

CS & IT ENGINEERING

Operating System

Memory Management

DPP 09 (Discussion Notes)



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TOPICS TO BE
COVERED

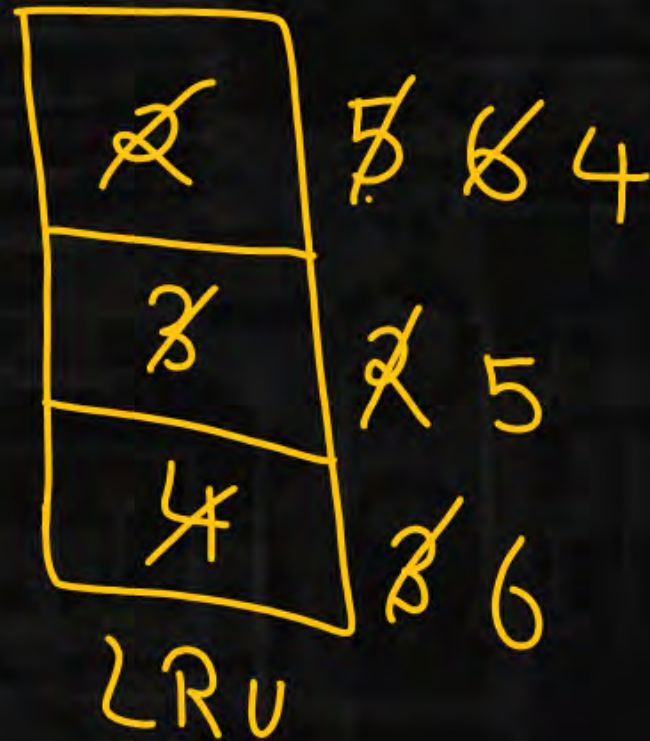
01 Question

02 Discussion

Q.1

Given 3 page frames and page references are in the order: **[NAT]** 2, 3, 4, 5, 2, 3, 6, 2, 3, 4, 5, 6. By using LRU page replacement algorithm. The number of page faults will occur.

2, 3, 4, 5, 2, 3, 6, 2, 3, 4, 5, 6
x x x x x x x ✓ ✓ x x



10

Q.2

Which of the following are virtual memory policies?

[MSQ]



A.

Page replacement

B.

Page reduction

C.

Page selection

D.

Page fault.

Q.3

Suppose there are 4 frames in memory and consider the following reference string:

A, B, E, D, C, E, F, A, G, E, D, C, A, C, B.

Which of the following is correct?

A.

FIFO has less page faults than LRU. ✗

B.

LRU has less page faults than FIFO. ✓

C.

Both FIFO and LRU has equal page faults. ✗

D.

FIFO has 12 page fault. ✗

[MCQ]



A, B, E, D, C, E, F, A, G, E, D, C, A, C, B
~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~ ~~x~~
 x x x x x x x x x x x x x x x

| | |
|--------------|-----------------------------|
| A | C E B |
| B | F D |
| E | A C |
| D | G A |

FIFO

Page faults = 13

| | |
|--------------|-----------------------------|
| A | C G A |
| B | F D |
| E | B |
| D | A C |

LRU

Page faults = 12

Q.4

Consider a system with page fault service time of 158ns and page fault hit ratio is 75%. If memory ~~dues~~^{used} time is 10ns then effective memory access time (EMAT) is? **[NAT]**



$$\text{Page fault hit ratio} = 0.75$$

$$\text{Page fault ratio} \Rightarrow 1 - 0.75 \Rightarrow 0.25$$

47

$$E.M.A.T = P.f.r (P_{fst}) + (1 - P.f.r) (M.M.A.T)$$

$$\Rightarrow 0.25(158) + 0.75(10)$$

$$\Rightarrow 39.50 + 7.5 \Rightarrow \underline{\underline{47.0 \text{ nsec}}}$$

Q.5



Consider a main memory with five page frames and the following sequence of page references are 4, 9, 3, 4, 10, 2, 7, 4, 9, 10, 4, 7, 3, 2, 4. Which of the statement is true with respect to page replacement policies, first in first out (FIFO) and least recently used (LRU)?

[MCQ]

A.

Page faults in FIFO is more than LRU. ✗

B.

Page faults in LRU is more than FIFO. ✗

C.

Both LRU and FIFO has same number of page faults. ✓

D.

