

Name: \_\_\_\_\_

Career Account ID (email): \_\_\_\_\_

### Assignment 4

Due: November 13th (Wednesday), 11:59 pm on Blackboard.

A disk driver (either for a local or remote disk) contains two conceptual pieces: a request queue and a cache of recently-accessed disk blocks. For purposes of this homework, we will make the following assumptions:

- Each node on the request queue either contains a *read* request or a *write* request. A request node specifies the disk block number. A read request node also specifies the process ID of the process that is waiting for the request to be satisfied.
- The request queue follows a FIFO policy (i.e., requests are always satisfied in the order they are added to the queue).
- Don't worry about the size of the cache. It will be large enough to hold any number of blocks necessary for the homework.
- Each event (relevant to questions 3 to 5) occurs in 1 unit of time. For example, in question 3, Process 1 makes a request to read disk block 817 in time 1. In time 5, the disk driver accepts one request (the one placed on the head of the queue) and satisfies it at time 5.
- Each question is independent (i.e., each question begins with an empty request queue and an empty cache).

1. (4 pts) When a read operation occurs, what steps does a disk driver take? Include an explanation related to the cache and the request queue.
2. (4 pts) When a write operation occurs, what steps does a disk driver take? Include an explanation related to the cache and the request queue.
3. (4 pts) Consider the following events and the time at which they occur:

Time	Event
1	Process 1 makes a request to read disk block 817
3	Process 2 makes a request to read disk block 760
5	Disk driver satisfies a request
6	Process 3 makes a request to write to disk block 200

Draw the resulting request queue.

4. (4 pts) Consider the following events and the time at which they occur:

Time	Event
1	Process 1 makes a request to write to disk block 101
2	Process 2 makes a request to write to disk block 307
4	Process 3 makes a request to write to disk block 307
5	Process 4 makes a request to write to disk block 307
7	Process 1 makes a request to read disk block 307
8	Disk driver satisfies a request

Draw the resulting request queue.

5. (4 pts) Read the text to learn how a disk driver manages a cache and consider the following events and the time at which they occur:

Time	Event
1	Process 1 makes a request to read disk block 900
2	Process 2 makes a request to read disk block 611
3	Process 3 makes a request to read disk block 118
7	Process 4 makes a request to read disk block 333
8	Disk driver satisfies a request
9	Process 5 makes a request to read disk block 900
11	Disk driver satisfies a request
14	Process 3 makes a request to write to disk block 118
22	All outstanding disk requests have been satisfied

What does the cache contain? How many actual disk reads and writes have occurred?

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**Submission instruction:**

Submit your PDF file on Blackboard before the due date.