

Chapter 7 – Memory Management**True / False Questions:**

1. T / F – In a multiprogramming system, main memory is divided into multiple sections: one for the operating system (resident monitor, kernel) and one for the set of processes currently being executed.
2. T / F – The task of subdividing memory between the O/S and processes is performed automatically by the O/S and is called relocation.
3. T / F – The practice in which a program and data are organized in such a way that various modules can be assigned the same region of memory is called overlaying.
4. T / F – The concept of virtual memory is based on one or both of two basic techniques: segmentation and paging.
5. T / F – A major problem with the largely obsolete Fixed Partitioning memory management technique is that of external fragmentation.
6. T / F – The problem of internal fragmentation can be lessened in a system employing a fixed-partition memory management scheme by using unequal size partitions.
7. T / F – In the Dynamic Partitioning technique of memory management, the best-fit placement algorithm is usually the best performer of the available algorithms.
8. T / F – In the Dynamic Partitioning technique of memory management, compaction refers to shifting the processes into a contiguous block, resulting in all the free memory aggregated into in a single block.
9. T / F – In the Dynamic Partitioning technique of memory management, the first-fit placement algorithm scans memory from the location of the last placement and chooses the first available block it finds that satisfies the request.
10. T / F – The Buddy System is a reasonable compromise to overcome the disadvantages of both the fixed and variable partition schemes.
11. T / F – A physical memory address is a reference to a memory location independent of the current assignment of data to memory.
12. T / F – A memory system employing paging may suffer slightly from internal fragmentation and experiences no external fragmentation.

13. T / F – In a memory system employing paging, the chunks of a process (called frames) can be assigned to available chunks of memory (called pages).
14. T / F – A memory system employing segmentation may suffer slightly from external fragmentation and experience no internal fragmentation.
15. T / F – A memory system employing segmentation consists of a number of user program segments that must be of the same length and have a maximum segment length.

Multiple Choice Questions:

1. The task of subdividing memory between the O/S and processes is performed automatically by the O/S and is called:
 - a. Protection
 - b. Relocation
 - c. Memory Management
 - d. All of the above
2. The concept of Memory Management satisfies certain system requirements, including:
 - a. Protection
 - b. Relocation
 - c. Physical organization
 - d. All of the above
3. The practice in which a program and data are organized in such a way that various modules can be assigned the same region of memory is called:
 - a. Overlaying
 - b. Sharing
 - c. Relocation
 - d. None of the above
4. The concept of virtual memory is based on one or both of two basic techniques:
 - a. Overlaying and relocation
 - b. Segmentation and paging
 - c. Segmentation and partitioning
 - d. None of the above
5. A problem with the largely obsolete Fixed Partitioning memory management technique is that of:
 - a. Allowing only a fixed number of Processes
 - b. Inefficient use of memory
 - c. Internal fragmentation
 - d. All of the above
6. The problem of internal fragmentation can be lessened in systems employing a fixed-partition memory management scheme by using:
 - a. Random size partitions
 - b. Equal size partitions
 - c. Unequal size partitions
 - d. None of the above
7. In the Dynamic Partitioning technique of memory management, the phenomenon that results in unused blocks of memory outside of existing partitions is called:
 - a. Internal fragmentation
 - b. External fragmentation

