Name	Signature	Student Id Nr	*Points*

Operating Systems, miniexam 1, 7.2.2018 (12 p)

Write your answer on this exam paper in the space given. Please notice, that the exam paper is 2-sided.

a) [4 p] In a multicore system a process has many user level threads (ULT).
How do they differ from kernel level threads (KLT)?

Give a situation where a ULT is in state "running", even though it is not really running on any of the cores. Explain why this is possible.

When and how will that thread eventually get executed in some core? In what state will it be then?

b) [4 p] When and how is the critical section problem solved purely with software?

When and how is the critical section problem solved with hardware (special instructions)?

When and how is the critical section problem solved with a semaphore?

When and how is the critical section problem solved with a monitor?

TURN

c) [4 p] Running track with semaphores. Running track is 400m long. Ann and her friends Bill and Charlie come there often to run 4000m. Ann is social and waits after every lap that one of the boys has caught up with her (equal number of laps). The boys are competitive and do not wait for anybody. Solve the resulting synchronization problem with semaphores. Give your solution by modifying the runner pseudocodes given below. Remember to define your semaphores, with their initial values.

```
Ann                     Bill                    Charlie
for (i=1 to 10)         for (i=1 to 10)         for (i=1 to 10)
    <run lap>               <run lap>               <run lap>
    <synchronize>           <synchronize>           <synchronize>
```