

**Bonus Homework**

**Submission deadline: Saturday March 20<sup>th</sup> by 11:59 pm**

Q2) Consider the following page reference string:

5,4,5,4,7,2,7,1,6,7,6,4,2,3.

How many page faults would occur for the following replacement algorithms, assuming three frames were allocated for the process? Please indicate page faults with an asterisk.

Remember that all frames are initially empty, so your first unique pages will cost one fault each.

**I. FIFO replacement.**

	5	4	5	4	7	2	7	1	6	7	6	4	2	3	
F1	5	5	5	5	<del>5</del>	2	2	2	<del>2</del>	7	7	7	<del>7</del>	3	
F2		4	4	4	4	4	<del>4</del>	1	1	1	<del>1</del>	4	4	4	
F3					7	7	7	<del>7</del>	6	6	6	<del>6</del>	2	2	

Number of page faults = 10

**II. Optimal replacement.**

	5	4	5	4	7	2	7	1	6	7	6	4	2	3	
F1	5	5	5	5	<del>5</del>	2	<del>2</del>	<del>1</del>	6	6	6	6	6	6	
F2		4	4	4	4	4	4	4	4	4	4	<del>4</del>	2	2	
F3					7	7	7	7	7	7	7	7	<del>7</del>	3	

Number of page faults = 8

Here i have applied FIFO since 6 4 7 won't be used anymore.

**III. LRU replacement.**

	5	4	5	4	7	2	7	1	6	7	6	4	2	3	
F1	5	5	5	5	<del>5</del>	2	2	<del>2</del>	6	6	6	6	<del>6</del>	3	
F2		4	4	4	4	4	<del>4</del>	1	1	1	<del>1</del>	4	4	4	
F3					7	7	7	7	7	7	<del>7</del>	2	2	2	

Number of page faults = 9

**IV. Most Recently Used (MRU) replacement: removes from memory the most recently used page.**

	5	4	5	4	7	2	7	1	6	7	6	4	2	3	
F1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
F2		4	4	4	4	4	4	4	4	4	4	<del>4</del>	<del>2</del>	3	
F3					<del>7</del>	<del>2</del>	<del>7</del>	<del>1</del>	<del>6</del>	<del>7</del>	6	6	6	6	

Number of page faults = 11

→ hit  
\* → miss (page fault).