

CSC 112: Computer Operating Systems

Lecture 8

Memory System II: Paging

Exercises ANS

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Q1. Page Replacement

- Consider cache size of 3 frames, and following reference stream of virtual pages:
 - 5, 3, 5, 1, 2, 5, 4, 6, 1
- Fill in the table for FIFO, LRU, and OPT page replacement algorithms, and give the number of page faults for each algorithm.

Ref	5	3	5	1	2	5	4	6	1
F1									
F2									
F3									

Q1. Page Replacement ANS

Ref	5	3	5	1	2	5	4	6	1
Frame 1	5	5	5	5	5	5	4	4	4
Frame 2		3	3	3	2	2	2	2	1
Frame 3				1	1	1	1	6	6

FIFO: 6 page faults

Ref	5	3	5	1	2	5	4	6	1
Frame 1	5	5	5	5	5	5	5	5	1
Frame 2		3	3	3	2	2	2	6	6
Frame 3				1	1	1	4	4	4

LRU: 6 page faults

Ref	5	3	5	1	2	5	4	6	1
Frame 1	5	5	5	5	5	5	4	4	4
Frame 2		3	3	3	2	2	2	6	6
Frame 3				1	1	1	1	1	1

OPT: 5 page faults

(When referencing 4 and 6, you can replace any page, as long it page 1 is not replaced, since only it will be referenced again in the future)

- Consider cache size of 3 frames, and following reference stream of virtual pages:
 - 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 1, 2, 0
- Fill in the table for FIFO, LRU, and OPT page replacement algorithms, and give the number of page faults for each algorithm.

[illegible]

Q2. Page Replacement ANS

Ref	7	0	1	2	0	3	0	4	2	3	0	3	1	2	0
F1	7	7	7	2	2	2	2	4	4	4	0	0	0	0	0
F2		0	0	0	0	3	3	3	2	2	2	2	1	1	1
F3			1	1	1	1	0	0	0	3	3	3	3	2	2

FIFO: 12 page faults

Ref	7	0	1	2	0	3	0	4	2	3	0	3	1	2	0
F1	7	7	7	2	2	2	2	4	4	4	0	0	0	2	2
F2		0	0	0	0	0	0	0	0	3	3	3	3	3	0
F3			1	1	1	3	3	3	2	2	2	2	1	1	1

LRU: 12 page faults

Ref	7	0	1	2	0	3	0	4	2	3	0	3	1	2	0
F1	7	7	7	2	2	2	2	2	2	2	2	2	2	2	2
F2		0	0	0	0	0	0	4	4	4	0	0	0	0	0
F3			1	1	1	3	3	3	3	3	3	3	1	1	1

OPT: 8 page faults

Q2. Page Replacement References

- Page replacement Algorithms | FIFO | Example | OS | Lec-26 | Bhanu Priya, Education 4u
 - <https://www.youtube.com/watch?v=16kaPQtYo28>
- Page replacement Algorithms | LRU | Example | OS | Lec-27 | Bhanu Priya, Education 4u
 - https://www.youtube.com/watch?v=u23ROrISK_g
- Page replacement Algorithms | OPTIMAL | Example | OS | Lec-28 | Bhanu Priya, Education 4u
 - <https://www.youtube.com/watch?v=jeIkkQcqpU>
 - Note that the reference stream is slightly different from FIFO and LRU videos