

Multiple Choice (3 points each)

1. Mutual exclusion can be done on
  - A. hardware level.
  - ☒ B. software level.
  - C. OS level.
  - D. All of the above
  - E. None of the above
2. A semaphore is a shared integer variable
  - ☒ A. that can not drop below zero
  - B. that can not be more than zero
  - C. that can not drop below one
  - D. that can not be more than one
3. A deadlocked state occurs whenever
  - A. a process is waiting for I/O to a device that does not exist.
  - B. the system has no available free resources.
  - ☒ C. every process in a set is waiting for an event that can only be caused by another process in the set.
  - D. a process is unable to release its request for a resource after use.
4. A \_\_\_\_\_ type presents a set of programmer-defined operations that are provided mutual exclusion within it.
  - A. transaction
  - ☒ B. signal
  - C. binary
  - D. monitor
5. A(n) \_\_\_\_\_ refers to where a process is accessing/updating shared data.
  - ☒ A. critical section

- B. entry section
  - C. mutex
  - D. test-and-set
6. What is the purpose of the mutex semaphore in the implementation of the bounded-buffer problem using semaphores?
- A. It indicates the number of empty slots in the buffer.
  - B. It indicates the number of occupied slots in the buffer.
  - C. It controls access to the shared buffer.
  - ☒ D. It ensures mutual exclusion.
7. When a semaphore is used to implement mutex lock, what is its value initialized to be?
- A. 0
  - ☒ B. 1
  - C. n,  $n > 1$
  - D. n,  $n < 0$

8. The following program consists of 3 concurrent processes and 3 binary semaphores. The semaphores are initialized as  $S_0 = 1$ ,  $S_1 = 0$ ,  $S_2 = 0$ .

```
Process P0
while (true)
{
    wait(S0);
    print '0';
    release(S1);
    release(S2);
}
```

```
Process P1
wait(S1);
release(S0);
```

```
Process P2
wait(S2);
release(S0);
```

- How many times will P0 print '0'?
- ☒ A. At least twice
  - B. Exactly twice
  - C. Exactly thrice

- D. Exactly once
9. Which one of the following can not be scheduled by the kernel?
- A. kernel level thread
  - ☒ B. user level thread
  - C. process
  - D. None of the above
10. When using semaphores, a process invokes the wait() operation before accessing its critical section, followed by the signal() operation upon completion of its critical section. Consider reversing the order of these two operations—first calling signal(), then calling wait(). What would be a possible outcome of this?
- A. Starvation is possible.
  - B. Several processes could be active in their critical sections at the same time.
  - ☒ C. Mutual exclusion is still assured.
  - ☐ D. Deadlock is possible.
11. Which of the following condition is required for deadlock to be possible?
- A. Mutual exclusion.
  - B. A process may hold allocated resources while awaiting assignment of other resources.
  - C. No resource can be forcibly removed from a process holding it.
  - ☒ D. All of the above
12. The circular wait condition can be prevented by \_\_\_\_
- ☒ A. defining a linear ordering of resource types
  - B. using thread
  - C. using Banker's algorithm
  - D. None of the above
13. The processes that are residing in main memory and are ready and waiting to execute are kept on a list called \_\_\_\_
- A. job queue
  - ☒ B. ready queue
  - C. execution queue
  - D. process queue
14. Which of the following scheduling algorithms must be nonpreemptive?

- A. SJF
  - B. RR
  - ☒ C. FCFS
  - D. priority algorithms
15. A cycle in a resource-allocation graph is
- A. a necessary and sufficient condition for deadlock in the case that each resource has more than one instance.
  - ☒ B. a necessary and sufficient condition for a deadlock in the case that each resource has exactly one instance.
  - C. a sufficient condition for a deadlock in the case that each resource has more than one instance.
  - D. neither necessary nor sufficient for indicating deadlock in the case that each resource has exactly one instance.
16. The first readers-writers problem
- A. requires that, once a writer is ready, that writer performs its write as soon as possible.
  - B. is not used to test synchronization primitives.
  - ☒ C. requires that no reader will be kept waiting unless a writer has already obtained permission to use the shared database.
  - D. requires that no reader will be kept waiting unless a reader has already obtained permission to use the shared database.
17. A significant problem with priority scheduling algorithms is \_\_\_\_
- A. complexity
  - ☒ B. starvation
  - C. determining the length of the next CPU burst
  - D. determining the length of the time quantum
18. In multilevel feedback scheduling algorithm
- ☒ A. process can move to a different classified ready queue.
  - B. classification of ready queue is permanent.
  - C. processes are not classified into groups.
  - D. None of the above
- True or False (2 points each)
19. True/False ☒ Protocols to prevent hold-and-wait conditions typically also prevent starvation.

