T-106.4155 Operating systems

The exam contains five questions. The maximum points for each question are listed in the beginning of the questions. Read the questions carefully. Give clear and compact answers. Remember to write the name of the course and your own personal information on each of your answer papers. No extra appliances are allowed in the exam.

1 (10p) Give short definitions for the following. (One point per question.)

a) What is an OS architecture?
b) What is an asynchronous call?
c) What is a critical section?
d) What is a scheduler?
e) What is a deadlock?
f) What is LRU?
g) What is internal fragmentation?
h) What is middleware?
i) What is priority inversion?
j) What is an asynchronous call?

Note that long explanations (several sentences) are *not allowed.*

2 (6p) Consider a main memory of four pages, which is used to implement a paged virtual memory. The main memory is initially empty, and the pages of the virtual memory are referred to in the following order: 0, 1, 2, 3, 0, 1, 4, 0, 1, and 2. How many page faults will occur, when LRU replacement is used? How many page faults will occur, when FIFO replacement is used? What is the optimal sequence of replacements? Explain and justify your results shortly.

3 (6p) Considering the producer-consumer problem, give a solution that implements mutual exclusion by using a *monitor.* Present your solution as a piece of pseudo code and give a short explanation.

4 (4p) How is the address translation from virtual addresses to physical addresses done in a modern operating system? What kind of hardware is available to support such translations in modern systems?

5 (6p) Considering device drivers, write an essay no longer than 45 lines.