University of Glasgow | School of Computing Science

Assessed Coursework

Course Name	Advanced Operating Systems (M)			
Coursework Number	Exercise 2			
Deadline	**Time:**	16:30	**Date:**	10 March 2017
% Contribution to final course mark	5%		**This should take this many hours:**	3
Solo or Group ✓	**Solo**	✓	**Group**	
Submission Instructions	**Submit via the dropbox outside the Teaching Office in Lilybank Gardens**			

Who Will Mark This? ✓	Lecturer ✓	Tutor	Other
Feedback Type? ✓	Written ✓	Oral	Both
Individual or Generic? ✓	Generic	Individual ✓	Both
Other Feedback Notes			
Discussion in Class? ✓	Yes	No ✓	

Please Note: This Coursework cannot be Re-Done

Code of Assessment Rules for Coursework Submission

Deadlines for the submission of coursework which is to be formally assessed will be published in course documentation, and work which is submitted later than the deadline will be subject to penalty as set out below. The primary grade and secondary band awarded for coursework which is submitted after the published deadline will be calculated as follows:

(i)   in respect of work submitted not more than five working days after the deadline
   a.   the work will be assessed in the usual way;
   b.   the primary grade and secondary band so determined will then be reduced by two secondary bands for each working day (or part of a working day) the work was submitted late.
(ii)   work submitted more than five working days after the deadline will be awarded Grade H.

Penalties for late submission of coursework will not be imposed if good cause is established for the late submission. You should submit documents supporting good cause via MyCampus.

Penalty for non-adherence to Submission Instructions is 2 bands

You must complete an "Own Work" form via
http://www.dcs.gla.ac.uk/socs-online for all coursework
UNLESS submitted via Moodle

Advanced Operating Systems (M): Exercise 2

Dr Colin Perkins

3 March 2017

The lectures have introduced real-time systems, including priority-driven scheduling of periodic tasks, along with scheduling and acceptance tests for aperiodic and sporadic tasks. This problem set will test understanding of that material, and give practice in determining if it is possible to schedule real-time systems. You should answer all questions.

Question 1: Consider the following two systems of independent periodic tasks, with period p and execution time e as specified, scheduled in a pre-emptive manner on a single processor. Is it possible to schedule these systems using either the rate monotonic algorithm or the earliest deadline first algorithm (assume the phase for each task is equal to zero, and relative deadline equals the period)? Explain your answers. [10 marks]

- $T_1 = (p = 7, e = 1)$, $T_2 = (p = 8, e = 2)$, and $T_3 = (p = 24, e = 3)$

- $T_1 = (p = 5, e = 2)$, $T_2 = (p = 4, e = 1)$, $T_3 = (p = 10, e = 1)$, and $T_4 = (p = 20, e = 3)$.

Question 2: The periodic tasks $T_1 = (p = 3, e = 1)$, $T_2 = (p = 4, e = 2)$, and $T_3 = (p = 6, e = 1)$ are scheduled in a pre-emptive manner according to the rate monotonic algorithm on a single processor. Each has period p and execution time e as specified, phase equal to zero, and relative deadline equal to its period. Draw a graph of the time-demand function for each of the three tasks [2 marks for each task]. Can these tasks be scheduled? Justify your answer. [2 marks]

Question 3: Consider a system comprising three independent periodic tasks $T_1 = (p=4, e=1)$, $T_2 = (p=5, e=1)$ and $T_3 = (p=10, e=2)$ with period and execution time as specified, phase equal to zero, and relative deadline equal to the period. Demonstrate that this system can be scheduled in a preemptive manner on a single processor using a) the rate monotonic algorithm; and b) the earliest deadline first (EDF) algorithm. [5 marks]

Question 4: How can sporadic jobs be scheduled in a fixed priority system including a number of periodic tasks? Your answer should explain how the sporadic jobs are scheduled, outline how the acceptance test for newly released sporadic jobs works, and explain how you can prove that the periodic tasks meet their deadlines. [7 marks]

You must submit your answers before 4:30pm on 10 March 2017. A mark out of 30 will be assigned to each submission, weighted as noted, and will be converted to a percentage and used to assign a band on the University's 22 point scale. Following the code of assessment, late submissions will be accepted for up to 5 working days beyond this due date. Late submissions will receive a two band penalty for each working day, or part thereof, the submission is late. Submissions that are received more than five working days after the due date will be awarded a band of H.

A drop box will be available for submissions outside the Teaching Office in Lilybank Gardens. Submissions are only accepted via that drop box. This problem set is worth 5% of the mark for this course. Make sure you include your matriculation number in your answers, and submit a statement of originality. Submissions that do not follow these submission instructions will be given a two band penalty.