Distribuerade system fk

*Tentamen 1999-05-*26

Dag, *Tid, Sal*: May 26th 1999, 8:45-12:45, ML2

***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. *12 marks*

   (a) Describe the quorum consensus replication scheme and then Gifford's file replication scheme.

   (b) Use the quorum consensus replication scheme and implement a distributed LIFO queue.

2. *6 marks*

   Three computers together provide a replicated service. The manufacturers claim that each computer has a mean time between failures of five days; a failure typically takes four hours to fix. What is the availability of the replicated service?

3. *12 marks*

   (a) Show that the protocol given below is not a correct solution to the mutual exclusion problem for a system with two processes, P and Q.

   Protocol for P (the one for Q is symmetric)

   ——————————————

when <become hungry> *do*

state := hungry
SEND(PERMISSION_REQUEST) to Q
end_ do

when RECEIVE(PERMISSION_GRANTED) from Q *do*

state := eating
<eat>
end_ do

when RECEIVE(PERMISSION_REQUEST) from Q *do*

if state = eating then Deferred := true
else SEND(PERMISSION_GRANTED) to Q
end_ if
end_ do

when <finished eating> *do*

state := thinking

if Deferred = true *then* SEND(PERMISSION_GRANTED) to Q Deferred := false

end_ if

end_ do

(a) Deferred is initialised to *true* for both P and Q.

(b) Give an enhancement to the above protocol to make it a correct solution for the mutual exclusion problem in a system with two processes, P and Q. Give an informal argument (3 or 4 sentences) for the correctness of your protocol.

4. *18 marks*

(a) Prove the impossibility to solve the Byzantine Generals problem in a system with three processes, one of which is faulty.

(b) How can we extend this result to the general system with n processes?

5. *12 marks*

(a) Linda and IVY are two DSM systems that are based on two completely different design philosophies. Which are the differences in these philosophies? What is the big plus of the IVY system and what is the big minus?

(b) 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:	$W(x)1; R(y)1; W(x)2$