- c. Compaction
d. None of the above
8. In the Dynamic Partitioning technique of memory management, the placement algorithm that chooses the block that is closest in size to the request is called:
a. **Best-fit**
b. First-fit
c. Next-fit
d. All of the above
9. In the Dynamic Partitioning technique of memory management, the placement algorithm that scans memory from the location of the last placement and chooses the next available block that large enough to satisfy the request is called:
a. Best-fit
b. First-fit
c. **Next-fit**
d. All of the above
10. A reference to a memory location independent of the current assignment of data to memory is called a(n):
a. Relative address
b. **Logical address**
c. Absolute address
d. None of the above
11. An actual location in main memory is called a(n):
a. Relative address
b. Logical address
c. **Absolute address**
d. None of the above
12. The page table for each process maintains:
a. **The frame location for each page of the process**
b. The page location for each frame of the process
c. The physical memory location of the process
d. None of the above
13. In a system employing a paging scheme for memory management, wasted space is due to:
a. External fragmentation
b. **Internal fragmentation**
c. Pages and frames of different specified sizes
d. None of the above
14. In a system employing a segmentation scheme for memory management, wasted space is due to:
a. **External fragmentation**
b. Internal fragmentation
c. Segments of different sizes
d. None of the above
15. In a system employing a segmentation scheme for memory management, a process is divided into:
a. One segment per thread
b. A number of segments which must be of equal size
c. **A number of segments which need not be of equal size**
d. None of the above

Fill-In-The-Blank Questions:

- The task of subdividing memory between the O/S and processes is performed automatically by the O/S and is called **memory management**.
- The Memory Management task of moving the process image between different areas of memory as required to support swapping is referred to as relocation.
- The practice in which a program and data are organized in such a way that various modules can be assigned the same region of memory is called **overlaying**.
- In almost all modern multiprogramming systems, memory is managed using a sophisticated technique known as **virtual memory**.
- The phenomenon, in which there is wasted space internal to a partition due to the fact that the block of data loaded is smaller than the partition, is referred to as **internal fragmentation**.
- The problem of internal fragmentation can be lessened in system employing a fixed-partition memory management scheme by using **unequal size** partitions.
- In the Dynamic Partitioning technique of memory management, the process of shifting processes so they occupy a single contiguous block in memory is called **compacting**.
- In the Dynamic Partitioning technique of memory management, the placement algorithm that chooses the block that is closest in size to the request is called **best-fit**.
- In the Dynamic Partitioning technique of memory management, the phenomenon that results in unused blocks of memory outside of existing partitions is called **external fragmentation**.
- Programs that employ **relative** addresses in memory are loaded using dynamic run-time loading.
- A compromise between the fixed and dynamic partitioning schemes for memory management that employs aspects of both is called the **Buddy System**.
- In a system that employs a paging memory management scheme, the **page table** shows the frame location for each page of the process.

13. In a system that employs a paging memory management scheme, the chunks of a process can be assigned to available chunks of memory, which are called frames.
14. A system that employs a segmentation memory management scheme makes use of a segment table that provides the starting address of the corresponding segment in main memory.
15. A system that employs a segmentation memory management scheme, the program and its associated data are divided into a number of segments that need not be of the same length.

Chapter 8 – Virtual Memory

True / False Questions:

1. T / F – In a system employing a memory management strategy that doesn't require an entire process to be in main memory at one time, the portion of a process that is actually in main memory at any given time is defined to be the resident set of the process.
2. T / F – The condition known as thrashing occurs when the majority of the processes in main memory require repetitive blocking on a single shared I/O device in the system.
3. T / F – The modify (M) bit is a control bit in a page table entry that indicates whether the contents of the corresponding page have been altered since the page was last loaded into memory.
4. T / F – A Page Fault occurs when the desired page table entry is not found in the Translation Lookaside Buffer (TLB).
5. T / F – One of the advantages to the programmer of virtual memory using segmentation is that it simplifies the handling of growing data structures by allowing the segment to grow or shrink as necessary.
6. T / F – In a combined paging/segmentation system, a user's address space is broken up into a number of fixed-size pages, which in turn are broken up into a number of segments.
7. T / F – To achieve sharing in a segmentation system, it is possible for a segment to be referenced in the segment tables of more than one process.

8. T / F – Linux is an example of an operating system that does not provide virtual memory.
9. T / F – The fetch policy determines when a page should be brought into main memory.
10. T / F – The Least Recently Used (LRU) replacement policy replaces the page in memory that has been referenced most recently.
11. T / F – A global replacement policy considers all unlocked pages in main memory as candidates for replacement, regardless of which process owns a particular page.
12. T / F – In a precleaning policy, modified pages are written to secondary memory once they have been selected for replacement.
13. T / F – SVR4 and Solaris systems use two separate schemes for memory management, one for user processes and disk I/O, and another for kernel memory allocation.
14. T / F – Linux makes use of a two-level page table structure, consisting of a page directory and a page table.
15. T / F – Every W2K user process sees a separate 32-bit address space, allowing 4 GB of memory per process.

