Real-Time and Embedded Systems: Problem Set 3

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The third set of lectures has described some 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: Consider a system of three periodic tasks T_1 = (3, 1), T_2 = (4, 0.5) and T_3 = (10, 2). Demonstrate that this system can be scheduled using a) the rate monotonic algorithm; and b) the EDF algorithm. [3 marks]

Question 2: The system from question 1 must also support the execution of three aperiodic jobs: A_1 which is released at time 0.5, A_2 which is released at time 12.25, and A_3 which is released at time 17. Each of the aperiodic jobs executes for 0.75 units of time. The system is scheduled using the rate monotonic algorithm, with a server task, T_s = (5, 0.5) to schedule these aperiodic jobs. Show the resulting schedules for sufficient time to illustrate how the aperiodic tasks are scheduled and to demonstrate correctness (or otherwise) of the schedule, and calculate the response times for each of the aperiodic tasks, if the server is scheduled as a) a polling server; b) a deferrable server; and c) a simple sporadic server. You should explain the process you used to derive each schedule, showing how the server budget changes over time. [9 marks]

This problem set is worth 5% of the mark for this module. Answers must be submitted by 5pm on 6th February 2006. A drop box will be available for submissions in Lilybank Gardens and submissions will only be accepted via that drop box. Any late submission will be awarded zero marks unless accompanied by a valid special circumstances form. Ensure your matriculation number is included on each submission, and attach a pink statement of originality form.