CS 162, FA00
Midterm #2
Professor A. Smith

You have until the time announced for this exam. The exam is **closed book and closed notes.** All answers should be written on the exam paper. Anything that we can't read or understand won't get credit. Any question for which you give *no answer at all will receive 25% partial credit.* Please answer in standard English; illiterate or illegible answers to essay questions will lose credit. Partial credit will be given for "computation-type" problems only if your errors are obvious to the grader; we are not going to spend a significant time debugging your solution. If necessary, you may continue on the back of a page. You should put your name on every page at the top (in the space provided) and copy the sequence number from part 1 to part 2 of this exam. (Every missing name or sequence number entry will cost you one point.) Please watch the front board for corrections and other information. This exam has 6 questions on 6 pages and is in two parts.

Part I

Problem #1

Assume that the mean job processing time is 10, and that the task switching overhead is 0.5. (I.e. at the end of every interval of length Q, the CPU experiences a task switching event.) Assume round robin scheduling. Assume that Q (the round robin quantum) ranges from .001 to 1000. Plot the shape of the mean flow time as a function of Q and explain. (No credit unless your explanation matches your plot.)

Problem #2

Suppose we have a disk with 512 cylinders, and the disk is currently at cylinder 110 (and has previously just processed a request for cylinder 105) and the disk queue contains read/write requests for sectors on cylinders 84, 302, 103, 96, 407 and 113.

a. How far must the head travel to satisfy the requests in the queue using SSTF scheduling? (If the arm goes from cylinder 10 to 20 to 14, that is a total of 16 cylinders moved.)

b. How far must the head travel to satisfy the requests in the queue using the FIFO arm scheduling strategy?

c. How far must the head travel to satisfy the requests in the queue using SCAN scheduling?

d. How far must the head travel to satisfy the requests in the queue using the CSAN arm scheduling strategy?

e. Assuming no further arrivals, what is the optimal order (i.e. sequence of cylinder numbers) in which to service the requests, and how far does the head travel?

Part II

Problem #3

Describe and explain at least two reasons why disabling interrupts to implement synchronization primitives is not sufficient to provide mutual exclusion. Is disabling interrupts necessary? Is it useful? Explain your answers.

Problem #4

a. What is the TLB and what is it used for?

b. Three ways that a TLB can be designed are fully associative, set associative, and direct mapped. Explain all 3 (including the tradeoffs between them). Use diagrams.

Problem #5

For the following page reference string, please show the number of page faults for a memory of size 3 page frames, and for a memory of size 4 page frames, using LRU, FIFO and OPT replacement. Please show your work

```
7      6      5      4
7      6      8      7
       6      5      4      8
```

             mem size

	3	4
LRU		
FIFO		
OPT		

Problem #6

a. What is a stack algorithm? What is the advantage of a paging algorithm being a stack algorithm?

b. Is LRU a stack algorithm? Prove or disprove.

c. Is FIFO a stack algorithm? Prove or disprove.

Solutions!

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