

Real Time and Embedded Systems: Problem Set 3

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The third set of lectures has described priority-driven scheduling algorithms and schedulability proofs for aperiodic and sporadic tasks. This problem set aims to test your understanding of these algorithms. You should answer all questions.

Question 1: Briefly explain the difference in budget consumption and replenishment rules between a polling server and a deferrable server. Outline what difference this makes to the performance of aperiodic jobs [2 marks].

Question 2: A system contains three independent preemptable periodic tasks $T_1 = (4, 1)$, $T_2 = (6, 2)$, $T_3 = (12, 1)$ scheduled using the rate monotonic algorithm. It also contains a deferrable server $T_s = (8, 2)$ which is used to run aperiodic jobs. There are two aperiodic jobs: A_1 arrives at time 3 and has execution time 1, A_2 arrives at time 12 and has execution time 2. What is the priority of the deferrable server? What are the response times of the aperiodic jobs? How is the schedule of the periodic jobs affected by the aperiodic jobs? [4 marks]

Question 3: A system contains three independent preemptable periodic tasks $T_1 = (10, 2)$, $T_2 = (14, 3)$, and $T_3 = (21, 4)$ scheduled using the Earliest Deadline First algorithm. It also contains a server task $T_s = (8, 1)$ that is used to schedule aperiodic jobs. Is the system schedulable if T_s is a deferrable server? If T_s is a simple sporadic server? Explain your answers. [6 marks]

Question 4: A simple sporadic server can be defined for EDF systems, as well as for rate monotonic systems. Explain the difference between the consumption and replenishment rules for a simple sporadic server in a deadline driven system, compared to a rate monotonic system. [3 marks]

This problem set is worth 5% of the mark for this module. Your answers must be submitted by 2:00pm on 4th February 2008 via the locked box outside the Teaching Office. You must include your pink declaration of authorship form with your submission. Any late submission will be awarded zero marks unless accompanied by a valid special circumstances form.