Real-Time Systems

Exercise #5

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Scheduling

"With cyclic executives the schedule is generated off-line, and stored in a time table. The schedule can be generated by simulating a run-time system with pseudo-parallel execution."

"With pseudo-parallel execution the schedule is generated on-line, as a side-effect of tasks being executed. Ready tasks are sorted in a queue and receive access to the processor based on priority."

Example 1: Cyclic executive

Problem: Consider a real-time system with two periodic tasks that should be scheduled using a time table. The parameters for the two tasks are given below. Both tasks arrive the first time at time 0.

a) Construct a time table for the execution of the two tasks. The tasks are allowed to preempt each other.

	C_i	D_i	T_i
τ_1	2	5	5
τ_2	4	7	7

Example 1: Cyclic executive

Problem: Consider a real-time system with two periodic tasks that should be scheduled using a time table. The parameters for the two tasks are given below. Both tasks arrive the first time at time 0.

a) Construct a time table for the execution of the two tasks. The tasks are allowed to preempt each other.

b) Does your schedule constitute the best possible schedule, or does there exist a superior one?

	C_i	D_i	T_i
τ_1	2	5	5
τ_2	4	7	7

Example 2: Pseudo-parallel execution

Problem: Consider a real-time system with three periodic tasks. The parameters for the three tasks are given below. All tasks arrive the first time at time 0.

a) Can you guarantee the schedulability of the task set using the RM scheduling algorithm?

Task	C_i	D_i	T_i
τ_1	1	7	7
τ_2	1	14	14
τ_3	4	18	18

Example 2: Pseudo-parallel execution

Problem: Consider a real-time system with three periodic tasks. The parameters for the three tasks are given below. All tasks arrive the first time at time 0.

a) Can you guarantee the schedulability of the task set using the RM scheduling algorithm?

b) Add a task τ_4 with $D_4 = T_4 = 100$ and $C_4 = x$ to the task set. What is the maximum value of x such that the new task set is schedulable for RM scheduling based on Liu and Layland's utilization test?

Task	C_i	D_i	T_i
τ_1	1	7	7
τ_2	1	14	14
τ_3	4	18	18