CS & IT ENGINEERING

Operating System

Memory Management

DPP 10 (Discussion Notes)

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Q.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?
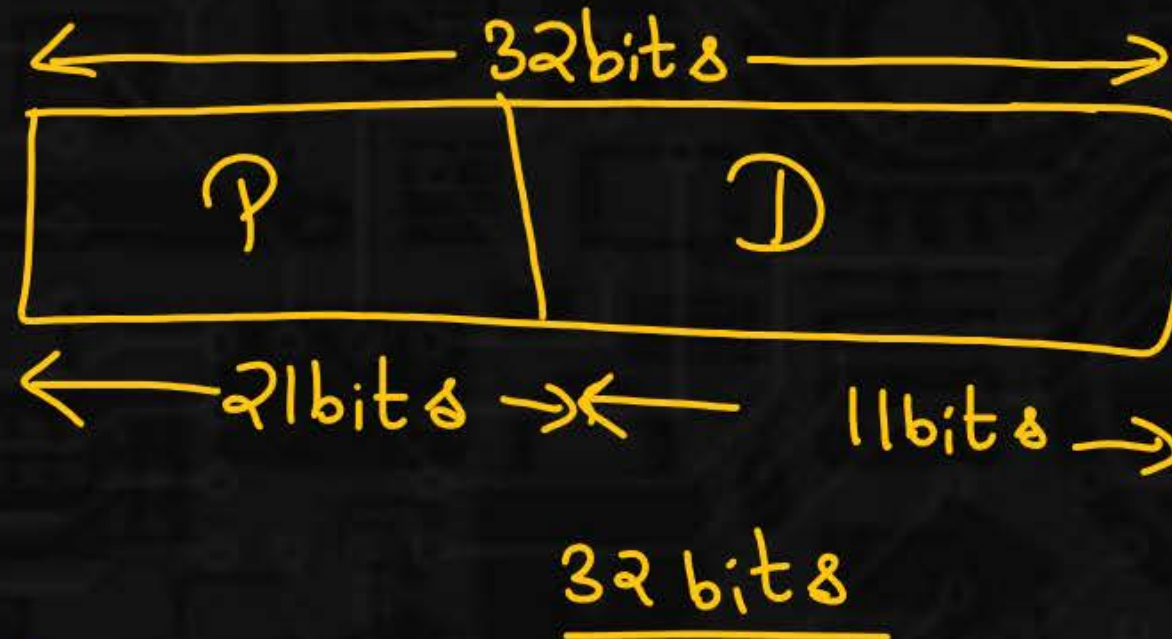
A. 95, 2008

B. 97, 1856

C. 94, 1732

D. 98, 2112

$$\xleftarrow{\hspace{3cm}} 32bits \xrightarrow{\hspace{3cm}}$$

P	D

$$\xleftarrow{} 21bits \xrightarrow{} \xleftarrow{} 11bits \xrightarrow{}$$

$$\begin{array}{r} 1024 \\ 512 \\ \hline 1536 \\ 256 \\ 1792 \\ \hline 32 \end{array} \qquad \begin{array}{r} 1792 \\ 64 \\ \hline 1856 \end{array}$$

$$\frac{2^{21}}{2^{11}} = 2$$

32 bits

$$0000\ 0000\ 0000\ 0011\ 0000\ \overset{10\,9\,8\,7\,6\,5\,4\,3\,2\,1\,0}{111\ 1\ 0100\ 0000}$$

$$2^0 \times 1 + 2^5 \times 1 + 2^6 \times 1 \qquad P$$
$$1 + 32 + 64 = 97 \qquad (97)_{10}$$

$$(1856)_{10} \quad D$$

Q.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,

[MCQ]

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

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

A. (i) − x (ii) − y

B. (i) − y (ii) − x

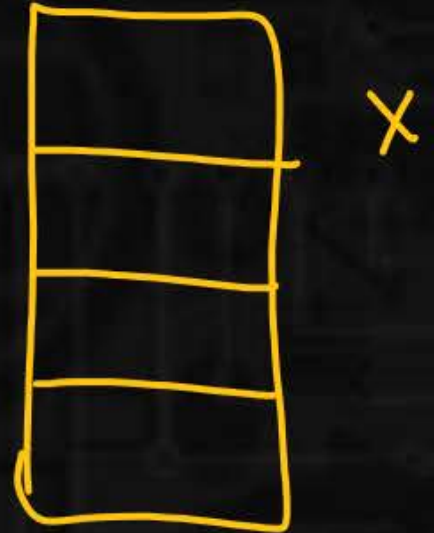C. (i) − s (ii) − y

D. (i) − s (ii) − x

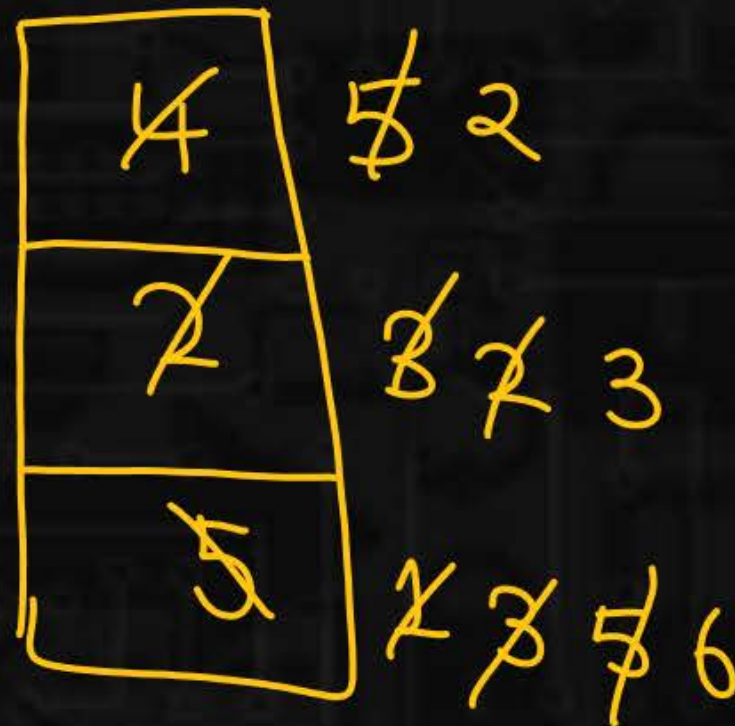(s): 1, 2, 3, 4, 3, 5, 7, 1, 3, 4

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Q.3

If MRU is used as page replacement policy in the system, and there are initially three-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)

4	5 2
2	8 7 3
5	2 7 5 6

page faults = 12
page hits = 3

$$\frac{12}{3} = 4$$

Q.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.

[NAT]

$$P_{f.r} = 0.5$$

$$\text{No } P.f = 1 - 0.5 = 0.5$$

$$60 + 105 \Rightarrow \underline{165\ nsec} \qquad LRU$$

$$\frac{5}{10} \cdot \frac{1}{2} = 0.5$$

$$0.5\,(TLB + M.M) + 0.5\,(TLB + 2^{*}\,M.M)$$

$$0.5\,(30 + 90) + 0.5\,(30 + 180)$$

$$\Rightarrow 0.5\,(120) + 0.5\,(210)$$

When will a page fault occur? [MCQ]

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.