Advanced Operating Systems (M): Exercise 2

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The lectures in the third week of the course have introduced priority-driven scheduling for aperiodic and sporadic tasks. This problem set seeks to test your understanding of that material. You should answer all questions.

Question 1: A system comprises a set of independent periodic tasks, scheduled in a preemptive manner on a single processor, and one aperiodic task. The aperiodic task could be scheduled using a background server, or it could be scheduled using some form of bandwidth-preserving server, for example a deferrable server. Discuss what are the advantages and disadvantages of the bandwidth-preserving server [2 marks].

Question 2: A system of three independent preemptable periodic tasks, $T_1 = (10, 2)$, $T_2 = (5, 0.5)$, and $T_3 = (6, 1)$ are scheduled using the earliest deadline first algorithm on a single processor. A deferrable server with period $p_s = 7.5$ and budget $e_s = 2$ is also present, to handle execution of aperiodic tasks. Is this system guaranteed to be schedulable? Explain your working. [4 marks]

Question 3: A system of independent preemptable periodic tasks is scheduled in priority-driven manner on a single processor using the rate monotonic algorithm. In addition to the periodic tasks, sporadic jobs may arrive at any time, and are executed in earliest deadline order within a sporadic server task. In your own words, and without using mathematics, outline how the acceptance test for the sporadic jobs works [6 marks].

Question 4: The fixed priority sporadic server has a very complex set of budget consumption and replenishment rules. Discuss whether you believe the benefits of this server outweigh its complexity [3 marks].

Answers must be submitted by 9:00am on 7 February 2011. A drop box will be available for submissions in outside the Teaching Office in Lilybank Gardens, and submissions will only be accepted via that drop box. This problem set is worth 5% of the mark for this course. Ensure that your name and matriculation number are included on each submission, and that you have completed a statement of originality form.