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## CSCI 4210 — Operating Systems Spring 2020 Quiz 9 (April 27, 2020)

- This is an open book, open notes quiz. Please do not use any other people as resources including your classmates.
- This quiz is designed to take 25 minutes; therefore, for 50% extra time accommodations, the expected time is 38 minutes and 100% extra time accommodations is 50 minutes (i.e., the end of class).
- Questions will not be answered except when there is a glaring mistake or ambiguity in a question. Please do your best to interpret and answer each question.
- Below is an honor code pledge for this course. By submitting this quiz for grading, you are asserting that you agree with and will abide by this pledge.

Honor Pledge: On my honor, I have neither given nor received any unauthorized aid on this quiz.

For the 4 questions on this quiz, consider a virtual memory that uses static and equal allocation schemes in which all processes have three frames of physical memory. For given process H, assume that the three frames of physical memory are allocated to logical pages 4, 2, and 5, as shown below:

	4	2	2	5	4	1	5	4	2	4	2	2	4	1
	4	4	4	4										
		2	2	2										
				5										
<pre>page faults ===&gt;</pre>	p	p		p										

1. **(5 POINTS)** Given the remaining 10 page references shown above, how many page faults occur if the least-frequently used (LFU) page replacement algorithm is applied? If a "tie" occurs, use the lowest-numbered page as the page to be replaced. Be sure to count the initial three page faults already shown.

(a) 6 page faults

(d) 4 page faults

(b) 7 page faults

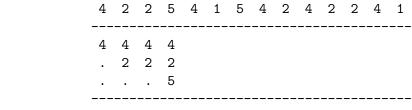
(e) 8 page faults

(c) 5 page faults

(f) 9 page faults

2.	(5 POINTS)	After the	LFU alg	orithm is	applied	${\rm in}$	Question	1	above,	what	pages	are	ir
	physical memo												

- (a) Pages 2, 4, and 5
- (b) Pages 1, 2, and 5
- (c) Pages 1, 2, and 4
- (d) Pages 1, 2, 4, and 5
- (e) I can't remember
- (f) None of the above
- 3. (5 POINTS) Now consider the First-In-First-Out algorithm applied to the same sequence of memory accesses. (The diagram is repeated below for your convenience)



page faults ===> p p

Given the remaining 10 page references shown above, how many page faults occur if the (FIFO) page replacement algorithm is applied? If a "tie" occurs, use the lowest-numbered page as the "victim" page. Be sure to count the initial three page faults already shown.

(a) 6 page faults

(d) 4 page faults

(b) 7 page faults

(e) 8 page faults

(c) 5 page faults

(f) 9 page faults

4. (5 POINTS) After the FIFO algorithm is applied in Question 3 above, what pages are in physical memory? Circle the best answer.

- (a) Pages 2, 4, and 5
- (b) Pages 1, 2, and 5
- (c) Pages 1, 2, and 4
- (d) Pages 1, 2, 4, and 5
- (e) I can't remember
- (f) None of the above