The Operating Systems Final Exam (ID1200 and ID1206)

Jan. 14, 2023

There are 20 multiple-choice questions, each with 1 point. To pass the exam, you should get at least 10. Some questions may have more than one correct answer, and you should mark them all to get those questions' points.

Grading: `A`: $x \geq 18$, `B`: $18 > x \geq 16$, `C`: $16 > x \geq 14$, `D`: $14 > x \geq 12$, `E`: $12 > x \geq 10$

Process Management

1. Which state of a process defined (1) the process is waiting for some event to occur, e.g., an I/O completion, and (2) the process is waiting to be assigned to a processor.

   (a) 1: waiting, 2: waiting
   (b) **1: waiting, 2: ready**
   (c) 1: ready, 2: waiting
   (d) 1: ready, 2: ready

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2. When a process creates a new process, there are two address-space possibilities for the new process:

   (a) **the child process is a duplicate of the parent process (it has the same program and data as the parent)**
   (b) the child process is a Not duplicate of the parent process (it has not the same program and data as the parent)
   (c) **the child process has a new program loaded into it**
   (d) the child process has the same program loaded into it

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3. (1) After a `fork()` system call, one of the two processes typically uses the _____ system call to replace the process's memory space with a new program. (2) The parent can create more children, or if it has nothing else to do while the child runs, it can issue a _____ system call to move itself off the ready queue until the termination of the child.

   (a) 1: `wait()`, 2: `exec()`
   (b) 1: `exec()`, 2: `exec()`
   (c) 1: `wait()`, 2: `fork()`
   (d) **1: `exec()`, 2: `wait()`**

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4. Message passing provides a mechanism to allow processes to communicate:

   (a) by sharing the same address space
   (b) by sharing the same process number and process identifier
   (c) **without sharing the same address space**
   (d) none of the above

5. In which of the following multi-threading model, (1) the entire process will block if a thread makes a blocking system call, and (2) allows multiple threads to run in parallel on multiprocessors.

   (a) 1: one-to-one, 2: many-to-one
   (b) 1: one-to-one, 2: many-to-many
   (c) 1: one-to-many, 2: one-to-one
   (d) **1: many-to-one, 2: one-to-one**

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6. Which of the following scheduling algorithm associates with each process the length of the process's next CPU burst.

   (a) First-Come-First-Served scheduling
   (b) **Shortest-Job-First scheduling**
   (c) Priority scheduling
   (d) Round-Robin scheduling

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7. Whenever the CPU becomes idle, the OS must select one of the processes in the _____ to be executed.

   (a) **ready queue**
   (b) execution queue
   (c) process queue
   (d) waiting queue

Process Synchronization

8. Select the correct statement(s) regarding mutex lock to prevent race condition.

   (a) **a process must acquire the lock before entering a critical section**
   (b) a process need not acquire the lock before entering a critical section
   (c) a process must acquire the lock when it exits the critical section
   (d) **a process releases the lock when it exits the critical section**

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9. In the readers-writers problem, if a process wishing to modify the shared data must request the lock in

   (a) read mode
   (b) **write mode**
   (c) read and write mode

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10. A process must be holding at least one resource and waiting to acquire additional resources that are currently being held by other processes. This condition for deadlock is refer to as:

    (a) mutual exclusion
    (b) no preemption
    (c) **hold and wait**
    (d) circular wait

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11. Which of the following statements is true for dealing with the deadlock problem?

    (a) **we can use a protocol to prevent or avoid deadlock, ensuring that the system will never enter a deadlock state**

    (b) **we can allow the system to enter the deadlock state, detect it, and recover**

    (c) **we can ignore the problem altogether and pretend that deadlock never occur in the system**

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12. Consider a system with 12 tape drives and 3 processes: P_0, P_1, and P_2. P_0 requires 10 tape drives, P_1 needs 4 tape drives, and P_2 needs 9 tape drives. Suppose that, at time t_0, P_0 is holding 5 tape drives, P_1 is holding 2 tape drives, and P_2 is holding 2 tape drives (thus, there are 3 free tape drives). At time t_0, which of the following sequence(s) is/are safe?

    (a) P_0, P_1, P_2

    (b) $\mathbf{P_1}$, $\mathbf{P_0}$, $\mathbf{P_2}$

    (c) P_2, P_0, P_1

    (d) P_1, P_2, P_0

Memory Management

13. Which of the following statement(s) is/are true for dynamic memory allocation?

    (a) dynamic memory allocated can be performed by a compiler, linker, or loader

    (b) dynamic memory allocation to a process is possible only if size of its data structures are known before its execution begins

    (c) **dynamic memory allocation is performed in a lazy manner during execution of a program**

    (d) **dynamic memory is allocated to a function or a variable just before it is used for the first time**

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14. Assuming a 1-KB (1024 bits) page size, what are the page numbers and offsets for the following address references (1) 4315 and (2) 364316.

    (a) **1: page 4, offset 219, 2: page 355, offset 796**

    (b) 1: page 5, offset 219, 2: page 355, offset 476

    (c) 1: page 4, offset 219, 2: page 357, offset 796

    (d) 1: page 4, offset 225, 2: page 355, offset 476

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15. Consider a logical address space of 128 pages of 32 words each, mapped onto a physical memory of 16 frames, so (1) how many bits are there in the logical address?, and (2) how many bits are there in the physical address?

    (a) 1: 13 bits, 2: 9 bits

    (b) 1: 13 bits, 2: 10 bits

    (c) **1: 12 bits, 2: 9 bits**

    (d) 1: 12 bits, 2: 10 bits

16. Page replacement becomes necessary when

    (a) **page faults occur and there are no free page frames in the memory**
    (b) page faults occur and there are free page frames in the memory
    (c) **page faults would arise if the replaced page is referenced again**
    (d) **it is important to replace a page that is not likely to be referenced again in the immediate future**

Storage Management

17. The information about all files is kept in the _____, which also resides on the secondary storage.

    (a) disk structure
    (b) **directory structure**
    (c) array structure
    (d) file control block

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18. Consider a queue for tracks on a disk are 8, 183, 137, 12, 14, 124, 67, 65, and the head pointer is at 50. If in total there are 200 tracks (0-199) on disk, how much the head move in (1) First-Come-First-Served and (2) Shortest-Seek-Time-First

    (a) 1: 510, 2: 254
    (b) 1: 530, 2: 215
    (c) 1: 510, 2: 254
    (d) 1: 559, 2: 241

This question is removed form the exam, and its grade is give to all the students.

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19. Which statement(s) file systems allocation methods is/are correct?

    (a) **contiguous allocation provides the best performance in reading files**
    (b) the problem of indexed allocation is to store large files
    (c) **linked allocation does not have external fragmentation**
    (d) contiguous allocation does not need the file size for allocation

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Device Management

20. Which of the following statement(s) is/are correct about host-device interaction?

    (a) using interrupt is not efficient in host-device interaction
    (b) **polling has busy-waiting problem**
    (c) we cannot transfer big data using polling
    (d) **DMA bypasses CPU to transfer data**