Chapter 2: Memory Management: Simple Systems

TRUE/FALSE

1. Single-user systems in a non-networked environment allocate, to each user, access to all available main memory for each job, and jobs are processed sequentially, one after the other. **True**

2. A single-user system supports multiprogramming. **False**

3. The first attempt to allow for multiprogramming used fixed partitions. **True**

4. Single-user contiguous allocation schemes have the problem of partition intrusion.. **True**

5. The algorithm used to store jobs into memory in a fixed partition system requires a few more steps than the one used for a single-user system because the size of the job must be matched with the size of the partition to make sure it fits completely. **True**

6. The fixed partition scheme does not require that the entire program be stored contiguously and in memory from the beginning to the end of its execution. **False**

7. The fixed partition scheme works well if all of the jobs run on the system are of the same size or if the sizes are known ahead of time and don't vary between reconfigurations. **True**

8. In a fixed partition scheme, large jobs will need to wait if the large partitions are already booked, and they will be rejected if they're too big to fit into the largest partition. **True**

9. The best-fit allocation method keeps the free/busy lists organized by memory locations, low-order memory to high-order memory. **False**

10. A large job can have problems with a first-fit memory allocation scheme. **True**

11. The first-fit algorithm assumes that the Memory Manager keeps only one list containing free memory blocks. **False**

12. One of the problems with the best-fit algorithm is that the entire table must be searched before the allocation can be made because the memory blocks are physically stored in sequence according to their location in memory. **True**

13. Research continues to focus on finding the optimum allocation scheme. **True**

14. For a fixed partition system, memory deallocation is relatively complex. **False**

15. In a dynamic partition system, a null entry in the busy list occurs when a memory block between two other busy memory blocks is returned to the free list. **True**

16. In the relocatable dynamic partitions scheme, the Memory Manager relocates programs to gather together all of the empty blocks and compact them to make one block of memory large enough to accommodate some or all of the jobs waiting to get in. **True**

17. Memory defragmentation is performed by the operating system to reclaim fragmented space. **True**

18. After relocation and compaction, both the free list and the busy list are updated. **True**

19. The bounds register is used to store the highest (or lowest, depending on the specific system) location in memory accessible by each program. **True**

20. Compaction should always be performed only when there are jobs waiting to get in. **False**

MULTIPLE CHOICE

1. Main memory is also known as __**B**__.

a.	single-user memory	c.	finite memory
b.	random access memory	d.	virtual memory

2. In a single-user system, jobs are processed **A**__.

a.	sequentially	c.	randomly
b.	intermittently	d.	in order of longest job to shortest job

3. Fixed partitions are also called __**B**_ partitions**.**

a.	complete	c.	direct
b.	static	d.	sized

4. In the fixed-partition memory management scheme, the table that the Memory Manager uses to keep track of jobs is composed of the ___**D**_.

a.	partition size, memory address, and status
b.	status, access, and memory address
c.	partition size, status, and access
d.	partition size, memory address, access, and status

5. The fixed partition scheme works well when _**A**___.

a.	all jobs are of similar size
b.	jobs have different sizes
c.	job sizes are not known in advance
d.	all jobs are under 100K

6. The phenomenon of less-than-complete use of memory space in a fixed partition is called __**B**__.

a.	dynamic fragmentation	c.	external fragmentation
b.	internal fragmentation	d.	fixed fragmentation

7. __**C**_ consists of fragments of free memory between blocks of allocated memory.

a.	An inefficient fit	c.	External fragmentation
b.	Indirect partitioning	d.	Internal fragmentation

8. The __**B**__ method keeps the free/busy lists organized by memory locations, from low-order memory to high-order memory.

a.	fixed partition allocation	c.	dynamic fit memory allocation
b.	first-fit memory allocation	d.	best-fit memory allocation

9. The goal of the __**D**__ memory allocation algorithm is to find the smallest memory block into which a job will fit.

a.	smallest-fit	c.	dynamic-fit
b.	first-fit	d.	best-fit

10. The release of memory space by the Memory Manager is called __**A**__.

a.	fragmentation	c.	free memory
b.	relocation	d.	deallocation

11. A(n) __**B**__ in the busy list occurs when a memory block between two other busy memory blocks is returned to the free list.

a.	blank line	c.	joined entry
b.	null entry	d.	empty entry

12. _**C**_ of memory is performed by the operating system to reclaim fragmented sections of the memory space.

a.	Deallocation	c.	Compaction
b.	Redirection	d.	Reallocation

13. Memory compaction is also referred to as __**A**__ .

a.	defragmentation	c.	reallocation
b.	collection	d.	dynamic allocation

14. Single-user, fixed partition, and dynamic partition memory schemes share unacceptable fragmentation characteristics that were resolved with the development of __**C**__.

a.	deallocation	c.	relocatable dynamic partitions
b.	best-fit algorithms	d.	null entry accounting

15. When reading an instruction, the operating system can tell the __**A**__ of each group of digits by its location in the line and the operation code.

