

Real Time and Embedded Systems: Problem Set 1

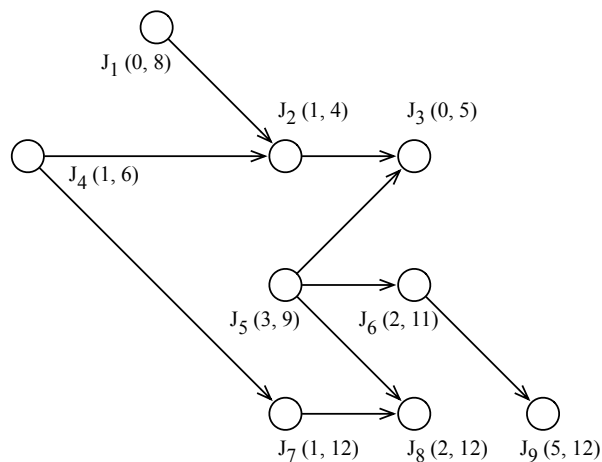
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11th January 2007

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: In not more than 100 of your own words, describe what is a real time system and explain the difference between hard real time and soft real time systems. Give an example of a real time system, and explain why that system is considered hard real time or soft real time. [4 marks]

Question 2: The task diagram below shows a set of jobs with the feasible interval for each listed next to the job name. The arrows in the diagram indicate the precedence relations between the jobs. Calculate the effective release times and deadlines of the jobs, and demonstrate whether they can be scheduled using the EDF algorithm. Each job executes for 1 time unit. The system has only a single processor. [4 marks]



Question 3: Can the set of jobs from Question 2 be scheduled using the least slack time algorithm? Justify your answer. [2 marks]

Question 4: The lecture and book outline a proof that earliest deadline first (EDF) scheduling is optimal on a single processor, as long as pre-emption is allowed and jobs do not contend for resources (section 4.6 of Liu's book). Using a similar method, prove that least slack time (LST) scheduling is optimal, and explain the constraints under which it is optimal. [5 marks]

This problem set is worth 5% of the mark for this module. Answers must be submitted by 9:00am on 22nd January 2007 via the locked box outside the Teaching Office. Submission must be in an unsealed A4 envelope with your name, name of the course, and assessment number clearly written on the front. You must include your pink declaration of authorship form in the envelope. Please note that failure to provide an envelope may result in other students seeing your mark. Any late submission will be awarded zero marks unless accompanied by a valid special circumstances form.