Operating System Concepts
Spring 2008
Test 1

Question Number	Score	Max Score
Section 1		30
Section 2		35
Section 3		15

Name: _____

Section 1: Circle the correct answer?   (30 points)
1. ____ operating systems are designed primarily to maximize resource utilization.
   A) PC
   B) Handheld computer
   C) Mainframe
   D) Network

2. A ____ can be used to prevent a user program from never returning control to the
   operating system.
   A) Portal
   B) program counter
   C) Firewall
   D) Timer

3. Which of the following would lead you to believe that a given system is an SMP type
   system?
   A) Each processor is assigned a specific task.
   B) There is a master-slave relationship between the processors.
   C) Each processor performs all tasks within the operating system.
   D) None of the above

4. Which of the following is a property of peer-to-peer systems?
   A) Clients and servers are not distinguished from one another.
   B) Separate machines act as either the client of the server but not both.
   C) They do not offer any advantages over traditional client-server systems.
   D) They suffer from the server acting as the bottleneck in performance.

5. Two important design issues for cache memory are ____.
   A) speed and volatility
   B) size and replacement policy
   C) power consumption and reusability
   D) size and access privileges

6. A process control block ____.
   A) includes information on the process's state
   B) stores the address of the next instruction to be processed by a different process
   C) determines which process is to be executed next
   D) is an example of a process queue

7. When a child process is created, which of the following is a possibility in terms of the execution or address space of the child process?
   A) The child process runs concurrently with the parent.
   B) The child process has a new program loaded into it.
   C) The child is a duplicate of the parent.
   D) All of the above

8. In a(n) _____ temporary queue, the sender must always block until the recipient receives the message.
   A) zero capacity
   B) variable capacity
   C) bounded capacity
   D) unbounded capacity

9. An instruction that executes atomically _____.
   A) must consist of only one machine instruction
   B) executes as a single, uninterruptible unit
   C) cannot be used to solve the critical section problem
   D) All of the above

10. Cancellation points are associated with _____ cancellation.
    A) Asynchronous
    B) Deferred
    C) Synchronous
    D) non-deferred

11. 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.

12. The _____ scheduling algorithm is designed especially for time-sharing systems.
    A) SJF
    B) FCFS
    C) RR
    D) Multilevel queue

13. The ____ multithreading model multiplexes many user-level threads to a smaller or equal number of kernel threads.
    A) many-to-one model
    B) one-to-one model
    C) many-to-many model
    D) many-to-some model

14. A schedule in which each transaction is executed atomically is called a(n) ____.
    A) exclusive schedule
    B) conflicting operation
    C) nonserial schedule
    D) serial schedule

15. Which of the following scheduling algorithms must be nonpreemptive?
    A) SJF
    B) RR
    C) FCFS
    D) priority algorithms

16. ____ is the number of processes that are completed per time unit.
    A) CPU utilization
    B) Response time
    C) Turnaround time
    D) Throughput

17. ____ scheduling is approximated by predicting the next CPU burst with an exponential average of the measured lengths of previous CPU bursts.
    A) Multilevel queue
    B) RR
    C) FCFS
    D) SJF

18. Which of the following is true of cooperative scheduling?
    A) It requires a timer.
    B) A process keeps the CPU until it releases the CPU either by terminating or by switching to the waiting state.
    C) It incurs a cost associated with access to shared data.
    D) A process switches from the running state to the ready state when an interrupt occurs.

19. In multithreaded programs, the kernel informs an application about certain events using a procedure known as a(n) _____.
    A) Signal
    B) Upcall
    C) event handler
    D) Pool

20. LWP is _____.
    A) short for lightweight processor
    B) placed between system and kernel threads
    C) placed between user and kernel threads
    D) common in systems implementing one-to-one multithreading models

21. A race condition _____.
    A) results when several threads try to access the same data concurrently
    B) results when several threads try to access and modify the same data concurrently
    C) will result only if the outcome of execution does not depend on the order in which instructions are executed
    D) None of the above

22. Flash memory is slower than DRAM but needs no power to retain its contents.
    A) True
    B) False

23. The difference between a program and a process is that a program is an active entity while a process is a passive entity.
    A) True
    B) False

24. A system call is triggered by hardware.
    A) True
    B) False

25. Virtually all contemporary operating systems support kernel threads.
    A) True
    B) False

26. Race conditions are prevented by requiring that critical regions be protected by locks.
    A) True
    B) False

27. The value of a counting semaphore can range only between 0 and 1.
    A) True
    B) False

28. A deadlock-free solution eliminates the possibility of starvation.
    A) True
    B) False

29. In preemptive scheduling, the sections of code affected by interrupts must be guarded from simultaneous use.
    A) True
    B) False

30. In RR scheduling, the time quantum should be small with respect to the context-switch time.
    A) True
    B) False

Section 2 : Short Answer questions

31. Explain the term marshalling.   (2 points)

32. Explain the terms "at most once" and "exactly once" and indicate how they relate to remote procedure calls.   (4 points)

33. Explain the difference between the first readers-writers problem and the second readers-writers problem.   (2 points)

34. Write two short methods that implement the simple semaphore wait() and signal() operations on global variable S.   (4 points)

35. What three conditions must be satisfied in order to solve the critical section problem?
(3 points)

36. How can write-ahead logging ensure atomicity despite the possibility of failures within a computer system? (2 points)

37. Explain the main differences between a short-term and long-term scheduler. (4points)

38. How can deferred cancellation ensure that thread termination occurs in an orderly manner as compared to asynchronous cancellation? (2 points)

39. What role does the dispatcher play in CPU scheduling? (1 point)

40. Explain the difference between a response time and a turnaround time. These times are both used to measure the effectiveness of scheduling schemes.   (2 points)

41. Explain the process of starvation and how aging can be used to prevent it.   (3 points)

42. Explain the fundamental difference between asymmetric and symmetric multiprocessing.   (2 points)

43. Explain the purpose of an interrupt vector.   (2 points)

44. What is a thread pool and why is it used?   (2 points)

Section 3:
45. Consider the following set of processes with the length of the CPU burst given in
milliseconds   (15 points)

Process	Burst Time
P1	5
P2	10
P3	1
P4	3
P5	1

Assume the processes arrive in the order P1, P2, P3, P4, all at time T0
a) Draw Gantt charts that illustrate the execution of these processes using SJF and RR (assume
quantum = 2)?

b) What is the turnaround time of each process for each of the scheduling algorithms in part a?

c) For each scheduling algorithm, what is the throughput of the system, (Assume context switch
time = 1ms)?