

⇒ Page Replacement Algorithms

①

1) Optimal Page Replacement (Replace the page which is not required in ~~long~~ longest dimension of time in future.

F4				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
F3			1	1	1	1	4	4	4	4	4	4	4	4	4	4	7	7	7
F2		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F1	7	7	7	7	7	3	3	3	3	3	3	3	3	1	1	1	1	1	1
	*	*	*	*	Hit	*	Hit	*	Hit	Hit	Hit	Hit	Hit	*	Hit	Hit	Hit	*	Hit

Ref string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1
 ↓

→ Page fault: 8

Page Hit: 12

$$\text{Page Hit Ratio} = \frac{12}{20} \times 100$$

$$\text{Page Miss / fault Ratio} = \frac{8}{20} \times 100$$

2) FIFO (first In first Out)

f3			1	1	1	1	0	0	0	3	3	3	3	2	2		
f2		0	0	0	0	3	3	3	2	2	2	2	1	1	1		
f1	7	7	7	2	2	2	2	4	4	4	0	0	0	0	0		
	*	*	*	*	Hit	*	*	*	*	*	*	Hit	*	*	Hit		

Ref String 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 1, 2, 0

Page Hit = 3 ; Page fault = 12

$$\begin{aligned} \text{Page Hit Ratio} &= \frac{3}{15} \times 100 & \text{Miss Ratio} &= \frac{12}{15} \times 100 \\ &= 20\% & &= 80\% \end{aligned}$$

(3)

Ref. $\rightarrow 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1$

String

10020304230321201701

Page hits = 12

$$\text{Hit ratio} = \frac{12}{20} \times 100$$

$$= 60\%$$

f ₄				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
f ₃			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
f ₂		0	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4			
f ₁	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7			
	*	*	*	*	+	*	*	*	+	*	*	*	*	+	*	*	+	+	+	+		

Page hits = 7

Page faults = 13

$$\text{Miss Ratio} = \frac{13}{20} \times 100$$

5) Not Recently used

Two bits are to be considered

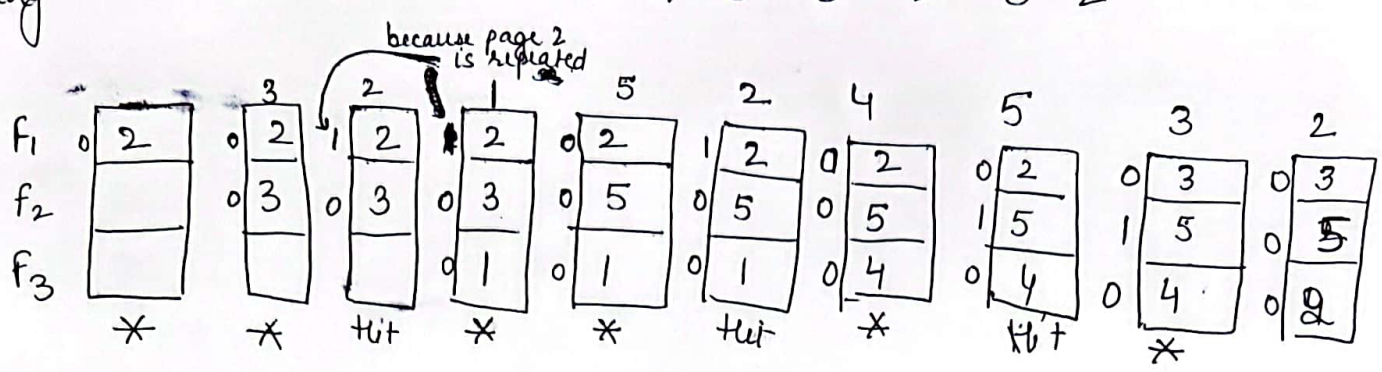
a) Reference bit (Read)

b) Modified bit (Write)

		R	M
E, G	Class 0	0	0
A, B	Class 1	0	1
C, N, M	Class 2	1	0
D, f	Class 3	1	1

Page	Reference bit (R)	Modified bit (M)
A	0	1
C	1	1
D	1	1
E	0	0
f	1	1
G	0	0
B	0	1
M	1	0
N	1	0

5) Second chance / Clock Page Replacement Algo.
 (Reference bit is an additional bit that will be used for each page)
 (Reference bit will be 0 or 1).
 Ref. string $\rightarrow 2 \ 3 \ 2 \ 1 \ 5 \ 2 \ 4 \ 5 \ 3 \ 2 \ 5 \ 2$



- If the reference bit is 1 for a particular page then you cannot replace that page as per Second chance Algo.
- Page '2' has got second chance now, so its reference bit will change to '0' from '1'.
- We have to follow FIFO also.

