Real-Time and Embedded Systems
Written Test #2, NYCU CS, June 2022

All the tasks in the following questions are priority-based, periodic, and preemptive ones. Tasks are numbered by their priorities, e.g., T1 has a higher priority than T2. All tasks are ready at time 0 unless specified otherwise.

1. [5 pts] Of the same server size, a deferrable server often delivers shorter response times of aperiodic jobs than a simple (non-split) sporadic server. Explain why.
2. [15 pts] Let the process scheduler be RM. Test the schedulability of the following tasks: {T1=(1,4), T2=(1,6), T3=(2,10)} using the response time analysis for the following cases:
    a. T2 is a simple sporadic server (non-splitting)
    b. T2 is a deferrable server
3. [20 pts] Consider that the tasks {T1=(1,5), T2=(2,8), T3=(2,12)} are scheduled by RM. Let there be two aperiodic tasks A1 and A2, arriving at time 2 and 4 and their computation demands are 2 and 1 units of time, respectively. Draw the task execution schedule (a Gantt chart) **plus** the server budget for the following cases:
    a. T2 is simple sporadic server (non-splitting)
    b. T2 is a deferrable server
4. [20 pts] Consider that a set of tasks {T1=(1,4), T2, T3=(2,10)} are scheduled by EDF. Let T2 be a constant utilization server of a size 25%. Consider that two sporadic tasks B1 and B2 arrive at time 50 and 100 and their computation demands are 2 and 4 units of time, respectively. Let the deadlines of B1 and B2 be 9 and 20 units of time after their arrivals. *__Notice__* Answer the following questions by *calculation only*, no Gantt charts are accepted.
    a. Is the task set {T1, T2, T3} schedulable?
    b. Can B1 and B2 meet their deadlines?
5. [20 pts] Draw the execution schedule of Global EDF for tasks {T1=(2,4), T2=(3,6), T3=(2,12)} on two processors. **Try minimizing the preemption count on tie breaking.
6. [20 pts] Draw the execution schedule of Partitioned EDF for tasks {T1=(1,2), T2=(2,4), T3=(2,10)} on two processors
    a. with the First Fit partitioning policy
    b. with the Best Fit partitioning policy

The following are bonus questions (extra marks):

7. [5 pts] Show an example in which Global EDF schedules a set of tasks but Partitioned EDF with FF fails.
8. [5 pts] Show an example in which Partitioned EDF with FF schedules a set of tasks but Global EDF fails.

Test time: 10:10 am~12 NN
Upload file of your answer sheet (PDF/JPG/JPEG) before 12:20pm
This is an open-book test, but discussion is not allowed.