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 two systems of independent preemptable periodic tasks. Are these systems schedulable using the Rate Monotonic algorithm? Explain your answers. [7 marks]

- $T_1 = (5, 1)$, $T_2 = (3, 1)$, and $T_3 = (15, 3)$
- $T_1 = (5, 2)$, $T_2 = (4, 1)$, $T_3 = (10, 1)$, and $T_4 = (20, 3)$.

Question 3: The periodic tasks $T_1 = (3, 1)$, $T_2 = (4, 2)$, and $T_3 = (6, 1)$ are scheduled according to the rate monotonic algorithm. Draw the time-demand functions of the tasks. Are the tasks schedulable? Justify your answer. [4 marks]

This problem set is worth 5% of the mark for this module, and is expected to take an hour or two to complete. You must submit your completed exercise by 1:00pm on 1 February 2010 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.

Marks will be returned in (or before) tutorial 3, along with some limited individual written feedback. Tutorial 3 will also include a review of the solutions to this exercise, along with time for a question and answer session on this material.