Programação de Sistemas Operativos de Tempo-Real
Departamento de Engenharia Informática - Instituto Superior de Engenharia do Porto

Exame Época Setembro - Duração: 60 minutos

Notas:

- Em cada uma das perguntas existe apenas **uma** resposta correta
- Cada **três** respostas erradas anulam uma resposta correta
- Nota mínima de 7.5 valores

Nº: _____ Nome:_____

1) Which of the following are functions of the operating system: i) execute user programs; ii) making solving user problems easier; iii) make the hardware convenient to use; iv) using the hardware in an efficient manner; v) scheduling resources among users.
(a) i, ii, iii, and iv only
(b) ii, iii, iv, and v only
(c) i, iii, iv, and v only
(d) All of these functions

2) The kernel keeps track of the state of each task by using a structure called _____.
(a) Process Control Block
(b) User Space Control Block
(c) Task Control Block
(d) Memory page

3)_____ is a large kernel containing virtually the complete operating system, including scheduling, file system, device drivers, and memory management.
(a) Multilithic kernel
(b) Monolithic kernel
(c) Micro kernel
(d) Macro kernel

4) In process scheduling, the _____ determines which ready process will be executed next by the CPU.
(a) Long-term scheduler
(b) Medium-term scheduler
(c) Short-term scheduler
(d) None of the above

5) _____ means a resource can be released only voluntarily by the process holding it, after that process has completed its task.
(a) Mutual exclusion
(b) Hold and wait
(c) Circular waits
(d) No preemption

6) The following conditions must be present for a deadlock to be possible:
i) Mutual exclusion **iii) No preemption**
ii) Hold and wait **iv) Circular wait**
(a) i, ii, and iii only
(b) ii, iii, and iv only
(c) i, iii, and iv only
(d) All of these conditions

7) _____ refers to a situation in which a process is ready to execute but it is continuously denied access to the CPU in deference of other processes.
(a) Synchronization
(b) Mutual exclusion
(c) Deadlock
(d) Starvation

8) State whether the following statement is true: i) it takes less time to terminate a thread than a process; ii) threads enhance efficiency in communication between different executing programs.
(a) i) is true, ii) is true
(b) i) is true, ii) is false
(c) i) is false, ii) is true
(d) i) is false, ii) is false

9) Which of the following statements about FCFS scheduling are true: i) it tends to favor CPU bound processes over I/O bound processes; ii) it may result inefficient use of both the processor and I/O devices; iii) it is an attractive alternative on its own for a single processor system.
(a) i and ii only
(b) ii and iii only
(c) i and iii only
(d) All of these statements

10) _____ establishes a set of scheduling queues and allocates processes to queues based on execution history and other criteria.
(a) Round robin
(b) Shortest Job First
(c) Shortest Remaining Time First
(d) Multilevel Feedback Scheduling

11) What is the blocked state of a process?
(a) When the process is able to make progress but not using the CPU
(b) When the process is unable to make progress until some task has been completed
(c) When the process is using the CPU
(d) None of the above

12) An optimal scheduling algorithm in terms of minimizing the average waiting time of a given set of processes is _____.
(a) First come, first served
(b) Round robin
(c) Shortest job first
(d) Any preemptive priority scheduling algorithm

13) If a set of processes cannot be scheduled by rate monotonic, then:
(a) They can be scheduled by EDF
(b) They cannot be scheduled by EDF, but they may be by other scheduling algorithm
(c) They cannot be scheduled by any other known algorithm
(d) It is impossible for a set of processes not to be scheduled by rate monotonic

14) Interrupts are provided primarily to:
(a) Improve processor utilization
(b) Improve processor control
(c) Improve processor speed
(d) Improve processor execution

15) From the following, the most effective technique to keep dispatch latency low is to:
(a) Provide a non-preemptive kernel
(b) Provide a preemptive kernel
(c) Switch processes in user space
(d) Allow fewer processes in the run queue

16) Consider one is implementing a plane ticketing system where each plane flight is represented by a data structure which has a lock and a list of reservations on that flight. To reserve a plane ticket for a user-supplied list of multiple flights, the system iterates through the list and acquires the lock for each flight, then iterates through the reservation list and verifies seats are available on each flight, eventually modifying the list of reservations for each flight, then releases the locks for all the flights. When might this strategy result in a deadlock:
(a) If two or more users are simultaneously trying to reserve the same sequence of flights and they specify the flights in the exact same order
(b) If two or more users are simultaneously trying to reserve the same sequence of flights, but they specify the flights in different orders
(c) If two users are simultaneously trying to reserve two different sequences of flights, and those sequences share the same last flight (but all the other flights are different)
(d) None of the above

17) In the many-to-one threading model, if a thread makes a blocking system call:
(a) The entire process will be blocked
(b) A part of the process will stay blocked, while the rest is able to run
(c) The entire process will run
(d) None of the above

18) Which changes to a system are likely to improve a system's throughput?
(a) Using a simpler scheduler that takes less time to decide which process to run
(b) Switching from a non-preemptive to a preemptive scheduling algorithm
(c) Making context switches take more time
(d) None of the above

19) Which of the following are performance issues that the L4 microkernel-based designs is likely to experience compared to a monolithic kernel design like Linux?
(a) Writing to a file is likely to require more kernel/user mode switches and/or context switches than in a monolithic kernel design
(b) Microkernel designs make it harder for user-mode code to ensure that data is kept in physical memory and not swapped out to disk
(c) Sending data between two processes is likely to require more kernel/user mode switches and/or context switches than in a monolithic kernel design
(d) All of the above

20) In lecture, we discussed multi-level feedback queue schedulers that attempts to adjust a process's priority based on the length of its CPU bursts. In such a scheduler, programs at the highest priority:
(a) Have shorter timeslices than programs at any other priority
(b) Are not allowed to use more total CPU time than the programs at lower priority
(c) Will be demoted to a lower priority if they stop using the CPU before the end of their timeslice
(d) None of the above