Chalmers Techniska Högskola — CTH TDA295
Datavetenskap — GU INN290

Distribuerade system fk
*Tentamen 2000-08-*18

Dag, *Tid, Sal*: August 18th 2000, 8:45-12:45, VV

***Kursansvarig*:** Philippas Tsigas (Tel: 772 5409, h. 7117763)

***Hjälpmedel*:** Inga

Totalt *Poängtal*: 60

***Betygsgränser*:**

CTH: 3:a 24 p, 4:a 36 p, 5:a 48 p

GU: Godkänd 28p, Väl godkänd 48 p

Instructions

- Please answer in English, if possible.
  If you have very big difficulty with that, though, you may answer in Swedish.
- **Do not forget to write your personal number and if you are a GU or CTH student and at which "linje"**
- Please start answering each assignment on a new page; number the pages and use only one side of each sheet of paper.
- Please write in a tidy manner and explain (briefly) your answers.

LYCKA TILL !!!!

1. *16 marks*

   The two-phase commit protocol gives the means to different processes on the network to atomically perform a transaction.

   (a) Describe the two-phase commit protocol.

   (b) Does this protocol work when there are undetectable message loses on the network?

   (c) How does this protocol respond to a failure of the Coordinator.

   (d) Prove the impossibility result for the two generals problem. What does this result say to the people that are looking for protocols that will allow them to perform atomic transactions on distributed systems with undetectable message loses?

2. *12 marks*

   (a) In the State machine approach for replication each replica processes the stable request with the least unique id. What is the definition of stable request?

   (b) How can a replica use logical clocks to determine the stability of a request in a fail-stop system?

3. *16 marks*

   (a) Describe an algorithm that processors of an asynchronous network *G=(V,E)* can use in order to broadcast information. The processors of the network are the nodes of the graph *G=(V,E)* and the physical links that connect the processors are the edges of *G=(V,E)*.

   (b) What is the time and communication complexity of your algorithm? Prove it.

   (c) In the algorithm that you have described is it possible for the sender to know when its message has been received by all the other processes of the network? If yes prove it. If not modify your algorithm to satisfy this condition also, and prove that the modified algorithm satisfies the required condition.

4. *16 marks*

   (a) Describe Ivy's dynamic distributed manager scheme.

   (b) In this scheme what steps are taken to minimise the number of lookups necessary to find a page?

   (c) Describe an advantage and a disadvantage of the following distributed shared memory consistency models: i) strict consistency, ii) eager release consistency, iii) lazy release consistency.

   (d) We use the notation $W(x)v$ to denote a write operation to the variable x with the value v, and $R(x)v$ to denote a read operation to the variable x that returns the variable v.

   Initially, all variables are set to zero. Is the memory underlying the following two processes sequentially consistent?:

P1:	$R(x)1; R(x)2; W(y)1$
P2:	$W(x)1; R(y)1; W(x)2$