**Name: Student ID:**

1. [10 points] Consider the following task set scheduled according to the rate monotonic assignment and answer the questions accordingly.

T1=(1, 0.5), T2= (1.5, 0.4)

(a) Is the schedule feasible?

U = 0.5/1 + 0.4/1.5 = 0.767 < URM(2) = 0.828

Therefore, based on Liu and Layland utilization bound, the task set is feasible.

(b) Do these tasks fully utilize the processor (based on RM scheduling)? Show your answer.

As the task set utilization is less than Liu and Layland bound, therefore it is also less than Liu and Lehoczky bound, which means the processor is not fully utilized.

(c) (if the answer to (b) is “no”,) Change the run time of the first task so that the resulting set will maximize the utilization of the processor under RM scheduling.

Assumption: Liu and Lehoczky (Completion) test is performed to test maximum schedulability

Defining e1 as the runtime for Task 1:

Therefore

Using will achieve highest utilization that will also pass the completion test.

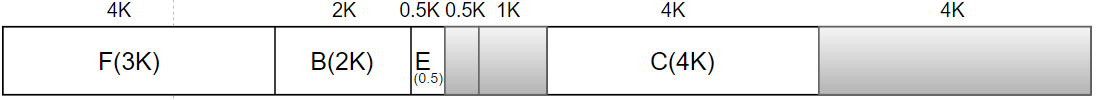
(note: higher runtime can also be achieved by drawing the schedule, but the completion test is standard and enough to use in this problem)

(d) What is the maximum achievable utilization if the period for the second task was changed from 1.5 to 2 (and the run times could also be modified to achieve maximum utilization)?

In this case, the tasks are harmonically related; therefore the maximum utilization will be 1.

1. [10 points] In a 16K memory system managed using the buddy algorithm, the following shows the sequence of requests from an application:
2. 4K ; (B) 2K ; (C) 4K ; (D) return “A” ; (E) 0.5K ; (F) 3K
3. Show the state of the memory after the last request (i.e. “F”)

Assumption: The smallest allocatable block size is less than or equal 0.5KB



(Note: If you have made other assumptions (and clarified it), your answers could differ and still be correct.)

1. Calculate the internal and external fragmentation as the percentage of the whole memory size at this state.

External Fragmentation: (0.5K+1K+4K)/(total memory) = 5.5K / 16K = 34%

Internal Fragmentation (Only applies to F): 1K/(total allocated memory) = 1K / 10.5K = 9.5%