

## Exercise Session 5

### Broadcast - Reliable, Uniform, Causal, and Total-Order

#### Exercise 1

If an algorithm implements Total Order broadcast, does it also satisfy the properties of the following?

1. Causal broadcast
2. Uniform Reliable broadcast

For each of the two (separately), either explain why it does, or give an execution that is allowed by total order broadcast, but is not allowed by the corresponding broadcast abstraction.

#### Exercise 2

Consider a broadcast algorithm that has the following properties:

**Validity:** For any two processes  $p_i$  and  $p_j$ , if  $p_i$  and  $p_j$  are correct, then every message broadcast by  $p_i$  is eventually delivered by  $p_j$ .

**No duplication:** No message is delivered more than once.

**No creation:** If a message  $m$  is delivered by some process  $p_j$ , then  $m$  was previously broadcast by some process  $p_i$ .

**Causal delivery:** No process  $p_i$  delivers a message  $m_2$  unless  $p_i$  has already delivered every message  $m_1$  such that  $m_1 \rightarrow m_2$ .

Does this broadcast algorithm satisfy the agreement property (if a message  $m$  is delivered by some correct process, then  $m$  is eventually delivered by every correct process)? Motivate your answer.