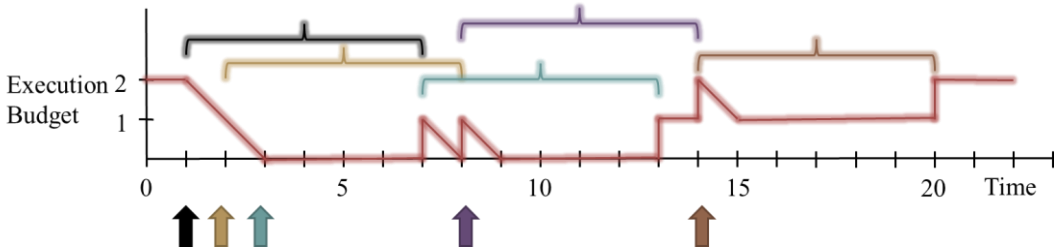
長庚大學109學年度第二學期 作業系統實務 第三次小考

系級: 姓名: 學號:

1. (60%) A sporadic server has a replenishment period 6 and an execution budget 2. Let the sporadic server have the budget 2 at time 0. Assume that events arrive at 1, 2, 3, 8, 14, and each event consumes the execution time 1. Please draw a diagram from time 0 to time 22 to show the changing of the execution budget at different time points.

Answer:



2. (60%) Consider 4 tasks, t_1, t_2, t_3, and t_4 which have priorities x_1, x_2, x_3, and x_4, respectively, and assume $x_1>x_2>x_3>x_4$ (x_1 is the highest priority). After we profiled the programs of the 4 tasks, we have the following information:
   - Task t_1 will lock semaphore S_1 for 30 ms.
   - Task t_2 will lock semaphore S_3 for 20 ms and lock semaphore S_2 for 25 ms.
   - Task t_3 will lock semaphore S_1 for 10ms and lock semaphore S_3 for 40ms.
   - Task t_4 will lock semaphore S_2 for 50ms and lock semaphore S_4 for 70ms.

   (a) Please derive the priority ceiling of each semaphore. If the priority ceiling protocol is used to manage the semaphore locking, (b) please derive the worst-case blocking time of each task. You have to provide the reason to support each of your answers.

Answer: (a) Priority ceilings: S_1: x_1, S_2: x_2, S_3: x_2, S_4: x_4
(b) Worst-case blocking times: t_1: 10 ms, t_2: 50 ms, t_3: 50 ms, t_4: 0 ms.