



ENCS3390- Operating Systems

**Problem Set #3**

**Question#1:** Suppose that a disk drive has 500 cylinders, numbered 0 to 499. The drive is currently serving a request at cylinder 150, and the previous request was at cylinder 85. The queue of pending requests, in FIFO order, is:

69, 212, 296, 80, 44, 18, 356, 23, 65, 81

Starting from the current head position, fill the table below with the order in which these requests are served, the total distance (in cylinders), and the average distance per request that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms listed in the table.

Algorithm	Order (cylinder numbers)	Total Distance	Average
FCFS			
SSTF			
SCAN			
LOOK			
C-SCAN			
C-LOOK			

**Question#2:** Consider the following snapshot of a system:

	<u>Allocation</u>	<u>Max</u>	<u>Available</u>
	A B C D	A B C D	A B C D
$P_0$	0 0 1 2	0 0 1 2	1 5 2 0
$P_1$	1 0 0 0	1 7 5 0	
$P_2$	1 3 5 4	2 3 5 6	
$P_3$	0 6 3 2	0 6 5 2	
$P_4$	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:

1. What is the content of the matrix Need?
2. Is the system in a safe state?
3. If a request from process  $P_1$  arrives for (0,4,2,0), can the request be granted immediately?

**Question#3:** Consider a file system on a disk that has both logical and physical block sizes of 512 bytes. Assume that the information about each file is already in memory. For each of the three allocation strategies (contiguous, linked, and indexed), answer these questions:

1. How is the logical-to-physical address mapping accomplished in this system? (For the indexed allocation, assume that a file is always less than 512 blocks long.)
2. If we are currently at logical block 10 (the last block accessed was block 10) and want to access logical block 4, how many physical blocks must be read from the disk?

**Question#4:** Consider a file system that uses inodes to represent files. Disk blocks are 8 KB in size, and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system?