Branch : CSE & IT **Batch : Hinglish**

Operating Systems

Memory Management

DPP 10

[MCQ]

1. A 32-bit address system, used a paged virtual memory; the page size is 2KBytes. What is the virtual page and the offset in the page (in decimal) for the virtual address 0x00030f40 respectively?

(a) 95, 2008
(b) 97, 1856
(c) 94, 1732
(d) 98, 2112

[MCQ]

2. Suppose, we have a page-reference string for a process with x frames (initially all empty). The page-reference string has length s, and y distinct page number occur on it, then,

(i) What is the maximum number of page fault?
(ii) What is the minimum number of page fault?

(a) (i) – x (ii) – y
(b) (i) – y (ii) – x
(c) (i) – s (ii) – y
(d) (i) – s (ii) – x

[NAT]

3. If MRU is used as page replacement policy in the system, and there are initially four-page frames for the following string of page reference.

4 2 5 1 3 5 6 2 3 2 3 4 5 2 3

What will be the value of page fault by page hits.

[NAT]

4. Consider a system with 3 frames and using LRU page replacement policy for the following page reference string.

3 2 3 4 1 4 2 4 1 2

What will be effective memory access time if time for accessing TLB is 30 ns and for accessing main memory is 90 ns.

[MCQ]

5. When will a page fault occur?

(a) When process tries to access a page which was not in CPU.
(b) When process tries to access a page which was not in disk.
(c) When process tries to access a page which was not in main memory.
(d) None of these.

Answer Key

1. (b)
2. (c)
3. (4)
4. (156)
5. (c)

Hints & Solutions

1. (b)

For a page size of N bytes the number of bits in the offset field is $\log_2 N$. In case of a 2KBytes page, there are:

$\log_2 2^{11} = 11$ bits

Therefore, the number of bits for the page number is:

32 – 11 = 21

this means a total of 2^{21} = 2M pages.

The binary representation of address is:

31 … 11	10 … 0
0000 0000 0000 0011 0000 1	111 0100 0000

The given virtual address identifies the virtual page number 0x61 = $(97)_{10}$.

The offset inside the page is 0x740 = $(1856)_{10}$.

2. (c)

Maximum number of page fault could occur equals length of page reference string (s) (No page Hit).

Minimum number of page fault occur equals to distinct page number appeared (y).

So, (c) is correct option.

3. (4)

Page Reference	4	2	5	1	3	5	6	2	3	2	3	4	5	2	3
Frame 1	4	4	4	4	4	4	4	4	4	4	4	4	5	2	2
Frame 2		2	2	2	2	2	2	2	3	2	3	3	3	3	3
Frame 3			5	1	3	5	6	6	6	6	6	6	6	6	6
	PF	PF	PF	PF	PF	PF	PF	PH	PF	PF	PF	PH	PF	PF	PH

Total Page Fault = 12.

Total Page hit = 3.

So, $\frac{\text{page fault}}{\text{page hit}} = \frac{12}{3} = 4$

4. (156)

LRU is used.

Page Reference	3	2	3	4	1	4	2	4	1	2
Frame 1	3	3	3	3	1	1	1	1	1	1
Frame 2		2	2	2	2	2	2	2	2	2
Frame 3				4	4	4	4	4	4	4
	PF	PF	PH	PF	PF	PH	PH	PH	PH	PH

Total page hits = 6

Total page miss/fault = 4

Hit ratio = 60%

So,

p = 0.6

Hit memory time = 30 + 90 = 120 ns.

Miss memory Time = 30 + 90 + 90 = 210 ns

Therefore, EAT = P × Hit + (1 - P) × miss

= 0.6 × 120 + (0.4) × 210

= 72 + 84

= 156 ns.

5. (c)

The page fault will occur when the process tries to access a page which was not in main memory.