

CSE 2431
SUMMER 2020

HOMEWORK 3

Due; Thursday, July 2nd by 11:30 pm on Carmen in pdf format

NOTE CAREFULLY: Homework submitted after the deadline will not be accepted; to get credit, be sure to submit on Carmen by the deadline given above.

The homework must be the student's own individual work. You should not discuss the details of any problem, or how to approach the solution, with other students. If you have questions of this type, you should ask the instructor or the grader, by making a private post on Piazza.

Note the following requirements:

- Type your solutions in this document, save it, and then export it as a pdf before submitting on Carmen. Carmen will only accept pdf submissions for this assignment.
- **Your solutions to each problem, and the sub-parts, must appear in the same order as the problems in the assignment (this is for the sake of the graders); if you fail to follow this, a penalty may, and usually will, be assessed. The answers and sub-parts must also be clearly labeled in accordance with the questions in the assignment.**

I. Page Replacement

Consider the following page reference string, for a process with 5 virtual pages, and three frames in memory, and fill in the tables for the FIFO, OPTIMAL, and LRU page replacement algorithms [See slide set 8_MemPolicy, slides 22-23, and PAGE REPLACEMENT EXAMPLE SU 20.pdf in Class slides, PartA]. **NOTE CAREFULLY:** If the algorithm allows replacement of more than one possible frame in memory for a given page fault (that is, if the algorithm does not uniquely determine which frame should be replaced), *the lowest-numbered frame of the possible ones should be replaced.*

ABCBDEABCD A

A. FIFO. Reference string: ABCBDEABCD A

Page Reference	Frame 1	Frame 2	Frame 3	Page Fault
A	A	B	C	XXX
B	A	B	C	
D	D	B	C	X
E	D	E	C	X
A	D	E	A	X
B	B	E	A	X
C	B	C	A	X
D	B	C	D	X
A	A	C	D	X
Total Page Faults				10

B. OPTIMAL. Reference string: ABCBDEABCD A

Page Reference	Frame 1	Frame 2	Frame 3	Page Fault
ABC	A	B	C	XXX
B	A	B	C	
D	A	B	D	X
E	A	B	E	X
A	A	B	E	
B	A	B	E	
C	A	C	E	X
D	A	D	E	X
A	A	D	E	
Total Page Faults				7

C. LRU. Reference string: ABCBDEABCD A

Page Reference	Frame 1	Frame 2	Frame 3	Page Fault
ABC	A	B	C	XXX
B	A	B	C	
D	D	B	C	X
E	D	B	E	X
A	D	A	E	X
B	B	A	E	X
C	B	A	C	X
D	B	D	C	X
A	A	D	C	X
Total Page Faults				10

II. Disk Scheduling

Consider the following requests for I/O, contained on the cylinder numbers shown for the disk
[For any algorithm where the direction of head movement matters, assume the head is moving toward cylinder 199 initially]:

Requests: 182, 31, 89, 47, 128, 101, 13, 55

Head starts at cylinder **80**

Assume there are 200 cylinders on the disk, and that the cylinders are numbered from 0 to 199 (from the outer edge of the disk to the innermost cylinder).

Consider the following disk-scheduling algorithms, and answer the questions given:

A. SSTF Scheduling

1. Write the sequence of cylinders, in order from first to last (including the cylinder where the head starts), to which the head moves (either to do I/O or for a direction change) using this algorithm.

80 -> 89 -> 101 -> 128 -> 182 -> 55 -> 47 -> 31 -> 13

2. Calculate the total head movement (give a numeric solution); show how you calculated it (just write an equation which makes the calculation you used clear).

$$(89 - 80) + (101 - 89) + (128 - 101) + (182 - 128) + (182 - 55) + (55 - 47) + (47 - 31) + (31 - 13) = 271$$

B. FCFS Scheduling

1. Write the sequence of cylinders, in order from first to last (including the cylinder where the head starts), to which the head moves (either to do I/O or for a direction change) using this algorithm.

80 -> 182 -> 31 -> 89 -> 47 -> 128 -> 101 -> 13 -> 55

2. Calculate the total head movement (give a numeric solution); show how you calculated it (just write an equation which makes the calculation you used clear).

$$(182 - 80) + (182 - 31) + (89 - 31) + (89 - 47) + (128 - 47) + (128 - 101) + (101 - 13) + (55 - 13) = 591$$

C. LOOK Scheduling [Assume the head is moving toward cylinder 199 initially]

1. Write the sequence of cylinders, in order from first to last (including the cylinder where the head starts), to which the head moves (either to do I/O or for a direction change) using this algorithm.

80 -> 89 -> 101 -> 128 -> 182 -> 55 -> 47 -> 31 -> 13

2. Calculate the total head movement (give a numeric solution); show how you calculated it (just write an equation which makes the calculation you used clear).

$$(89 - 80) + (101 - 89) + (128 - 101) + (182 - 128) + (182 - 55) + (55 - 47) + (47 - 31) + (31 - 13) = 271$$

D. C-LOOK Scheduling [Assume the head is moving toward cylinder 199 initially]

1. Write the sequence of cylinders, in order from first to last (including the cylinder where the head starts), to which the head moves (either to do I/O or for a direction change) using this algorithm.

80 -> 89 -> 101 -> 128 -> 182 -> 13 -> 31 -> 47 -> 55

2. Calculate the total head movement (give a numeric solution); show how you calculated it (just write an equation which makes the calculation you used clear).

$$(89 - 80) + (101 - 89) + (128 - 101) + (182 - 128) + (182 - 13) + (31 - 13) + (47 - 31) + (55 - 47) = 313$$

E. SCAN Scheduling [Assume the head is moving toward cylinder 199 initially]

1. Write the sequence of cylinders, in order from first to last (including the cylinder where the head starts), to which the head moves (either to do I/O or for a direction change) using this algorithm.

80 -> 89 -> 101 -> 128 -> 182 -> 199 -> 55 -> 47 -> 31 -> 13

2. Calculate the total head movement (give a numeric solution); show how you calculated it (just write an equation which makes the calculation you used clear).

$$(89 - 80) + (101 - 89) + (128 - 101) + (182 - 128) + (199 - 182) + (199 - 55) + (55 - 47) + (47 - 31) + (31 - 13) = 305$$

F. C-SCAN Scheduling [Assume the head is moving toward cylinder 199 initially]

1. Write the sequence of cylinders, in order from first to last (including the cylinder where the head starts), to which the head moves (either to do I/O or for a direction change) using this algorithm.

80 -> 89 -> 101 -> 128 -> 182 -> 199 -> 0 -> 13 -> 31 -> 47 -> 55

2. Calculate the total head movement (give a numeric solution); show how you calculated it (just write an equation which makes the calculation you used clear).

$$(89 - 80) + (101 - 89) + (128 - 101) + (182 - 128) + (199 - 182) + (199 - 0) + (13 - 0) + (31 - 13) + (47 - 31) + (55 - 47) = 373$$

The homework answers must be typed in this document, exported as pdf, and submitted on Carmen.