

EE249 Design of Embedded Systems

Fall 2007, Homework 3

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Due in class, Dec. 4, Tuesday (firm deadline)

Thanks Marco Di Natale for proposing all the questions in this homework.

1. (30 points) List the possible causes of priority inversion in a Controller Area Network bus.
2. (30 points) For the following task set, compute the response times of all the tasks (computation time C_i , period T_i and priorities p_i are given, lower priority index means higher priority).

Task	C_i	T_i	p_i	D_i
t1	12	40	1	40
t2	6	45	2	45
t3	12	45	3	45
t4	21	100	4	100

3. (40 points) Define an algorithm that computes, if the set is schedulable, what is the maximum amount of computation time that can be added to each task without violating the deadlines. If the set is not schedulable, the algorithm must return, for each task, the minimum reduction of computation time (if possible) that would bring the system back to a feasible schedule. (Pseudo code is fine as long as it is clearly described. Actual implementation will get 20 bonus points!)

Bonus question for extra points:

4. (30 points) For the previous example in Question 2, given the deadlines D_i , compute the changes in the C_i that bring the system at the boundary of the feasibility region, as defined for the previous question.
5. (50 points) Develop a program, in a language of your choice, that implements a priority queue with constant time insertions and extractions.