Real-Time Systems

Exercise #7

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Multiprocessor scheduling

Partitioned scheduling: "If all tasks are assigned using the Rate-Monotonic-First-Fit (RMFF) algorithm, then all tasks are schedulable if the total task utilization does not exceed 41% of the total processor capacity."

Global scheduling: "If tasks with the highest utilization are given highest priority and the remaining tasks are given RM priorities according to RM-US, then all tasks are schedulable if the total task utilization does not exceed 33.3% of the total processor capacity."

Example 1: RMFF scheduling

Problem:

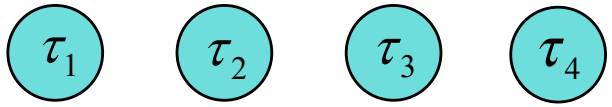
There are two approaches for scheduling tasks on multiprocessor platform: the *partitioned* approach and the *global* approach. The table below shows C_i (WCET) and T_i (period) for six periodic tasks to be scheduled on $m = 3$ processors. The relative deadline of each periodic task is equal to its period.

	C_i	T_i
τ_1	2	10
τ_2	10	25
τ_3	12	30
τ_4	5	10
τ_5	8	20
τ_6	7	100

The task set is schedulable using rate-monotonic first-fit (RMFF) partitioned scheduling algorithm. Show how the task set is partitioned on $m = 3$ processors so that all the deadlines are met using RMFF scheduling?

Example 2: RM-US scheduling

Problem: Consider the task set below for a system using global scheduling on m=3 processors. Show that the task set is schedulable on the processors assuming that task priorities are given according to RM-US[m/(3m-2)].



Task	C_i	T_i
τ_1	1	7
τ_2	4	19
τ_3	9	20
τ_4	11	22