

Name	Signature	Student Id Nr	Points

## Operating Systems, Mini-exam 1, 5.2.2020 (12 p)

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

a) [1 p] Explain, how ULT (user level thread) S of multithreaded process P can be in state Running, even though it is not in execution at that moment.

b) [3 p] System has four cores and it supports multithreaded processes. Process P has 17 threads. One thread (S) does all I/O, and the other threads do all computational work. We want to have the computational threads do their work at the same time as thread S saves results to disk or waits for user input.

Would it be better to implement the 17 threads in P as ULT (user level threads) or as KLT (kernel level threads)? Explain why your solution is correct and why the other solution is incorrect.

c) [4 p] Give a pseudocode example on a critical section problem where critical section is composed of two separate code segments.

Give a scenario, which has correct result. Give a scenario, which has erroneous result.

Explain how this critical section problem is solved with a monitor.

- d) [4 p] We have 80-character buffer B. Process P writes to B every now and then. If B is full, P waits until there is room in B. Process Q reads from B every now and then. If B is empty, Q waits until there are characters to read from B. Give the pseudocode level semaphore-based solution to the synchronization problem between P and Q. Remember to initialize all your semaphores.