

Tentamen i TDDD82 Säkra mobila system (Systemprogramvara)

2017-08-24, kl. 14-18

- Inga hjälpmedel är tillåtna.
- Kom ihåg att svaren på samtliga uppgifter måste MOTIVERAS, och att motiveringarna skall vara uppställda på ett sådant sätt att det går att följa hur Du tänkt. OMOTIVERADE SVAR GER 0 POÄNG OM INGET ANNAT SÄGS.
- Jour: Mikael Asplund (nåbar på tel. 0700-895827).
- Maxpoäng är 30 poäng. För betyg 3 krävs minst 15 poäng, för betyg 4 krävs 20 poäng och för betyg 5 krävs 25 poäng.

Lycka till!!!

1. The monitor construct can be implemented by using semaphores. Consider a monitor that has one condition variable `condx` and functions `f1 ... fn`. First assume that `signal(condx)` is only called *at the end of a function*.

(a) Explain how each function body `fx` should be modified to ensure mutual exclusion to the monitor by providing pseudocode. Explain any additional variable you introduce and how they should be initialised.

```
%Your pseudocode here  
Body of fx  
%Your pseudocode here
```

(1p)

(b) Provide pseudocode for the operations `wait(condx)` and `signal(condx)` and explain any additional variable you introduce and how they should be initialised. (3p)

(c) Now consider the possibility that `wait(condx)` can be called in the middle of a function `fx`. Describe the necessary changes that must be made (through new pseudocode). (3p)

(7 points)

2. What is *busy waiting* (at a mutual exclusion lock), why should it be avoided especially on processors with one core only, and how can it be avoided?

(2 points)

3. What is the difference between *deadlock* and *starvation*?

(1 points)

4. Consider the following resource allocation problem in a system with 3 resources (R1-R3), and 4 processes (P1-P4). The table indicates the currently allocated resources and in parenthesis the maximum possible demand.

	R1	R2	R3
P1	0 (2)	1 (6)	0 (2)
P2	1 (2)	3 (6)	0 (2)
P3	0 (0)	2 (2)	0 (2)
P4	3 (3)	0 (2)	2 (2)

The currently available resources are: [3, 2, 0]. Use Banker's algorithm to determine if the request [0, 2, 0] from Process P2 should be granted.

(4 points)

5. Define the terms *process*, *kernel-level thread* and *user-level thread*, and explain the differences between them.

(3 points)

6. It has been shown that in order to reach majority agreement in a set of replicas in a distributed system where some nodes might crash, one must assume the so called synchronous system model.

- (a) Explain the meaning of this model (2p)
- (b) Explain why it can be difficult to fulfil these assumptions for a system which is spread out across a wide area (e.g., multiple cities). (2p)
- (c) Give an example of when this system model is suitable (1p)

(5 points)

7. Describe the concept of generalised processor sharing (GPS) and how an approximation of this concept can be realised in a networking context. Also explain why a perfect realisation of GPS is not possible for a network router.

(5 points)

8. Describe and explain the difference between *fault removal*, *fault tolerance*, and *fault prevention*.

(3 points)