20. True/False F A system in an unsafe state will ultimately deadlock.
21. True/False T The monitor construct ensures that only one process can be active at a time within the monitor.
22. True/False T Round-robin (RR) scheduling degenerates to first-come-first-served (FCFS) scheduling if the time quantum is too long.
23. True/False F In the Linux CFS scheduler, the task with smallest value of runtime is considered to have the highest priority.

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number of page faults the apparent algorithms. Assume that all pages algorithms. Stream: E D H B D E H  
(a) FIFO page replacement with 3 frames. Reference: Stream: E D H B D E H  
11 faults  
(b) LRU page replacement with 3 frames. Reference: Stream: E D H B D E H  
9 faults  
(c) OPT page replacement with 3 frames. Reference: Stream: E D H B D E H  
7 faults  
27. (7 points) Given five memory partitions (in order) of sizes 100 Kb, 212 Kb, 417 Kb, 112 Kb, and 426 Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms use of memory?

#### Multiple Choice (5 points each)

- Mutual exclusion can be done on
  - hardware level.
  - software level.
  - OS level.
  - ☒ All of the above
  - None of the above
- A semaphore is a shared integer variable
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- A \_\_\_\_\_ type presents a set of programmer-defined operations that are provided mutual exclusion within it.
  - transaction
  - signal
  - binary
  - ☒ monitor
- A(n) \_\_\_\_\_ refers to where a process is accessing/updating shared data.
  - ☒ critical section

#### Multiple Choice (5 points each)

- Increasing the RAM of a computer typically improves performance because \_\_\_\_\_.
  - virtual memory increases
  - larger RAMs are faster
  - ☒ fewer page faults occur
  - fewer segmentation faults occur
- On media that uses constant linear velocity, the \_\_\_\_\_.
  - disk's rotation speed increases as the head moves towards the middle of the disk from either side
  - disk's rotation speed remains constant
  - density of bits decreases from the inner tracks to the outer tracks
  - ☒ density of bits per track is uniform
- With segmentation, a logical address consists of \_\_\_\_\_.
  - ☒ segment number and offset
  - segment name and offset
  - segment number and page number
  - segment table and segment number
- Which of the following data structures is appropriate for placing into its own segment?
  - heap
  - kernel code and data
  - user code and data
  - ☒ all of the above
- Assume the value of the base and limit registers are 1200 and 350 respectively. Which of the following addresses is legal?
  - 355
  - ☒ 1200



- C. 1551  
D. all of the above
6. Which of the following statements are true with respect to hashed page tables?
- A. They only work for sparse address spaces.
  - B. The virtual address is used to hash into the hash table.
  - ☒ C. A common approach for handling address spaces larger than 32 bits.
  - D. Hash table collisions do not occur because of the importance of paging.
7. Which of the following is a benefit of allowing a program that is only partially in memory to execute?
- A. Programs can be written to use more memory than is available in physical memory.
  - B. CPU utilization and throughput is increased.
  - C. Less I/O is needed to load or swap each user program into memory.
  - ☒ D. All of the above
8. Suppose we have the following page accesses: 1 2 3 3 2 3 4 1 2 1 1 3 1 4 and that there are three frames within our system. Using the LRU replacement algorithm, what is the number of page faults for the given reference string?
- A. 14  
☒ B. 8  
C. 13  
D. 10
9. What size segment will be allocated for a 39 KB request on a system using the Buddy system for kernel memory allocation?
- A. 39 KB  
B. 42 KB  
☒ C. 64 KB  
D. None of the above
10. Which of the following is the simplest method for implementing a directory?
- A. tree data structure  
B. linear list  
☒ C. hash table  
D. nonlinear list
11. Which of the following statements is false?

