Branch : CSE & IT **Batch : English**

Operating Systems

Memory Management

DPP 05

[NAT]

1. Consider a paging system with a 256MB logical address space. How many bits of logical address will be required corresponding to given LAS?

[NAT]

2. Consider a paging with 12 bits of logical address and each page is of size 2KB. Calculate the number of pages in this system?

[MSQ]

3. Consider a system with 22 bits of logical address and 12 bits of page offset. Calculate logical address space, the number of pages, and page size respectively. Which of the following is correct?
(a) 4MB, 4KB, 1K
(b) 8MB, 2KB, 2K
(c) 4096KB, 4KB, 1K
(d) 4096MB, 4MB, 2K

[MCQ]

4. Which among the following is not an operation of paging hardware?
(a) Page fault repair
(b) Memory protection
(c) Address translation
(d) none

[MCQ]

5. Consider the following statements:
S_1: In paging, logical address space is divided into fixed partitions called "pages".
S_2: In paging, physical address space is divided into fixed partition called "frames"
Which of the following is correct?
(a) Only S_1 is true
(b) Only S_2 is true
(c) Both S_1 as S_2 are true
(d) Both S_1 and S_2 are false

[MCQ]

6. Consider a system with 32-bit logical address, page size of 32KB and page table entry (PTE) size is 8 Bytes. How many pages are there in logical address space?
(a) 2^{17} (b) 2^{19}
(c) 2^{20} (d) none

[MCQ]

7. Which of the memory allocation scheme suffers from external fragmentation?
(a) Paging (b) Swapping
(c) Segmentation (d) none

[MCQ]

8. There are half as many holes as processes, the S be the average size of process and xS be the average size of holes. Then the total memory M is estimated using ______ if there are total n process in the system.
(a) $nS\left(\frac{x}{2}-1\right)$ (b) $nS\left(\frac{x}{2}+1\right)$
(c) $xS+\frac{n}{2}$ (d) $\frac{nS}{2}+x$

Answer Key

1. (28)
2. (2)
3. (a, c)
4. (a)
5. (c)
6. (a)
7. (c)
8. (b)

Hints & Solutions

1. (a)

LAS = 256MB

LA = $\log_2$(256MB)

= log2($2^8.2^{20}$)

= 28 bits

2. (2)

LA = 12 bits

LAS = 2^{12}

LAS = $2^2.2^{10}$

LAS = 4KB

Page size = 2KB

$$\therefore \text{ Number of pages} = \frac{\text{LAS}}{\text{Page size}} = \frac{4\text{KB}}{2\text{KB}} = 2.$$

3. (a, c)

LA = 22 bits

LAS = 2^{22}

LAS = $2^2.2^{20}$

LAS = 4 MB ≈ 4096 KB

d = 12 bits,

So, page size = 4KB

$$\text{Number of pages} = \frac{\text{LAS}}{\text{PS}} = \frac{2^{22}}{2^{12}} = 2^{10} = 1\text{K}$$

4. (a)

Page fault repair: Page fault repair is not an operation of paging hardware, It's an error which is occurred when operating system is unable to find the particular file in memory.

Hence a is correct option.

Memory protection: It's an operation of paging hardware where, memory protection prevents a process from accessing unallocated memory in operating system.

Address translation: The addresses generated by the machine while executing in user mode are logical addresses. The paging hardware translates logical addresses to physical addresses.

5. (c)

- In paging, logical address space is divided into fixed partitions called **pages.**
- In paging, physical address space is divided into fixed partitions called 'frames'.

6. (a)

Given

Logical address (LA) = 32bits

Page size (PS) = 32KB

Page table entry size (PTES) = 8 Bytes

Number of pages in logical address space

$$= \frac{2^{32}}{2^5 \times 2^{10}}$$

$$= \frac{2^{32}}{2^{15}}$$

$$= 2^{17}$$

7. (c)

Segmentation does not Suffer from internal fragmentation but suffers from external fragmentation.

8. (b)

Number of space occupied by holes = total space – Number of space occupied by process.

$$\Rightarrow \frac{n}{2} \times xS = M - nS$$

$$\Rightarrow M = \frac{n}{2} \times xS + nS$$

$$\Rightarrow M = nS\left(\frac{x}{2} + 1\right)$$