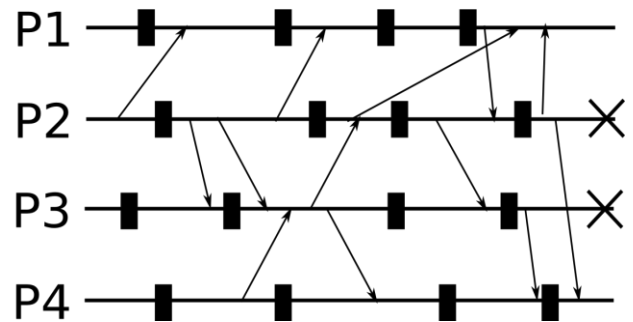
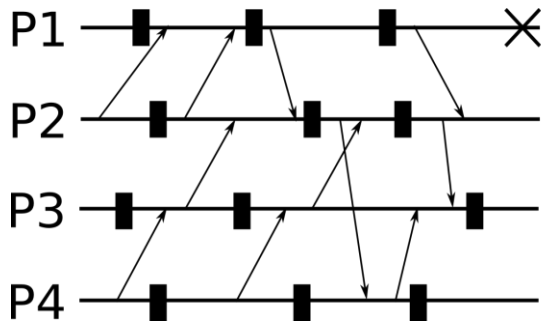




Rules:

- You are not allowed to use books, notes, or other material.
- You can answer in Italian or English.
- Total time for the test: 2 hours.

1. Describe and compare RPC and RMI (as general communication abstractions). Clarify the differences regarding the way parameters are handled.
2. Describe leader election. The goal, possible usage scenarios, how to implement it, under which hypothesis the presented protocol works.
3. Calculate the recovery line for the two diagrams below using the rollback-dependency graph for the first one, the checkpoint dependency graph for the second one.



4. Discuss virtual Synchrony.
5. Consider the following schedule over 2 variables (both initialized at zero):

P0 W(x) 2 R(y) 3 W(x) 3 R(x) 3
P1 R(y) 1 R(x) 2 R(x) 3 W(y) 3
P2 R(x) 0 W(x) 1 W(y) 1 R(x) 2
P3 R(y) 1 W(y) 2 R(x) 3 R(y) 2

Is it FIFO/causal/sequential consistent?

6. Describe the two different approaches for primary based consistency protocols, underlying also the advantages and disadvantages of having a backup system.
7. Describe the figure shown here: what protocol is it? In what system is it used? What is “t”?