Multiple Choice Questions:

16. The type of memory that allows for very effective multiprogramming and relieves the user of memory size constraints is referred to as:
 - a. Real memory
 - b. Virtual memory
 - c. Main memory
 - d. All of the above
17. The situation where the processor spends most of its time swapping process pieces rather than executing instructions is called:
 - a. Paging
 - b. The Principle of Locality
 - c. Thrashing
 - d. None of the above
18. The situation that occurs when the desired page table entry is not found in the Translation Lookaside Buffer (TLB) is called a:
 - a. TLB miss
 - b. TLB hit
 - c. Page fault
 - d. None of the above
19. The real address of a word in memory is translated from the following portions of a virtual address:

- a. Page number and frame number
 - b. **Page number and offset**
20. Segmentation has a number of advantages to the programmer over a non-segmented address space, including:
- a. Simplifying the handling of growing data structures
 - b. Sharing among processes
 - c. Protection
 - d. **All of the above**
21. In a combined paging/segmentation system, a user's address space is broken up into a number of:
- a. Segments or pages, at the discretion of the programmer
 - b. Fixed-size pages, which are in turn broken down
 - c. **Variable-sized Segments, which are in turn broken down into fixed-size pages**
 - d. All of the above
22. Sharing is achieved in a segmentation system by:
- a. **Referencing a segment in the segment tables of more than one process**
 - b. Each process segment table having a reference to the dispatcher main memory area
 - c. Having a common data area that all processes can share
 - d. All of the above
23. A fundamental choice in the design of the memory-management portion of an O/S is:
- a. Whether or not to use virtual memory techniques
 - b. Whether to use paging, segmentation of a combination of the two
 - c. The algorithms employed for various aspects of memory management
 - d. **All of the above**
24. The fetch policy that exploits the characteristics of most secondary memory devices, such as disks, which have seek time and rotational latency is called:
- a. Demand paging
 - b. **Prepaging**
 - c. Swapping
 - d. None of the above
25. The replacement policy that is impossible to implement because it would require the O/S to have perfect knowledge of future events is called the:
- a. **Optimal policy**
 - b. Least recently used (LRU) policy
 - c. Clock policy
 - d. None of the above

26. The replacement policy that chooses only among the resident pages of the process that generated the page fault in selecting a page to replace is referred to as a:
- a. Global replacement policy
 - b. **Local replacement policy**
 - c. Variable replacement policy
 - d. None of the above
27. The concept associated with determining the number of processes that will be resident in main memory is referred to as:
- a. A cleaning policy
 - b. The page fault frequency
 - c. **Load Control**
 - d. None of the above
28. In SVR4 and Solaris systems, the memory management scheme that manages user processes and disk I/O is called the:
- a. **Paging system**
 - b. Virtual memory manager
 - c. Kernel memory allocator
 - d. None of the above
29. The multi-level memory management scheme implemented in Linux was designed to minimize large page tables and directories in which of the following line of processors:
- a. 16-bit X86 architecture
 - b. 32-bit Pentium/X86 architecture
 - c. **64-bit Alpha architecture**
 - d. None of the above
30. The Windows 2000 virtual memory manager can use page sizes ranging from:
- a. **4 KB to 64 KB**

Fill-In-The-Blank Questions:

31. In a system employing a memory management strategy that doesn't require an entire process to be in main memory at one time, the portion of a process that is actually in main memory at any given time is defined to be the **resident set** of the process.
32. The situation where the processor spends most of its time swapping process pieces rather than executing instructions is called **thrashing**.
33. Most virtual memory schemes make use of a special high-speed cache for page table entries, called a **translation lookaside buffer (TLB)**.
34. Each entry in a **page table** contains control bits and the corresponding frame number if the page is resident in memory.
35. In a segmentation system, each entry in a **segment table** contains control bits and the starting address and the length of the segment.

