes the write Number[1] = 1 first, and then p1 enters the critical section before Number[0] is written as 1 by p0.

Then, p0 completes writes Number[0] = 1. Now, Number[1] = Number[0] and the process ids are used to break tie: (Number[1],1) > (Number[0],0) .

Then, p0 enters the critical section. The mutual exclusion property is violated, because p1 is also in the critical section.

Grading policy:

Question 1:

(a) Safety NO 3 points + explanation 2 points

(b) Liveness YES 3 points + explanation 2 points

Question 2:

NO 7 points + explanation 3 points

Question 3:

NO 7 points + explanation 3 points