- C. 1551  
D. all of the above
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- 71.5
- Answer the question - run out of time
- vided :  
time :
- ite,  
for
- California State University, Sacramento  
CSC 139 Operating System Principles  
Quiz 3, Spring 2019 (Continued)
- A. Virtual memory implements the translation of a program's address space into physical memory address space.  
B. Virtual memory allows each program to exceed the size of the primary memory.  
C. Virtual memory increases the degree of multiprogramming.  
D. Virtual memory reduces the context switching overhead.
12. DMA controllers \_\_\_\_\_  
A. do not utilize an additional, special purpose, processor  
B. are a nonstandard component in PCs of today  
C. can steal memory access cycles from the main CPU  
D. can access main memory at the same time as the main CPU
13. Consider a disk queue holding requests to the following cylinders in the listed order: 116, 22, 3, 11, 75, 185, 100, 87. Using the SCAN scheduling algorithm, what is the order that the requests are serviced, assuming the disk head is at cylinder 88 and moving upward through the cylinders?  
A. 116 - 22 - 3 - 11 - 75 - 185 - 100 - 87  
B. 100 - 116 - 185 - 87 - 75 - 22 - 11 - 3  
C. 87 - 75 - 100 - 116 - 185 - 22 - 11 - 3  
D. 100 - 116 - 185 - 3 - 11 - 22 - 75 - 87
14. Which of the following disk head scheduling algorithms does not take into account the current position of the disk head?  
A. FCFS  
B. SSTF  
C. SCAN  
D. LOOK
15. Which of the following is not considered a classification of users in connection with each file?  
A. owner  
B. current user  
C. group  
D. world
16. Which of the following allocation methods is needed to get a disk block using direct access?  
A. linked allocation

- B. indexed allocation  
C. hashed allocation  
D. contiguous allocation
17. A disk with free blocks 0,1,5,9,15 would be represented with what bit map?  
A. 0011101110111110  
B. 1100010001000001  
C. 0100010001000001  
D. 1100010001000000
18. Which algorithm is considered reasonable for managing a buffer cache?  
A. least-recently-used (LRU)  
B. first-in-first-out (FIFO)  
C. most-recently-used  
D. least-frequently-used (LFU)
- True or False (2 points each)
19. True/False I In general, LOOK disk head scheduling will involve less movement of the disk heads than SCAN disk head scheduling.
20. True/False I A relative path name begins at the root.
21. True/False F Inverted page tables require each process to have its own page table.
22. True/False F Linked allocation suffers from external fragmentation.
23. True/False T Indexed allocation may require substantial overhead for its index block.

- B. entry section
- C. mutex
- D. test-and-set

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- C. a sufficient condition for a deadlock in the case that each resource has more than once instance.
- D. is neither necessary nor sufficient for indicating deadlock in the case that each resource has exactly one instance.

16. Which of the following is true of multilevel queue scheduling?

- A. Processes can move between queues.
- ☒ B. Each queue has its own scheduling algorithm.
- C. A queue cannot have absolute priority over lower-priority queues.
- D. It is the most general CPU-scheduling algorithm.

17. A significant problem with priority scheduling algorithms is \_\_\_\_\_.

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- ☒ B. starvation
- C. determining the length of the next CPU burst
- D. determining the length of the time quantum

18. In multilevel feedback scheduling algorithm

- ☒ A. process can move to a different classified ready queue.
- B. classification of ready queue is permanent.
- C. processes are not classified into groups.
- D. None of the above

True or False (2 points each)

- 2 19. True/False F A deadlock-free solution eliminates the possibility of starvation.
- 10. 20. True/False T A system in an unsafe state will ultimately deadlock.

- 21. True/False T The monitor construct ensures that only one process can be active at a time within the monitor.
- 22. True/False F In RR scheduling, the time quantum should be small with respect to the context-switch time.
- 23. True/False T In the Linux CFS scheduler, the task with smallest value of *runtime* is considered to have the highest priority.