

# CS-450 & CS-550: *Operating Systems*, Sections 1 & 2

## *Fall 2008: Quiz # 4*

# ANSWERS

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**INSTRUCTIONS:**

- (1) Closed book, closed notes (but open mind), NO calculators allowed.
- (2) For each question, **circle** the identifying letter next to the choice corresponding to your answer, or fill in the blank, as appropriate.\*
- (3) You will not get credit for your grade unless you sign the Honor Code declaration on the back of this page (this is a JMU requirement).
- (4) You must also print your name legibly **on the back of this page sheet**, so that I know who you are, and also write the **last four digits only** of your JMU ID number in the indicated location on the back of the page.
- (5) For any questions requiring calculation, you must show all your work. If you perform your calculation on sheet(s) of paper not part of the exam, then you must write your name **legibly** on all such sheets and hand them in together with your exam.

Following is a sequence of I/O requests. The disk tracks/cylinders are numbered from 0 through 199. The read-write head for the disk had last moved from a lower-numbered track or cylinder to Cylinder 53 (Track 53), where it performed a disk write operation. For each disk scheduling algorithm listed, calculate how many tracks/cylinders are traversed, starting from the current location at track/cylinder 53 up to and including the track/cylinder where the last I/O is serviced:

**98    183    37    120    14    124    4    65    67    94    122    169**  
**3    180    8    184    97    123    9    168    36    99    2    95**

*2 pts each*

1. C-SCAN, where all of the I/O requests in the queue arrived **during** the servicing of the request for Cylinder 53.
2. LOOK, where all of the I/O requests in the queue arrived **during** the servicing of the request for Cylinder 53.
3. FIFO (First-In-First-Out), where all of the I/O requests in the queue arrived **during** the servicing of the request for Cylinder 53.
4. 4-step SCAN, where the disk write operation carried out at track/cylinder 53 had been the fourth one of the previous 4-step sequence, and where all of the I/O requests in the queue arrived **during** the servicing of the request for Cylinder 53.
5. F-SCAN, in which the disk write operation carried out at track/cylinder 53 had been the last one in the I/O queue serviced, the request for I/O at track 98 begins a new F-SCAN queue, the disk I/O request for track/cylinder 122 arrives just after service was initiated for the queue beginning with track/cylinder 98, and all of the other I/O requests arrive while the first group (Cylinders 98-183-37-120-14-124-4-65-67-94) is still being serviced.

Question	Answer	Points
<b>1</b>	<b>382</b>	
<b>2</b>	<b>313</b>	
<b>3</b>	<b>2322</b>	
<b>4</b>	<b>1240</b>	
<b>5</b>	<b>529</b>	
<b>TOTAL:</b>		

Last four digits of your JMU Number: \_\_\_\_ \_

This work complies with the JMU Honor Code: \_\_\_\_\_

*YourSignature*

Please **print** your name **legibly**: \_\_\_\_\_

<p><b>#1:</b> In <b>C-SCAN</b>, we make use of the fact that the I/O's had been taking place in the direction of increasing track numbers. Accordingly, in carrying out this algorithm we continue from track 53 towards the higher-numbered tracks until we reach track 199, stopping momentarily at each track along the way where we have an I/O request. Then, we go back from 199 to zero, doing no I/O's. Then, we ascent from zero to wards track 53, but we stop at the highest-numbered track less than 53., which is 37</p>	$\uparrow 199 - 53 = 146$ $\downarrow 199 - 0 = 199$ $\uparrow 37 - 0 = 37$ <b>SUM = 382</b>
<p><b>#2:</b> In <b>LOOK</b>, we continue moving the head in the direction of increasing track numbers from its initial location of track 53 all the way out to the highest track number for which we have an I/O request, that is, track 184. Then we turn around and head in the direction of lower track numbers, continuing onward to The lowest-numbered track for which we have an I/O request, namely, track 2.</p>	$\uparrow 184 - 53 = 131$ $\downarrow 184 - 2 = 182$ <b>SUM = 313</b>
<p><b>#3: FIFO:</b> We go upwards, first, from 53 to 98 and then continue onwards to 183. then down to 37, up to 120, down to 14, up to 124, down to 4, up to 65 and then continuing onwards past 67, 94, and 122 to 169. Next, we go down to 3, up to 180, down to 8, up to 184, down to 97, up to 123, down to 9, up to 168, down to 36, up to 99, down to 2, and finally up to 95.</p>	$\uparrow 183 - 53 = 130$ $\downarrow 183 - 37 = 146$ $\uparrow 120 - 37 = 83$ $\downarrow 120 - 14 = 106$ $\uparrow 124 - 14 = 110$ $\downarrow 124 - 4 = 120$ $\uparrow 169 - 4 = 165$ $\downarrow 169 - 3 = 166$ $\uparrow 180 - 3 = 177$ $\downarrow 180 - 8 = 172$ $\uparrow 184 - 8 = 176$ $\downarrow 184 - 97 = 87$ $\uparrow 123 - 97 = 26$ $\downarrow 123 - 9 = 114$ $\uparrow 168 - 9 = 159$ $\downarrow 168 - 36 = 132$ $\uparrow 99 - 36 = 63$ $\downarrow 99 - 2 = 97$ $\uparrow 95 - 2 = 93$ <b>SUM = 2322</b>
<p><b>#4. 4-Step SCAN:</b> First, we scan in the upwards direction to track 199, stopping briefly at 98, 120, and 183 to do "I/O's. Next, we come down to 37. Having finished the first four steps (I/O's), we then continue downwards to track 0, doing I/O's at 14 and at 4. Next, we turn upwards towards 199, doing I/O's at 65 and at 124. After finishing the second four steps, we continue onwards towards 199, servicing the I/O along the way at 169. We then turn back down, servicing I/O's along the way at 122, 94, and 67. Continuing back down past 8 and 3 to track 0, we then turn back up, pausing along the way towards 199 at 180 and 184. Next, we proceed downwards towards 0, servicing I/O's at 168, 124, 97, and 9 to finish that 4-step. Continuing towards 0, we service the I/O at 2. We then turn upwards, servicing the I/O's at 36, 95, and 99.</p>	$\uparrow 199 - 53 = 146$ $\downarrow 199 - 0 = 199$ $\uparrow 199 - 0 = 199$ $\downarrow 199 - 0 = 199$ $\uparrow 199 - 0 = 199$ $\downarrow 199 - 0 = 199$ $\uparrow 99 - 0 = 99$ <b>SUM = 1240</b>
<p><b>#5: F-SCAN:</b> We continue scanning upwards from track 53 to track 199, servicing the I/O's at 65, 67, 94, 98, 120, 124, and 183. We then turn around and go back towards 0, servicing I/O's along the way at 37, 14, and 4. At this point, we have finished servicing the first queue. We continue towards 0, servicing the I/O's at tracks 3 and 2. We then turn upwards towards track 199, servicing the I/O's at 8, 9, 36, 95, 97, 99, 122, 123, 168, 169, 180, and 184.</p>	$\uparrow 199 - 53 = 146$ $\downarrow 199 - 0 = 199$ $\uparrow 184 - 0 = 184$ <b>SUM = 529</b>