Page faults in FIFO has 2 more than LRU. ✗

4, 9, 3, 4, 10, 2, 7, 4, 9, 10, 4, 7, 3, 2, 4
 x x x ✓ x x x x x ✓ ✓ ✓ x x ✓
 x x x ✓ x x x ✓ x ✓ ✓ x x ✓

| | |
|---------------|---|
| 4 | 7 |
| 9 | 4 |
| 3 | 9 |
| 10 | 3 |
| 2 | |

FIFO

9 page faults.

| | |
|--------------|----------------|
| 4 | |
| 9 | 7 |
| 3 | 9 2 |
| 10 | |
| 2 | 3 |

LRU

9 page faults.

Q.6

The Belady's phenomenon is commonly experienced in

[MSQ]



A.

First in first out

B.

Second chance algorithm

C.

Random page replacement algorithm

D.

Least recently used algorithm

Q.7

Given reference to the following page by a program :

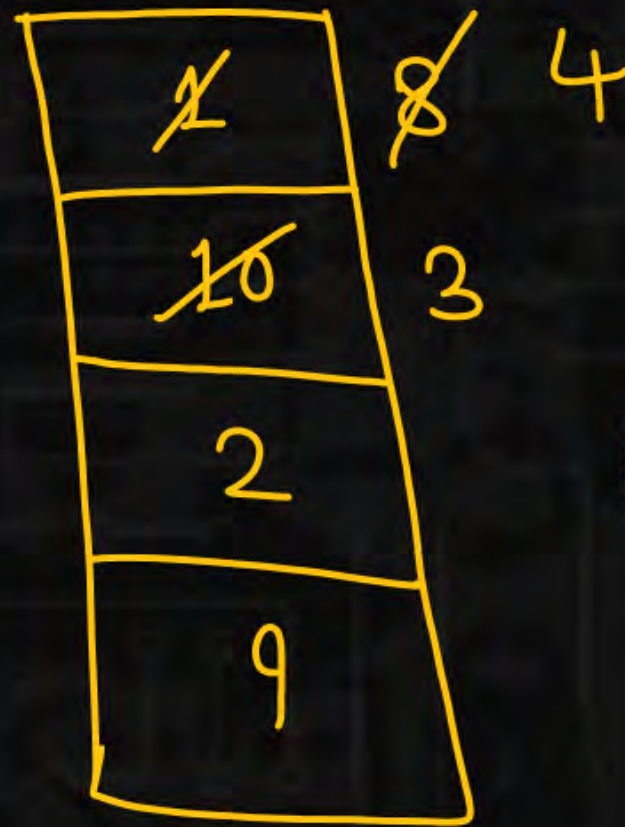
[NAT]



1, 10, 1, 2, 9, 2, 9, 8, 9, 8, 2, 3, 9, 3, 8, 9, 3, 4, 9, 3

~~x~~ ~~x~~ ✓ ~~x~~ ~~x~~ ✓ ✓ ~~x~~ ✓ ✓ ✓ ~~x~~ ✓ ✓ ✓ ✓ ✓ ~~x~~ ✓ ✓

If the program contains 4 page frames. How many page fault will occur in optimal page replacement policy?



7 page faults

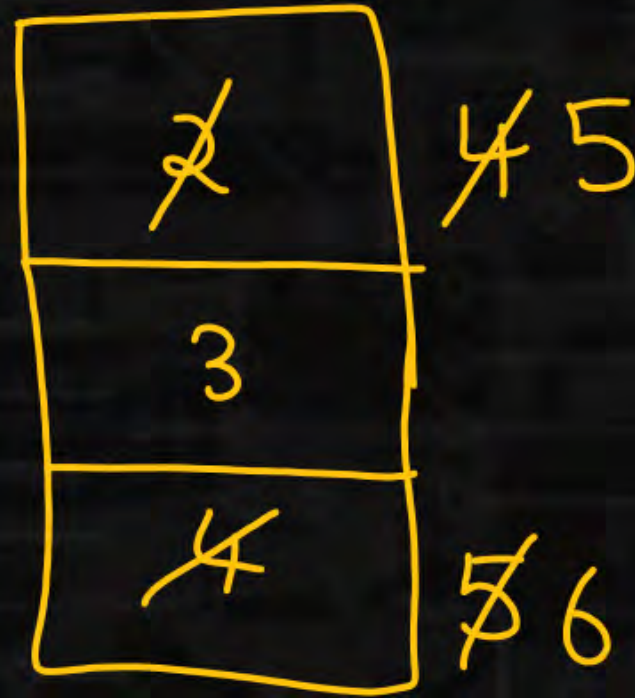
Q.8

Given 3 pages frames and page references in the order:

[NAT]



2, 3, 4, 5, 2, 3, 6, 2, 3, 4, 5, 6. By using optimal page replacement algorithm, the number of pages faults will be?



7 page faults.

