

## CS-C3140 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* with clear definitions and descriptions. (Max. two points per subquestion.)
  - a) What is a trap?
  - b) What is polling?
  - c) What is spooling?
  - d) What are livelocks and deadlocks?
  - e) What is an OS kernel?
- 2 (6p) Considering the *producers-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. List also the assumptions that you make about the monitor semantics.
- 3 (6p) Explain in detail how interrupts are processed. Include both hardware and software structures and their operation in your explanation.
- 4 (6p) Consider a single processor real-time system with three tasks, whose periods are 18ms, 11ms, and 13ms. The required processor times for the tasks are 7.8ms, 2.7ms, and 0.2ms, respectively. Can the system be schedulable if static priorities are used? Explain and justify why or why not. (Hint: the cube root of  $2 > 34/27$ .)
- 5 (6p) Write an essay that is not longer than 50 lines on modern virtual machines.