# Distributed Systems 11/10/2017
# 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:**
Discuss which is the system model where the use of a primitive of probabilistic broadcast is better than the use of a reliable broadcast primitive. In addition discuss the parameters that can tuned in an implementation of probabilistic broadcast based on gossiping in order to improve the probability to delivery at each process.

**Ex 2:**
Discuss the Primary Backup replication scheme, point out which problems of inconsistency could arise in the replicated data if the primary crashes and write the steps you need to recover to a consisted state of the replicated data when electing a new primary.

**Ex 3:**
Describe the hierarchy of total order primitives discussing order and agreement properties. Show an original run (i.e., a run not shown during the classes):

- . satisfying TO(NUA,SUTO) and not satisfying TO(UA,SUTO)
- satisfying TO(UA,WUTO) and not satisfying TO(UA,SUTO)

**Ex 4:**
Consider an asynchronous distributed system composed by $n$ processes $p_1, p_2 \ldots p_n$. Each process is equipped with an oracle that provides the name of a leader and processes communicate through a reliable broadcast primitive. Answer the following questions:
1) Write the pseudo code of an algorithm that implements a "Total Order Broadcast" primitive without considering process crashes
2) discuss if the protocol implements also causal order of broadcast messages (motivate the answer)
3) modify the pseudo code of the protocol to handle the crash of the leader

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: _____