TEKNISKA HÖGSKOLAN I LINKÖPING
Institutionen för datavetenskap
Petru Eles

Tentamen i kursen

Distribuerade System- TDDB 37

2000-08-26, kl. 08-12

Hjälpmedel:

Inga.

Supporting material:

No supporting material allowed.

Poänggränser:

Maximal poäng är 40.
För godkänt krävs sammanlagt 21 poäng.

Points:

Maximum points: 40.
In order to pass the exam you need a total of minimum 21 points.

Resultat anslås:

Senast 2000-09-11 på IDAs anslagstavla för tentamensresultat.

Results available:

Results will be available latest 2000-09-11 on IDA's board for exams.

Jourhavande lärare:

Petru Eles, tel. 281396

Good luck !!!

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Du kan skriva på svenska eller engelska!

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

(2p)

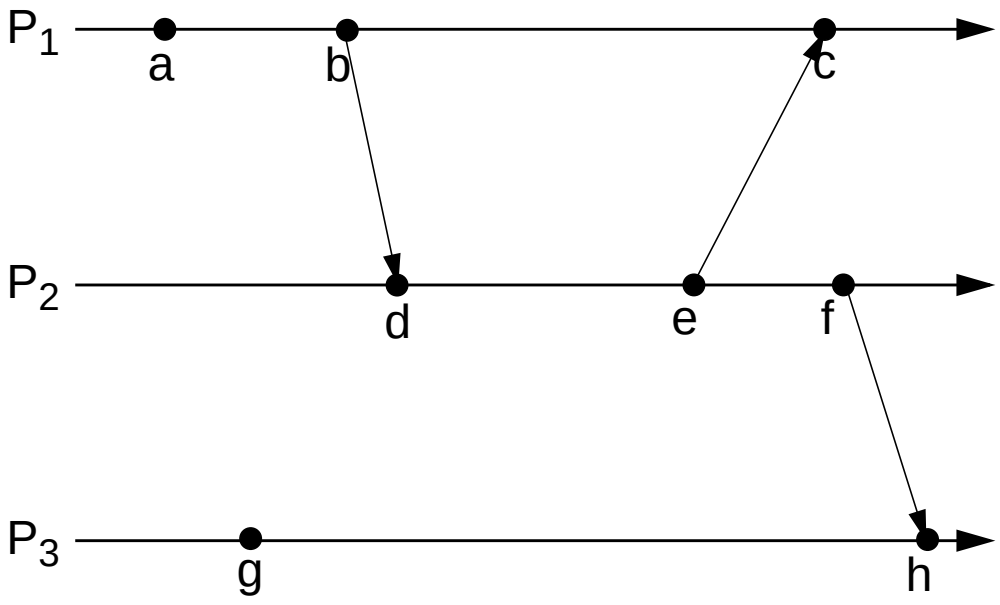
2. Remote Procedure Call: trace the way of a request and of the reply from the client to a remote server and back. Illustrate with a figure.

(3p)

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

(3p)

4 Define the *happened before* relation (Lamport).
When are two events concurrent?



What is the relation between events a - b, a - d, b - g, g - e, d - c, b - c, a - g, f - g, e - h, a - h?

(3p)

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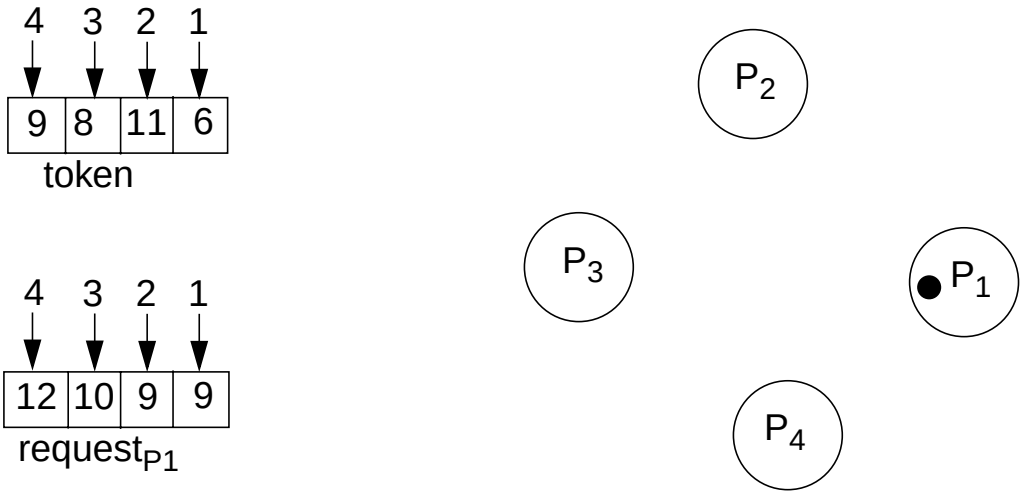
5. Consider the four processes in the picture below. Mutual exclusion relative to a shared resource is solved using the Ricart-Agrawala - second algorithm (the token-based one). P_1 is ready to give up the resource. Which process will get the resource? Why?



(3p)

6. 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).

(4p)

7. Give a short description of how the following update protocols for replicated data work and compare them:
   read-any - write-all protocol, available-copies protocol, primary-copy protocol.

(3p)

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

(3p)

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9. What is the basic idea with voting protocols for updating replicated data? How do they work? Consider a set of 15 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).

(4p)

10. How many processors do you need in order to achieve *k*-fault tolerance with byzantine faults:
    - for agreement?
    - with a majority voting scheme?

(3p)

11. Predictability of real-time systems:
    Why is it important?
    What are the main problems?

(2p)

12. What does it mean by external and internal synchronization of physical clocks?

(2p)

13. You now the maximum drift rate of the clocks on two processors and the maximal allowed skew between them. How do you determine the maximum interval between two successive synchronizations between the clocks?

(2p)

14. Compare the CAN protocol and the TDMA protocol from the point of view of how collisions are avoided.

(3p)