

## Homework 4 for CSE153 (Fall 2019)

### Instructions:

- \* Be brief in your answers. You will be graded for correctness, not on the length of your answers.
- \* Make sure to write legibly. Incomprehensible writing will be assumed to be incorrect.
- \* At our discretion, we may sample-grade the homeworks. The choice any problems that may not be graded is not pre-determined.

I. Consider that requests to read the following set of logical block numbers are enqueued to be serviced from a disk that has 100 logical blocks laid out sequentially from block 0 to block 99.

{1, 22, 14, 72, 86, 32, 11, 66, 45, 80}

Assume that the seek time in moving the disk arm head from logical block  $i$  to block  $j$  is proportional to  $|i - j|$ . Given that the arm head is currently positioned at block 75 and is in the midst of moving in the direction towards block 0, what is the sequence in which the enqueued blocks will be read with the i) SSTF, ii) SCAN, and iii) C-SCAN algorithms (picks up requests on way down only)? (3 points)

II. Consider a file system that uses a structure similar to an i-node with the following differences. If the file size is less than 100 bytes, the data is stored directly in the i-node. If it is larger, there are 6 direct links (point to a data block), 1 single-indirect links, 2-double indirect links and 1 triple indirect link.

- (a) What is the largest file size that can be indexed in this system? Assume the block size is 512 bytes. (3 points)
- (b) How many blocks (including index blocks) are needed to address a file of size 50 bytes, 500 bytes, 50Kbytes, and 5Mbytes? (4 points)

III. On the original UNIX file system, we are reading the file “/one/two/three.txt” All the directories fit in a single block each.

- (1) Describe and count the number of disk reads involved in reading the file. Assume no disk cache/buffer is used. (2 points)
- (2) How does FFS improve performance over the basic UNIX file system? (1 point)
- (3) How does using the open(...) system call help the performance of the file system (1 point)
- (4) Let's create a symbolic link called three in directory one pointing at three.txt – Assume that three has a single block of data. List all i-nodes that are modified or created (2 point)

(5) Explain two specific scenarios of problems that happen if the system crashes in the middle of part 4. What is their effect? (2 points)

IV. Please submit the confirmation screen that the ieval is submitted (1 point)