

**Distributed Systems 18/01/2018**  
**Corso di Laurea Magistrale in Ingegneria Informatica**

☐ **5 Credits**

☐ **6 out of 12 Credits (not passed CNS yet)**

☐ **6 Credits**

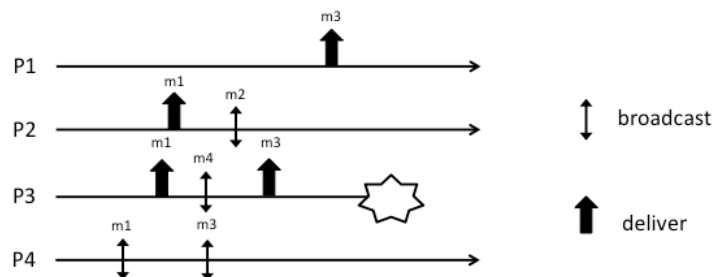
☐ **6 out of 12 Credits (passed CNS )**

(tick the appropriate box above – write clear below)

Family Name \_\_\_\_\_ Name \_\_\_\_\_ Student ID \_\_\_\_\_

**Ex 1:** Consider the two implementations of reliable broadcast for synchronous and asynchronous system models that have been described during the lectures. Describe how the two algorithms work, discuss the impact asynchrony has on the design of their structure and detail their message complexity (best and worst case).

**Ex 2:** Consider the partial execution depicted in the Figure



Answer to the following questions:

1. Provide all the possible sequences that satisfy causal order and total order.
2. Provide all the possible sequences that satisfy TO (UA, WNUTO) and do not satisfy causal order.

**Ex 3:** Provide the statement of the CAP theorem and the sketch/intuition of its proof.

**Ex 4:** Consider a distributed system where processes are arranged in a ring topology. Every link of the ring is implemented through a perfect point-to-point channel. Each process in the system has a unique identifier and it stores, in a local variable called `next`, the identifier of the next process in the ring.

Answer to the following questions:

1. Write the pseudo-code of an algorithm implementing a counting abstraction that eventually reports the number of processes in the ring, assuming that processes are not going to fail.  
**Note:** The student is free to define the interface of the abstraction.
2. Discuss what happen to the counting oracle if processes are anonymous.

According to the Italian law 675 of the 31/12/96, I authorize the instructor of the course to publish on the web site of the course results of the exams.

Signature: \_\_\_\_\_