Assignment 4 — ECEN 449/749 (Fall 2017)
Due: Nov 29, 2017

Overview

In this assignment, you need to write several C programs to emulate real-time scheduling policies for systems with periodic tasks. For each programming problem, your program should read input from the file "input.txt." The input file contains multiple lines, each line has two integer numbers. The first number is the period of the task, and the second number is the execution time. For example, the sample input below describes a system with two tasks. Task 1 has period 2 and execution time 1, and task 2 has period 3 and execution time 1. Assume that all tasks release their first jobs when the system starts, and all tasks are preemptable.

Sample Input

2 1
3 1

Your program needs to emulate the system for one hyperperiod and check whether all deadlines are met. If some deadlines are missed, your program only outputs a single line: "Fail", like the following:

Sample Output 1

Fail

If all deadlines are met, your program first outputs a line: "Succeed". In the next line, your program outputs the duration of a hyperperiod, denoted by H. In the third line, your program outputs H integers to describe the scheduling decision in each of the H time units. If the i-th integer is k, then that means your program schedules a job for task k at time i. If the i-th integer is 0, then that means your program idles at time i.

For example, if your program emulates EDF, then the output for the sample input above would be

Sample Output 2

Succeed
6
1 2 1 2 1 0

1. (25pt)

Write a C program to emulate EDF.

2. (25pt)

Write a C program to emulate RM.

3. (25pt)

Construct an example where the total utilization of the system is larger than $U_{RM}(n)$, but RM produces a feasible schedule. Explain your answer. Your system needs to contain at least four tasks, that is, $n \geq 4$.

4. (25pt)

A system contains four periodic tasks: (8,1), (15,3), (20,4), and (22,6). Construct the EDF schedule and the RM schedule in the time interval $[0, 50]$. Compare your answer to the outputs of your C programs.

5. (749 only, 25pt)

Write a C program to emulate LST.