Exercise Session 4
Broadcast – Reliable, Uniform, Causal, and Total-Order

Exercise 1

Sketch an execution history with two processes p1 and p2, that satisfies the properties of **Reliable Causal Broadcast** but does not satisfy **Uniform Causal Broadcast**.

Exercise 2

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 3

Consider a broadcast algorithm that has the following properties:

Validity: For any two processes pi and pj, if pi and pj are correct, then every message broadcast by pi is eventually delivered by pj.

No duplication: No message is delivered more than once.

No creation: If a message m is delivered by some process pj, then m was previously broadcast by some process pi.

Causal delivery: No process pi delivers a message m2 unless pi has already delivered every message m1 such that m1 $\longrightarrow$ m2.

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