Real Time and Embedded Systems: Problem Set 1

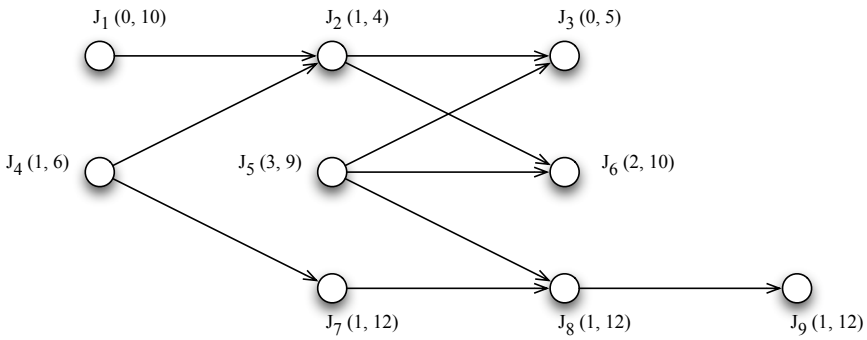
Dr. Colin Perkins

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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, explain what is a real-time system and explain the difference between hard real-time and soft real-time systems. [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. [5 marks]



Question 3: 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. [6 marks]

This problem set is worth 5% of the mark for this module. Answers must be submitted by 5pm on 20th January 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 name and matriculation number are included on each submission, and attach a pink statement of originality form.