

Birla Institute of Technology and Science, Pilani, Rajasthan

BITS G553 Real Time Systems

First Semester 2015-16

Mid Semester Test (Regular)-Closed Book

Max. Marks 50

5-10-2015

Max. Duration- 90 Min

Note: 1) Answer all parts of a question in one place consecutively.

2) Show all the necessary steps clearly.

1. a) What are the different types of parameters that describe a Task? What information does each of these types of parameters give?  
b) What is the need of reference model in a Real-Time Systems and what advantages does it offer?  
c) How is scheduling in Real-Time Systems or Real-Time Operating Systems different from that in a traditional/general purpose Operating Systems?  
d) How do we check the schedulability of a given task set if schedulability utilization method and Time demand analysis method?  
e) What is priority inversion? While calculating the blocking time due to priority

$$b_i(np) = \max_{i+1 \leq k \leq n} \theta_k$$

inversion, we use

Why do we take the duration of maximum non-preemptible portion of only **one task** to account for maximum blocking time?

f) What is meant by in-phase busy interval? What is its importance while designing a real-time system?

[3+1+1.5+1+2+1.5=10]

2. Periodic tasks T1(2,0.5,6) T2(4,1) T3(6,1) and T4(8,2) are to be scheduled using clock driven cyclic scheduling. Determine whether this task set is schedulable?  
b) Now if there are Aperiodic jobs A1 (6, 2) and A2 (10, 2). What will be their response times using cyclic executive?  
c) What will be their response times if stack stealing is used? Show the schedule using stack stealing.  
d) Now if we have sporadic jobs S1 (0, 1, 10] and S2 (8, 2, 20]. Determine whether these jobs are acceptable?

[5+2+4+3=14]

3. Tasks T1 (8,1) T2(15,3) T3(4,2) is to be scheduled using RMA. The task T3 after executing for 0.5 units of time, it accesses an input output (I/O) device twice during its entire execution. The duration of I/O access for each of its job is 2 units of time. Also the overhead due to each context switching is 0.2 time units. Further the jobs of tasks T1 and T2 have a non-preemptible portion of 0.3 and 0.8 time units respectively. Without performing the simulation, Determine whether this task set is schedulable. [11]

b) For the task sets mentioned in the question 3 we add a deferrable server Ts(11,1). Now determine whether the given task set is schedulable. [6]

4. Consider the precedence graph given below. The execution times and feasible intervals of the jobs are given as below. J1 (1,(0,10]) J2(2,(3,15]) J3(1,(5,10]) J4(1,(3,11]) J5 (1.5,(2,12]) J7(2,(3,15])
- What will be their effective release times and effective deadline?
  - Try to schedule using non-strict LST and determine whether the jobs are schedulable.

[9]

