TEKNISKA HÖGSKOLAN I LINKÖPING
Institutionen för datavetenskap
Petru Eles

# Tentamen i kursen

# Distribuerade System- TDDA 67, TDDB 67, TDDI78

# 1999-03-08, kl. 09-13

**Hjälpmedel:**

Inga.

**Poänggränser:**

Maximal poäng är 30.
För godkänt krävs sammanlagt 16 poäng.

**Resultat anslås:**

Senast 1999-03-22 på IDAs anslagstavla för tentamensresultat.

**Jourhavande lärare:**

Petru Eles, tel 28 13 96

## Good luck !!!

**Tentamen i kursen Distribuerade System - TDDA 67, TDDB 67, TDDI78, 1999-03-08, kl. 09-13**
**Du kan skriva på svenska eller engelska!**

1. - Advantages of Distributed Systems.
   - Problems with Distributed Systems.
   Enumerate them and comment.

(2p)

2. Remote Procedure Call: trace the way of a request and of the reply from the client to a remote server and back. Illustrate with a figure.

(2p)

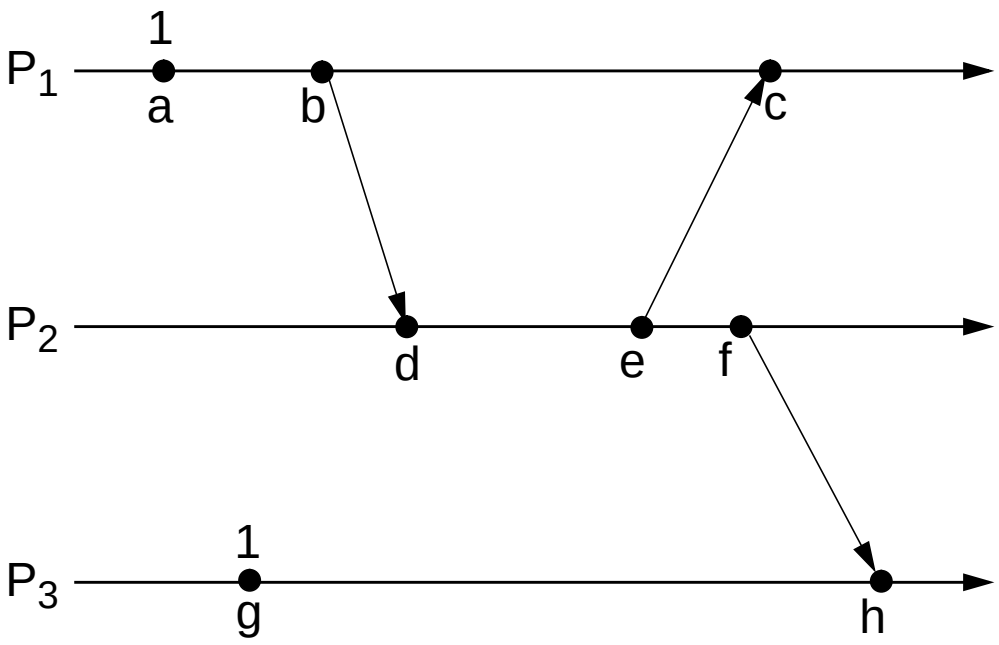
3. Middleware:
   What is it? Why do we need it?

(2p)

4. Static and dynamic invocation in CORBA:
   How do they work? Compare.

(3p)

5. Consider the following set of events:




Assign the missing Lamport Logical Timestamps to the events.

(2p)

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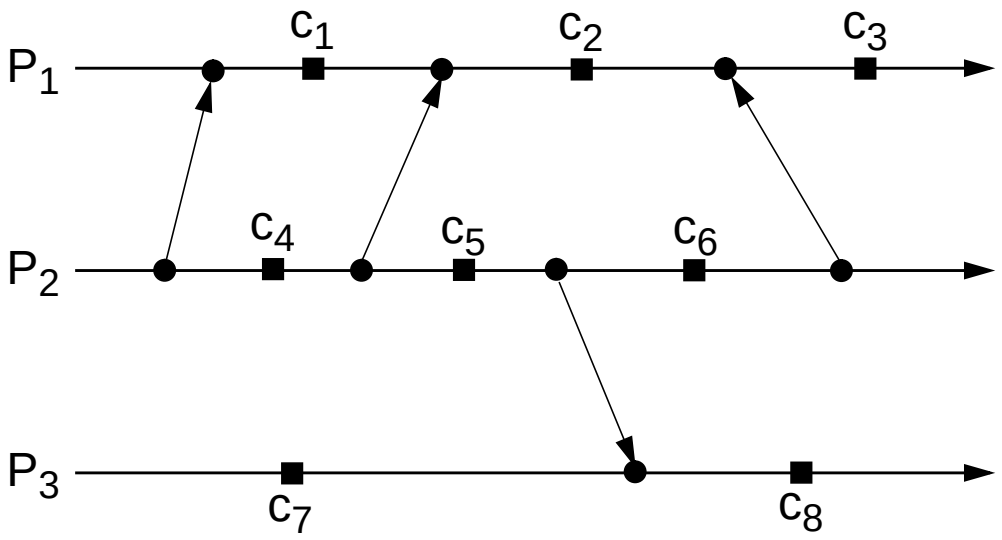
6. What is a cut of a distributed computation? What means a consistent and a strongly consistent cut? Consider the following set of events:




Determine for each of the following cuts if it inconsistent, consistent or strongly consistent:
$\{c_1, c_4, c_7\}$, $\{c_1, c_5, c_7\}$, $\{c_1, c_6, c_7\}$, $\{c_3, c_6, c_8\}$, $\{c_2, c_6, c_8\}$, $\{c_1, c_6, c_8\}$.

(3p)

7. Consider mutual exclusion with the Ricart-Agrawala algorithm (the first algorithm, not using a token). Imagine three processes: $P_0$, $P_1$, and $P_2$. $P_1$ and $P_2$ are requesting the same resource, and the timestamp of the requests is (8, 1) and (7, 2) respectively. Illustrate the sequence of messages exchanged (use figures). Who gets the resource fist?

(3p)

8. Consider a bully election with 6 processes, $P_1$, ..., $P_6$. $P_6$, the current coordinator fails, and $P_3$ starts the election. Illustrate the sequence of messages exchanged (use figures).

(3p)

9. Define total and causal ordering of requests. Illustrate by an example.

(2p)

10. What is the basic idea with voting protocols for updating replicated data? How do they work? Consider a set of 8 replica managers. Define two voting protocols. One for a situation when the number of writes is relatively large compared to that of reads, and the other for the reverse situation. Give examples of read and write quorums (use figures).

(3p)

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11. What is a fault tolerant system?
    Explain the following fault types (fault models):
    - fail-stop
    - slowdown
    - byzantine.

    (3p)

12. Define majority voting for forward recovery. Illustrate by two examples: one with strict equality and the other with non-strict equality.

    (2p)