

Name	Signature	Student Id Nr	Points

581305-6 Computer Organization I, mini exam 4, 13.12.2018 (12 p)

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

Assume that device driver process DD has asked for disk I/O, and starts waiting for an answer from the device controller. Next process waiting in Ready queue for its turn to execute is process P.

- a) [2 p] How is moving DD to waiting state done at register level?
What data is copied, from where, and where to? Who is doing the copying?
- b) [1 p] Is moving DD to waiting state done privileged or in user CPU execution state? Explain.
- c) [2 p] When and after which events will DD get to execute again? How is DD brought back to execution?

Assume that disk spinning speed is 7200 rpm (8.33 ms/rotation), it has 4 disk surfaces, it has one read/write head per surface, it has 2000 cylinders per surface, each track has 50 sectors, and each sector is 0.5 KB. We assume (unrealistically) that the read/write head transfer time is linear to the number of tracks travelled, and that it is 0.02 ms/track. We assume (unrealistically) that each disk block location on the disk is random, which gives with simple probability math the number of average tracks to be travelled as 667. Each disk block has two (2) adjacent sectors.

- d) [1 p] How long, in average, does it take to read a 2 KB file FileA? (arithmetic expression is enough)
- e) [1 p] Assume now, that the device drivers is smarter and has placed both disk blocks for FileA in the same track. How long, in average, does it take now to read a 2 KB file FileA?
- f) [1 p] Assume now, that each disk block has four (4) adjacent sectors. How long, in average, does it take now to read a 2 KB file FileA?

Direct I/O, interrupt driven I/O and DMA I/O

g) [1 p] In what circumstances is direct I/O faster than interrupt driven I/O, and why?

h) [1 p] In what circumstances would it be better to use interrupt driven I/O than direct I/O, and why?

i) [2 p] How does DMA I/O differ from the other I/O types, when considering memory bus usage?
What is good with that? What is bad with that?