Real Time and Embedded Systems: Problem Set 1

Dr Colin Perkins

14 January 2010

The first week of the module has outlined the concepts behind real time and embedded systems, introduced some terminology, and provided an overview of some real time scheduling techniques. This problem set seeks to test your understanding of that material, and your ability to draw new conclusions based on material provided. You should answer all questions.

Question 1: Briefly describe what is a real time system, and outline the difference between hard and soft real time systems. With the aid of an example, discuss whether the distinction between hard and soft real time systems is always clear cut. [5 marks]

Question 2: A system comprises three periodic tasks: $T_1 : p_1 = 5, e_1 = 1, T_2 : p_2 = 10, e_2 = 3$, and $T_3 : p_3 = 3, e_3 = 1$. Calculate the hyperperiod and total utilization for this system, explaining how you arrive at your answers. [4 marks]

Question 3: We considered several priority-driven scheduling algorithms. It was noted that these algorithms make *locally optimal* decisions about which job to run, but the resulting schedules are often not globally optimal. Explain the difference between locally and globally optimal, and discuss why priority-driven scheduling algorithms typically do not produce globally optimal schedules. [4 marks]

Question 4: It was noted that priority-driven scheduling is difficult to validate, since *scheduling anomalies* can occur. Explain what is a scheduling anomaly, and outline a situation when one might occur. [2 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 25 January 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 2, along with some limited individual written feedback. Tutorial 2 will also include a review of the solutions to this exercise, along with time for a question and answer session on this material.