Seminar 4 – Scheduling analysis

1. Scheduling

   Consider a system with the following threads:

	T	**C**
A:	4	1
B:	5	2
C:	8	1

where T denotes the desired period and C is the worst-case execution time (WCET). Apply Rate Monotonic Scheduling (RMS) to obtain the priority for each thread.

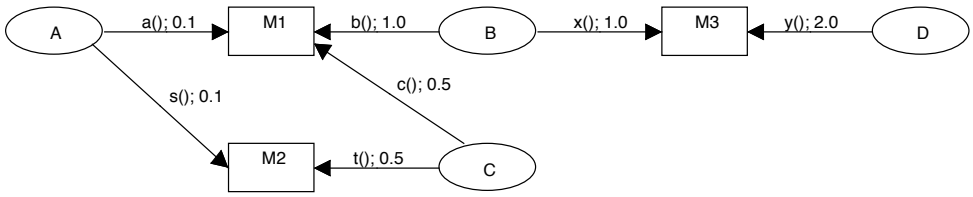
a) Is the system schedulable, i.e., will the computer meet its deadlines? (The deadline for each thread is equal to T.) What will the worst case response time be for each thread?

b) The system is extended with an additional thread:
   D: 20 2
   Will the system still be schedulable? What about the response times?

c) The D thread is exchanged by a thread E with the following execution time properties:
   E: 12 1.2
   Analyze the schedulability also in this case.

2. Scheduling with blocking

Consider a system with threads A, B, C, and D according to exercise 1b. These threads communicate via three monitors; M1, M2, M3. The used monitor operations and their worst-case execution time are depicted in the following figure:



Our real-time kernel (or JVM) provides dynamic priority inheritance.

a) Compute the maximum response time including the blocking that may occur. Is there any thread that can have difficulties to ensure that its deadline is met? What about robustness in the case that some given execution time should be a little longer than specified?

b) The thread D was rewritten to do half the work each sample and to be run twice as often; the timing requirements were changed from 20, 2 to 10, 1. Furthermore, the monitor operation y was split up into four smaller parts y1(), y2(), y3() and y4(), each with execution time 0.5. What does this imply for the scheduling of the system?

c) Due to the special demands from the control carried out by thread A, that thread needs to fulfill a shorter deadline of 2 (instead of 4, which still is the period) time units. Propose a restructuring of the system so that the deadlines are met, without changing the monitor operations.