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

---

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) he 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) he child process has the same program loaded into it

---

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()

---

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 models, (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

---

6. Which of the following scheduling algorithms 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

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

---

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

---

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 referred to as:

(a) mutual exclusion

(b) no preemption

(c) hold and wait

(d) circular wait

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 occurs in the system

---

12. Consider a system with 12 tape drives and 3 processes: P0, P1, and P2. P0 requires 10 tape drives, P1 needs 4 tape drives, and P2 needs 9 tape drives. Suppose that, at time t0, P0 is holding 5 tape drives, P1 is holding 2 tape drives, and P2 is holding 2 tape drives (thus, there are 3 free tape drives). At time t0, which of the following sequences is/are safe?

(a) P0, P1, P2

(b) P1, P0, P2

(c) P2, P0, P1

(d) P1, P2, P0

Memory Management

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

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

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

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

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

---

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

---

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

---

18. Consider a queue for tracks on a disk: 8, 183, 137, 12, 14, 124, 67, 65, with the head pointer at 50. If there are a total of 200 tracks (0-199) on the disk, how much does 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 from the exam, and its grade is given to all the students.

19. Which statement(s) about 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

Device Management

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

(a) using interrupts is not efficient in host-device interaction

(b) polling has a busy-waiting problem

(c) we cannot transfer big data using polling

(d) DMA (Direct Memory Access) bypasses the CPU to transfer data