a.	function	c.	order
b.	value	d.	assignment

16. In a relocatable dynamic partition scheme, the __**D**__ ensures that, during execution, a program won't try to access memory locations that don't belong to it.

a.	relocation register	c.	compaction register
b.	load register	d.	bounds register

17. In a relocatable dynamic partition scheme, the __**C**__ contains a value that must be added to each address referenced in a program so that the system will be able to access the correct memory addresses after relocation.

a.	bounds register	c.	relocation register
b.	load register	d.	compaction register

18. By compacting and relocating, the Memory Manager optimizes the use of memory and thus improves throughput. However, it also requires more __**D**_ than the other memory allocation schemes discussed in this chapter.

a.	null entries	c.	main memory
b.	segmentation	d.	overhead

19. One approach to performing compaction is to do it when a certain __**B**__ of memory becomes busy.

a.	byte	c.	bit
b.	percentage	d.	area

20. The four memory management techniques presented in this chapter share the requirement that the entire program being executed must be __**A**__.

a.	loaded into memory	c.	written in a single language

b.	stored on disk	d.	Relocatable

Essay Questions:

1: In a system using the fixed partitions memory allocation scheme, given the following situation (and using decimal form): After Job J is loaded into a partition of size 50K, the resulting fragmentation is 7168 bytes:

a. What is the size of Job J in bytes?
b. What type of fragmentation is caused?

2: If the relocation register holds the value -83968, was the relocated job moved toward lower or higher addressable end of main memory? By how many kilobytes was it moved?

3: Describe a present-day computing environment that might use each of the memory allocation schemes (single user, fixed, dynamic, and relocatable dynamic) described in the chapter. Defend your answer describing the advantages and disadvantages of the scheme in each case.

Ans: Single-User Contiguous Scheme: Program is loaded in its entirety into memory and allocated as much contiguous space in memory as it needs. Some of the advantages are Jobs processed sequentially in single-user systems, Requires minimal work by the Memory Manager, Register to store the base address, Accumulator to keep track of the program size. Some of disadvantages are:Doesn't support multiprogramming Not cost effective. Fixed Partitions: Main memory is partitioned; one partition/job. Some of the advantages are it allows multiprogramming, Partition sizes remain static unless and until computer system is shut down, reconfigured, and restarted. Some of the disadvantages are:Requires entire program to be stored contiguously

Jobs are allocated space on the basis of first available partition of required size. Dynamic Partitions: Jobs are given only as much memory as they request when they are loaded some of the advantages

are: Available memory is kept in contiguous blocks, Memory waste is comparatively small. Some of the Disadvantages are:Fully utilizes memory only when the first jobs are loaded, and Subsequent allocation leads to memory waste or external fragmentation. Relocatable dynamic disadvantages are Time consumption is very high, Due to compaction Every program in memory must be relocated so they are contiguous, and Operating system must distinguish between addresses and data values which consumes a lot of time.

4: How often should memory compaction/relocation be performed? Describe the advantages and disadvantages of performing it even more often

Ans: Relocation process must be performed before running the program. This process is typically done by the linker during compilation (at compile time), although it can be done at runtime by a relocating loader. Compilers or assemblers typically generate the executable with zero as the lower-most, starting address. Before the execution of object code, these addresses should be adjusted so that they denote the correct runtime addresses.Compacting and relocating optimizes the use of memory, thus improving memory efficiency. In simpler terms, it's job is to effectively fit each job into a space without having a lot of wasted memory, the part of the process that refers to "compact". It should be completed either when a certain percentage of memory is busy; when jobs are waiting to get in; pr after a specific amount of pre-determined time has elapsed. One disadvantage is that each job will have a new address except for those that were already at the lowest memory locations. Another disadvantage is that compaction requires dynamic relocation capability, is very time consuming, and complicates memory management. Also, it cannot share memory between processes, and the process is still limited to physical memory size. But as for the advantages, the operating system can easily move a process during execution; the operating system allows a process to grow over time and it is considered fast hardware with two special registers.

5: In a system using the relocatable dynamic partitions scheme, given the following situation (and using decimal form): Job W is loaded into memory starting at memory location 5000K.
A: Calculate the exact starting address for Job W in bytes
B: If the memory block has 3K in fragmentation, calculate the size of the memory block.
C: Is the resulting fragmentation internal or external? Explain your reasoning.
Ans: a)

6: In a system using the relocatable dynamic partitions scheme, given the following situation (and using decimal form): Job Q is loaded into memory starting at memory location 42K.
a. Calculate the exact starting address for Job Q in bytes.
b. If the memory block has 3K in fragmentation, calculate the size of the memory block.
c. Is the resulting fragmentation internal or external? Explain your reasoning.
Ans: a) Address 43008
b)The size of the memory block is the size of the program.
c) c: In this type of scheme, it is all external fragmentation because it can be used for other jobs, and if too small, the existing jobs can be moved around as the system performs compaction of memory.