

Memory Management: Binding and Relocation

- 1. When does binding occur at load time?**
 - A) When the program is compiled
 - B) When the program is loaded into memory
 - C) When the program is executed
 - D) When the program terminates

- 2. A program is loaded at base address 5000. An instruction uses logical address 1200. What is the corresponding physical address?**
 - A) 3800
 - B) 5000
 - C) 6200
 - D) 1200

Memory Management: Contiguous Allocation

- 3. Which technique tends to produce more external fragmentation in the long run?**
 - A) First-fit
 - B) Worst-fit
 - C) Best-fit
 - D) External fragmentation does not exist with contiguous allocation

- 4. A 200 KB memory area allocates processes of 60 KB, 80 KB, and 40 KB. How much free space remains?**
 - A) 20 KB
 - B) 40 KB
 - C) 60 KB
 - D) 0 KB

- 5. Assume the following list of free contiguous memory blocks: 15 KB, 35 KB, 60 KB, 90 KB. Which block will be allocated to a 50 KB process assuming the best-fit allocation strategy?**
 - A) 15 KB
 - B) 35 KB
 - C) 60 KB
 - D) 90 KB

Memory Management: Paging

- 6. Which problem does paging eliminate?**
 - A) Internal fragmentation
 - B) External fragmentation
 - C) Thrashing
 - D) Page faults

- 7. A process has a logical memory of 48 KiB and a page size of 4 KiB. How many logical pages are required?**
 - A) 4
 - B) 8
 - C) 10
 - D) 12

- 8. In a virtual memory system, a process generates a reference to logical address 9876. The page size is 1024 bytes. What are the virtual page number (VPN) and the offset?**
 - A) VPN 9, offset 660
 - B) VPN 8, offset 676
 - C) VPN 9, offset 548
 - D) VPN 10, offset 452

- 9. A system uses pages of size 512 B. Knowing that logical page 3 is mapped to physical frame 5 and that the offset is 200, what is the corresponding physical address?**
 - A) 2760
 - B) 2762
 - C) 2660
 - D) 2560

- 10. A system has a virtual memory of 128 KiB and a page size of 2 KiB. How many page table entries (PTEs) are required in the page table?**
 - A) 32
 - B) 64
 - C) 128
 - D) 256

- 11. A system has a logical memory of 1 GiB divided into pages of 4 KiB. Knowing that each page table entry (PTE) occupies 8 bytes, how much space is required for a single page table per process, assuming it is organized as a simple linear array?**
- A) 256 KiB
 - B) 768 KiB
 - C) 1 MiB
 - D) 2 MiB
- 12. A system uses 48-bit logical addresses and a logical memory divided into pages of 4 KiB. Knowing that each page table/directory entry (PTE/PDE) occupies 8 bytes, how many levels are required to store each process's page table using a hierarchical (*multi-level paging*) structure, assuming that each page directory must fit within a single page?**
- A) 2
 - B) 3
 - C) 4
 - D) 9
- 13. A 36-bit logical address is used in a system with a page size of 4 KiB. How many bits are required to identify the virtual page number (VPN)?**
- A) 10
 - B) 12
 - C) 16
 - D) 24
- 14. A system with a virtual memory of 2 GiB uses pages of size 16 KiB. How many bits are required to represent a logical address, and how are they divided between page number and offset?**
- A) 30 total bits: 16 for the page number, 14 for the offset
 - B) 30 total bits: 14 for the page number, 16 for the offset
 - C) 31 total bits: 17 for the page number, 14 for the offset
 - D) 32 total bits: 18 for the page number, 14 for the offset

Memory Access Time

- 15. A system uses a TLB (Translation Lookaside Buffer) with an access time of 10 ns and a main memory access time of 100 ns. If the TLB hit rate is 90%, what is the effective average memory access time?**
- A) 110 ns
 - B) 120 ns
 - C) 130 ns
 - D) 210 ns
- 16. In a paged system, the memory access time is 200 ns and each page fault requires 10 ms to handle. If the page fault rate is 1 out of 4000 accesses, what is the effective average memory access time?**
- A) ~270 ns
 - B) ~2.7 μ s
 - C) ~4 μ s
 - D) ~27 ms

Virtual Memory

- 17. Which page replacement algorithm can suffer from Belady's anomaly?**
- A) LRU
 - B) OPT
 - C) FIFO
 - D) Second Chance
- 18. A system uses the LRU page replacement algorithm. The reference string is: A, B, C, A, D, B, E, C, C, D, E. With 3 frames, how many page faults occur, assuming that initially no frames are loaded (*pure demand paging*)?**
- A) 7
 - B) 8
 - C) 9
 - D) 10
- 19. A system uses the FIFO page replacement algorithm. The reference string is: A, B, B, A, C, D, C, E, A, B, E. With 3 frames, how many page faults occur assuming that initially no frame is loaded (*pure demand paging*)?**
- A) 7
 - B) 8
 - C) 9
 - D) 10

Secondary Storage Devices

20. Which component is NOT part of disk access time?

- A) Seek time
- B) Rotational delay
- C) Transfer time
- D) Page fault time

Disk Scheduling Algorithms

21. Which disk scheduling algorithm guarantees the greatest fairness?

- A) SSTF
- B) FCFS
- C) SCAN
- D) LOOK (optimized SCAN)

22. In a magnetic disk using the SCAN scheduling algorithm, the requests arrive in the following order: 50, 20, 30, 90, 60. Assuming the disk head is at cylinder 40 and is moving toward the outer cylinders (toward lower-numbered cylinders), what is the order in which the requests are serviced?

- A) 30, 20, 50, 60, 90
- B) 50, 60, 90, 30, 20
- C) 50, 20, 30, 90, 60
- D) 30, 20, 90, 60, 50

23. In a magnetic disk using the FCFS scheduling algorithm, the requests arrive in the following order: 70, 20, 10, 50, 45. Assuming the disk head is initially at track 30, what is the total distance traveled (measured as the number of track movements)?

- A) 105
- B) 115
- C) 145
- D) 155

24. In a magnetic disk with 100 cylinders (numbered from 0 to 99) using the C-SCAN scheduling algorithm, the requests arrive in the following order: 60, 25, 45, 10, 90, 75. Assuming the disk head is at cylinder 35 and is moving toward the outer cylinders (toward lower-numbered cylinders), what is the total distance traveled (measured as the number of track movements)?

- A) 88
- B) 168
- C) 178
- D) 188

25. In a magnetic disk, the average seek time is 10 ms, and the rotational delay is 5 ms. Knowing that 5 MiB of data are transferred in 50 ms, what is the disk transfer rate?

- A) ~124 MiB/s
- B) ~137 MiB/s
- C) ~143 MiB/s
- D) ~150 MiB/s