

CSC 112: Computer Operating Systems

Lecture 6

Real-Time Scheduling Exercises

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Q1. Schedulability under RM or EDF

- Determine schedulability of the following tasksets under (1) Rate Monotonic (RM) scheduling, using Utilization Bound test and/or Response Time Analysis (RTA) to determine taskset schedulability. (2) Earliest Deadline First (EDF) scheduling, using Utilization Bound test. We use the notation $\tau_i (C_i, T_i, D_i)$ to denote task τ_i with WCET C_i Period T_i , Deadline D_i (c.f. Slide 33 in Lecture 6)
- 1) Taskset $\tau_1 (3, 6, 6), \tau_2 (4, 9, 9)$
- 2) Taskset $\tau_1 (3, 6, 6), \tau_2 (3, 9, 9)$
- 3) Taskset $\tau_1 (3, 6, 6), \tau_2 (2, 9, 9)$
- 4) Taskset $\tau_1 (2, 4, 4), \tau_2 (4, 8, 8)$
- 5) Taskset $\tau_1 (2, 5, 5), \tau_2 (4, 7, 7)$
- 6) Taskset $\tau_1 (1, 2, 2), \tau_2 (2.5, 5, 5)$

# Tasks	RM Util Bound
1	1.00
2	0.828
3	0.780

Q2. Schedulability under RM, DM, or EDF

- Determine schedulability of the following tasksets under (1) Rate Monotonic (RM) scheduling, using Utilization Bound test and/or Response Time Analysis (RTA) to determine taskset schedulability. (2) Deadline Monotonic (DM) scheduling (3) Earliest Deadline First (EDF) scheduling, using Utilization Bound test.
- 1) Taskset $\tau_1 = (0.5, 3, 3)$, $\tau_2 = (1, 4, 4)$, $\tau_3 = (2, 6, 6)$
- 2) Taskset $\tau_1 = (0.5, 3, 3)$, $\tau_2 = (1, 4, 2)$, $\tau_3 = (2, 6, 6)$
- 3) Taskset $\tau_1 = (1, 3, 3)$, $\tau_2 = (1, 4, 2)$, $\tau_3 = (2, 6, 6)$

Q3 RM, EDF, LLF

- Consider the set of 2 periodic tasks whose period, deadline and WCET parameters are given.
- 1. For each scheduling algorithm (RM, EDF, LLF), draw the Gantt chart by filling in the table with the task ID that runs in each time slot until time 10, and calculate the WCRT for each task.
- 2. Under RM scheduling, use utilization bound and Response Time Analysis (RTA) to determine taskset schedulability.

Task ID	T=D	C	RM Resp. Time	EDF Resp. Time	LLF Resp. Time
1	8	3			
2	10	4			

RM										
EDF										
LLF										

Time 0 1 2 3 4 5 6 7 8 9 10
Gantt Chart

Time	τ_1 Laxity	τ_2 Laxity	Running Task
t=0			
t=1			
t=2			
t=3			
t=4			
t=5			
t=6			
t=7			
t=8			
T=9			