

CPSC 351 Homework 7 (36 points)

Deadline: Sunday, May 8, 11:59 PM

Upload your submission on Canvas.

This is NOT group work. Please work individually on this homework.

#1 [36 points]

This is a continuation of example question 2, which we worked on in class and which is also posted on Canvas:

Consider a file currently consisting of 100 blocks. Assume that the file control block (and the index block, in the case of indexed allocation) is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed (single-level) allocation strategies, if, for one block, the following conditions hold. **In the contiguous allocation case, assume that there is no room to grow in the beginning, but there is room to grow in the end.** Assume that the block information to be added is stored in memory. **For linked allocation, there is a head and tail pointer pointing respectively to the first and last node.**

- A. The block is added at the beginning (This is done in class example)**
- B. The block is added in the middle (3 points for each allocation method : Total 9 points)

(After block 50)

- C. The block is added at the end. (3 points for each allocation method : Total 9 points)
- D. The block is removed from the beginning. (3 points for each allocation method : Total 9 points)
- E. The block is removed from the middle (This is done in class example)**

(51st block is removed)

- F. The block is removed from the end. (3 points for each allocation method : Total 9 points)

Assumptions:

- Read one whole block = one I/O operation
- Write one whole block = one I/O operation
- For linked allocation, a file allocation table (FAT) is not used, i.e., only the address of the starting and ending block is in memory
- All preparation of a block (including putting in the data and any link value) is done in main memory and then the block is written to disk with one write operation
- The file control block does not have to be written to disk after a change (this is typical where

- many operations are performed on a file)
- At most one index block is required per file and it does not have to be written to disk after a change.
 - For linked, contiguous and indexed allocations, assume that no I/O operations are necessary to add a freed block to the free list
 - The OS has information about the free blocks. It does have to go to the disk to find a free block.
 - For removing a block, nothing needs to be written to block or disk indicating a block is removed

Solutions for A. and E. are already given to you in example question 2. You have to answer for B., C., D. and F.

Note that while calculating the total number of I/O operations for each, also indicate how many are from r(read) and w(write), just as demonstrated in the example question 2 solution.