36. Paging, which is transparent to the programmer, eliminates external fragmentation, provides efficient use of main memory, and has pieces of fixed, equal size.
37. Segmentation, which is visible to the programmer, has the ability to handle growing data structures, modularity, and support for sharing and protection.
38. An example of an O/S that doesn't provide virtual memory is MS-DOS or early UNIX.
39. The fetch policy where a page is brought into main memory only if a reference is made to a location on that page is called demand paging.
40. The replacement policy that treats the page frames allocated to a process as a circular buffer is called FIFO.
41. A local replacement policy chooses only among the resident pages of the process that generated the page fault in selecting a page to replace.
42. A precleaning policy writes modified pages before their page frames are needed so that pages can be written out in batches.
43. In SVR4 and Solaris systems, the memory management scheme that manages memory allocation for the kernel is called the kernel memory allocator.
44. Linux systems use a three level page table structure in its memory management scheme to accommodate large addresses.
45. In a W2K system, although each user sees a 32-bit address space, allowing 4 GB of memory per process, a portion of this memory is reserved for O/S use, so a user process actually has access to 2 GB of virtual address space.

Chapter 9 – Uniprocessor Scheduling

True / False Questions:

1. T / F – Scheduling affects the performance of a system because it determines which processes will wait and which will progress.
2. T / F – The short-term scheduler may limit the degree of multiprogramming to provide satisfactory service to the current set of processes.

3. T / F – Medium-term scheduling is part of the system swapping function.
4. T / F – The long-term scheduler is invoked whenever an event occurs that may lead to the suspension or preemption of the currently running process.
5. T / F – The main objective of short-term scheduling is to allocate processor time in such a way as to optimize one or more aspects of system behavior.
6. T / F – One problem with a pure priority scheduling scheme is that lower-priority processes may suffer deadlock.
7. T / F – The selection function determines which process, among ready processes, is selected next for execution.
8. T / F – First-come-first-served (FCFS) is a simple scheduling policy that tends to favor I/O-bound processes over processor bound processes.
9. T / F – Round Robin is a scheduling technique is also known as time slicing, because each process is given a slice of time before being preempted.
10. T / F – The Shortest Process Next (SPN) scheduling policy is often used for time-sharing and transaction processing environments because of the lack of preemption.
11. T / F – The Shortest Remaining Time (SRT) scheduling policy is a preemptive version of the Shortest Process Next (SPN) scheduling policy.
12. T / F – In the Highest Response Ratio Next (HRRN) scheduling policy, longer jobs are favored, because they yield a larger ratio from the smaller denominator in the equation.
13. T / F – A disadvantage of simulation is that results for a given “run” only apply to that particular collection of processes under that particular set of assumptions.
14. T / F – In “fair share” scheduling, each user is assigned a weighting of some sort that defines that user's share of system resources as a fraction of the total usage of those resources.
15. T / F – The traditional UNIX scheduler, such as those used in SVR3 and 4.3 BSD UNIX systems, employs single level feedback using round robin.

Multiple Choice Questions:

