Real Time and Embedded Systems: Problem Set 2

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The second group of lectures has described clock-driven and priority-driven scheduling in some detail, describing algorithms and schedulability proofs. This problem set aims to test your understanding of these algorithms, and your ability to reason about the schedulability of systems. You should answer all questions.

Question 1: Consider a system of four periodic tasks T_1 = (8, 1), T_2 = (15, 3), T_3 = (20, 4), and T_4 = (22, 6) that are to be scheduled and executed according to a structured cyclic schedule with fixed frame size. What is an appropriate frame size? [4 marks]

Question 2: Consider the following systems of independent preemptable periodic tasks. Are these systems schedulable using the Rate Monotonic algorithm? Explain your answers. [6 marks]

- T_1 = (10, 2), T_2 = (15, 5), and T_3 = (30, 9)
- T_1 = (10, 2), T_2 = (12, 5), and T_3 = (15, 4)

Question 3: Are the two systems from question 2 schedulable using the Earliest Deadline First algorithm? Explain your answer. [2 marks]

Question 4: A system contains five independent preemptable periodic tasks with utilization of $u_1 = 0.60$, $u_2 = 0.10$, $u_3 = u_4 = u_5 = 0.02$. Can these tasks be scheduled using a rate monotonic algorithm? Explain your answer. [3 marks]

This problem set is worth 5% of the mark for this module. Your answers must be submitted by 2:00pm on 28th January 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.