

## OPERATING SYSTEMS – PART 2

### NON-CONTIGUOUS MEMORY ALLOCATION AND VIRTUAL MEMORY

(Data Structure for free memory)

1. Which of these data structure was used to represent free memory in the lecture video?

- a) free hash table
- b) free list
- c) free tree
- d) free heap

(Time of Completion)

2. In a computer system with 4 CPUs available, where the 'best-fit' algorithm is used for allocating 'jobs' to memory partitions, the following situation was encountered:

Partition sizes in kB				4k	8k	20k	2k
Jobs	2k	14k	3k	6k	10k	20	2k
Time for Execution	4	10	2	1	1	8	6

Assuming the scheduling algorithm is FCFS scheduling and the memory allocation method is Fixed Partitioning, when will the 20k job be completed.

Note: Every job enters the queue at 0 units of time.

- a) 19 units of time
- b) 20 units of time
- c) 18 units of time
- d) 21 units of time

(Choose the correct option)

3. Consider the requests from processes in given order 300K, 25K, 125K, and 50K. Let there be two blocks of memory available of size 150K followed by a block size 350K. Assume the memory allocation technique to be used is Dynamic Partitioning.

Which of the following partition allocation schemes can satisfy the above requests?

- a) Best fit but not first fit.
- b) First fit but not best fit.
- c) Both First fit & Best fit.
- d) Neither first fit nor best fit.

(Best Strategy)

4. Select all the basic strategies to manage free space in which we can avoid exhaustive searches on the entire free space:

- a) Best Fit
- b) Worst Fit
- c) First Fit
- d) Next Fit

(Choose the correct option)

5. Fill in the blanks:

Using the approach of \_\_\_\_\_ to improve memory allocation, if a particular application has one (or a few) popular-sized requests that it makes, we'll keep a separate list just to manage objects of that size. All other requests are forwarded to a more general memory allocator.

a) Buddy allocation

b) Growing the Heap

c) Segregated Lists

d) Merging

**(Choose the correct option)**

**6. In the following problem description, consider holes as synonyms for free memory spaces.**

**Problem Description:**

**Consider allocation of memory to a new process. Assume that none of the existing holes in the memory will exactly fit the process's memory requirement. Hence, a new hole of smaller size will be created if allocation is made in any of the existing holes. Which one of the following statements is TRUE ?**

a) The hole created by the first fit is always larger than the hole created by the next fit.

b) The hole created by the worst fit is always larger than the hole created by the first fit.

c) The hole created by the best fit is never larger than the hole created by the first fit.

d) The hole created by the next fit is never larger than the hole created by best fit.

**(Base of a Segment)**

**7. What does base of a segment contain?**

a) The capacity or size of segment

b) Contains the starting address where process is loaded at physical memory

c) Stores the starting address of virtual address space of memory

d) None of these

**(Segmentation Fault)**

**8. Which of the following can cause a segmentation fault?**

a) The data of segment bases are corrupted

b) A process requesting an address which exist absolutely fine.

c) A process accessing stack segment instead of heap segment

d) A process accessing illegal address, which is beyond the bounds of address space assigned to process

**(Code Sharing)**

**9. What are the bits introduced, per segment, to implement code sharing in memory management module of OS?**

a) Protection bits

b) Read-write bits

c) Reading bits

d) Permission bits

**(Mapping to Code Segment)**

**10. Select the correct option for the following statement:**

**To find which code segment the virtual address belongs to, we would always need 2 bits.**

a) True

b) False

**(Choose the correct option)**

**11. Select the correct option for the following statement:**

**External fragmentation is avoided when segmentation is used.**

a) True

b) False

**(Components of Virtual Address)**

**12. Select all the components in which the virtual address generated by a process is initially broken into:**

a) the virtual page number (VPN)

b) physical frame number (PFN)

c) the offset within the page

d) page table entry (PTE)

**(Address Translations)**

**13. Fill in the blank:**

**A \_\_\_\_\_ stores virtual-to-physical address translations, thus letting the system know where each page of an address space actually resides in physical memory.**

a) page table entry (PTE)

b) page table

c) page frame

d) page offset

**(Physical Memory Divisions)**

**14. Which of the following refers to the fixed-sized units that the physical memory is divided into?**

a) Pages

b) Page Tables

c) Page Frames

d) Segments

**(Virtual Address to Physical Address)**

**15. For a process of 64 B virtual address and 128 B physical address and following page table:**

Virtual Page Number	Physical Page Frame
0	3
1	7
2	5
3	2

**What will be the physical address for virtual address 37?**

a) 75

b) 85

c) 89

d) 95

**(External Fragmentation in Paging)**

**16. Select the correct option for the following statement:**

**External fragmentation is avoided when paging is used.**

a) True

b) False

**(Slow Paging!)**

**17. What is the most accurate description for slowness of Paging?**

a) Division of virtual address space into pages

b) Division of physical address space into frames

c) Extra space allocated for page table

- d) Too many memory references to access the actual data stored

(Fill the blank cells in table)

18. The following table has filled and unfilled cells. There are few unfilled cells that are marked with characters. Find the values of these characters, by completing the table.

Size of Virtual Address Space	Size of Physical Address Space	Number of bits required for Virtual Address	Number of bits required for Physical Address	Page Size	Number of bits required for Page offset	Number of Pages	Number of Frames
128 KB	128 KB	U		4 KB	W		
256 KB	1 MB		X	4 KB	Y		
1 MB			Z		10		2256

- a) U=17, W=12, X=20, Y=10, Z=18

- b) U=17, W=12, X=20, Y=12, Z=18

- c) U=17, W=10, X=20, Y=12, Z=18

- d) U=17, W=10, X=20, Y=10, Z=18

(What is TLB?)

19. "TLB is a hardware cache which stores the contents of a Page table. CPU always checks TLB first, before moving to the page table in case of page miss. If the memory reference is made for the first time in TLB, then it always results in Page Miss."

Select the correct option for the above statement.

- a) True

- b) False

(TLB Hit)

20. What is the most accurate description of TLB hit?

- a) The TLB contains the mapping for the requested physical address
- b) The TLB contains the mapping for the requested virtual address
- c) The TLB checks and confirms whether this virtual address is accessible
- d) None of the above

(Context Switching Support)

21. Which of the following addition is done to provide hardware support for sharing of TLB across context switching?

- a) Valid bit
- b) Protection bit
- c) Permission bit
- d) Address space identifier (ASID)

(Absent in Physical Memory)

22. What is the term used for using swap space for accessing a page, which is not present in physical memory?

- a) Segmentation Fault
- b) Page Fault
- c) Page Miss
- d) Swap Space Hit

**(Page Faults)**

**23. Consider the following page trace:**

**4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5**

**Determine the number of page fault that would occur if FIFO Page Replacement Algorithm is used with number of frames for the job  $m=4$  will be**

- a) 8                      b) 10                      c) 12                      d) 9

**(LRU - I)**

**24. An LRU page Replacement is used with four page frames and eight pages. How many page faults will occur with reference string 0172237103 if the four frames are initially empty?**

- a) 5                      b) 6                      c) 7                      d) 8

**(LRU - II)**

**25. How many hits occur in LRU page replacement algorithm for the given reference string with four page frames**

**7, 0, 1, 2, 0, 3, 4, 0, 3, 2, 0, 1?**

- a) 5                      b) 6                      c) 7                      d) 8

\*\*\*\*\*