46. The type of scheduling that involves the decision to add a process to those that are at least partially in main memory and therefore available for execution is referred to as:
- Long-term scheduling
 - Medium-term scheduling
 - I/O scheduling
 - None of the above
47. The decision as to which job to admit to the system next can be based on which of the following criteria:
- Simple FIFO
 - Priority
 - I/O requirements
 - All of the above
48. Typically, the swapping-in function for processes is based on the need to manage:
- Process priorities
 - Virtual memory
 - The degree of multiprogramming
 - None of the above
49. In terms of frequency of execution, the short-term scheduler is usually the one that executes:
- Most frequently
 - Least frequently
 - About the same as the other schedulers
 - None of the above
50. Response time in an interactive system is an example of:
- System-oriented criteria for short-term scheduling policies
 - User-oriented criteria for short-term scheduling policies
 - System-oriented criteria for long-term scheduling policies
 - None of the above
51. A typical way to overcome starvation of lower-priority processes in a priority-based scheduling system is to:
- Change a process priority randomly
 - Change a process priority with its age
 - Round-robin cycling of processes in a priority queue
 - All of the above
52. Which of the following scheduling policies allow the O/S to interrupt the currently running process and move it to the Ready state?
- Preemptive
 - Non-Preemptive
 - First-come-first-served
 - None of the above
53. In terms of the queuing model, the total time that a process spends in a system (waiting time plus service time) is called:
- Normalized turnaround time (TAT)
 - Finish time (FT)
 - Turnaround or residence time (TAT)
 - None of the above

54. In the Round Robin scheduling technique, the principle design issue is:
- Determining the fair distribution of time quanta to individual processes
 - Determining the method of cycling through a given set of processes
 - Determining the length of the time quantum
 - None of the above
55. One difficulty with the Shortest Process Next (SPN) scheduling technique is:
- The need to know or estimate required processing times for each process
 - The starvation of longer processes
 - The lack of preemption
 - All of the above
56. One difficulty with the Shortest Remaining Time (SRT) scheduling technique is:
- The need to know or estimate required processing times for each process
 - The starvation of shorter processes
 - The lack of preemption
 - All of the above
57. Which of the following scheduling policies require prior knowledge or estimation of process length:
- Shortest Remaining Time (SRT)
 - Shortest Process Next (SPN)
 - Highest Response Ratio Next (HRRN)
 - All of the above
58. It is impossible to make definitive comparisons of various scheduling policies due to dependence on factors such as:
- The probability distribution of service times of the various processes
 - The efficiency of the scheduling and context switching mechanisms
 - The nature of the I/O demand and performance of the I/O subsystem
 - All of the above
59. The strategy that schedules processes based on their group affiliation is generally referred to as:
- Queuing analysis
 - Simulation modeling
 - Fair share scheduling
 - All of the above
60. The traditional UNIX scheduler divides processes into fixed bands of priority levels, with the highest priority band being the:
- Swapper band
 - File manipulation band
 - User process band
 - None of the above

Fill-In-The-Blank Questions:

61. The task of assigning processes to the processor or processors over time, in a way that meets system objectives is called scheduling.
62. The decision as to when to create a new process is generally driven by the desired degree of multiprogramming.
63. Medium term scheduling is part of the system swapping function.
64. The short term scheduler is invoked whenever an event occurs that may lead to the suspension or preemption of the currently running process.
65. Response time and throughput are examples of performance-related criteria for short-term scheduling
66. In a system employing priority scheduling, the scheduler always selects the process with the highest priority level for processing.
67. The decision mode which has two general categories, specifies the instants in time at which the selection function is exercised.
68. In terms of the queuing model, the total time that a process spends in a system (waiting time plus service time) is called the turnaround time (TAT).
69. The Round Robin scheduling technique is also known as time slicing, because each process is given a set amount of processor time before being preempted.
70. Shortest process next (SPN) is a scheduling policy in which the process with the shortest expected processing time is selected next, but there is no preemption.
71. Shortest remaining time (SRT) is a scheduling policy in which the process with the shortest expected processing time is selected next, and if a shorter process becomes ready in the system, the currently running process is preempted.
72. A scheduling mechanism that requires no prior knowledge of process length, yet can nevertheless favor shorter jobs, is known as the feedback scheduling mechanism.
73. Some of the difficulties of analytic modeling are overcome by using discrete-event simulation, which allows a wide range of policies to be modeled.
74. In fair share scheduling, each user is assigned a weighting of some sort that defines that user's share of system resources as a fraction of the total usage of those resources.
75. The traditional UNIX scheduler, such as those used in SVR3 and 4.3 BSD UNIX systems, divides processes into fixed bands of priority levels.