

## 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) Answer *shortly*. (One point per question.)
  - a) What is trashing while using memory?
  - b) What is synchronous call?
  - c) What is a monitor in an operating system?
  - d) What is a disk partition?
  - e) What is polling?
  - f) What is spooling?
  - g) What is internal fragmentation?
  - h) What is priority-inversion?
  - i) What is TLB?
  - j) What is middleware?
- 2 (6p) Considering the dining philosophers problem (assume five philosophers), give a solution that implements mutual exclusion by using *semaphores*. Present your solution as a piece of pseudo code and give a short explanation.
- 3 (4p) Typically `open` and `close` calls are used when handling files. Why such operations are needed? How they are related to `read` and `write` calls?
- 4 (4p) What conditions must hold in a system in order for a *race condition* to occur (i.e., define in detail what the concept means)?
- 5 (6p) Write an essay that is not longer than 45 lines discussing memory management in shared memory systems. Consider operating systems with multicore support.