System Design - Operating System (TEST-2)

1. In the context of file systems, what does the term "journaling" refer to? (2 points)
   - ○ A technique for compressing file data
   - ○ A method for encrypting sensitive files
   - ● A way of tracking file system changes to ensure consistency
   - ○ A process of defragmenting the file system

2. Which scheduling algorithm is most likely to cause starvation? (2 points)
   - ○ Round Robin
   - ○ First-Come, First-Served
   - ○ Shortest Job First (non-preemptive)
   - ● Priority Scheduling

3. Which scheduling algorithm is most likely to provide the best turnaround time for a mix of short and long jobs? (2 points)
   - ○ First-Come, First-Served
   - ○ Round Robin
   - ● Shortest Job First
   - ○ Priority Scheduling

4. Which of the following is NOT a common page replacement algorithm? (2 points)
   - ○ Least Recently Used (LRU)
   - ○ First-In-First-Out (FIFO)
   - ○ Optimal Page Replacement
   - ● Most Frequently Used (MFU)

5. Which of the following best describes the purpose of a "capability" in the context of operating system security? (2 points)
   - ● A token that grants specific access rights to a resource
   - ○ A method for encrypting sensitive data
   - ○ A technique for detecting and preventing buffer overflow attacks
   - ○ A way of implementing mandatory access control

6. Which of the following is NOT a type of operating system? (2 points)
   - ○ Batch Operating System

- ○ Time-Sharing Operating System
- ○ Distributed Operating System
- ● Quantum Operating System

7. What is the primary purpose of a file system? (2 points)

- ○ To encrypt data stored on disk
- ○ To compress data to save storage space
- ● To organize and manage files on storage devices
- ○ To schedule disk access for multiple processes

8. In the context of deadlock avoidance, what does the banker's algorithm determine? (2 points)

- ○ The optimal order of process execution
- ● Whether a system is in a safe state
- ○ The minimum number of resources needed to avoid deadlock
- ○ The maximum number of processes that can run concurrently

9. What is the primary difference between a hard link and a symbolic link in file systems? (2 points)

- ○ Hard links can cross file system boundaries, while symbolic links cannot
- ○ Symbolic links can point to directories, while hard links cannot
- ● Hard links share the same inode, while symbolic links have their own inode
- ○ Symbolic links are updated automatically when the target file is moved

10. In the context of monitors, what is the purpose of condition variables? (2 points)

- ○ To implement mutual exclusion
- ● To allow threads to wait for specific conditions to be met
- ○ To count the number of threads currently in the monitor
- ○ To store the monitor's internal state

11. In segmentation, what does the segment table entry typically contain? (2 points)

- ○ Page number and frame number
- ● Base address and limit
- ○ Offset and page size
- ○ Process ID and priority

12. In the context of file systems, what does the term "inode" represent? (2 points)

- ● A data structure that stores metadata about a file
- ○ A method of file encryption

- ○ A type of file compression algorithm
- ○ A technique for optimizing file access times

13. In the context of memory management, what is the purpose of a Translation Lookaside Buffer (TLB)? (2 points)
    - ○ To store frequently accessed memory pages
    - ● To cache virtual-to-physical address translations
    - ○ To manage the swapping of pages between memory and disk
    - ○ To implement demand paging algorithms

14. What is the main purpose of the "setjmp" and "longjmp" functions in C programming? (2 points)
    - ○ To implement exception handling
    - ○ To create new processes
    - ○ To allocate dynamic memory
    - ● To perform non-local goto operations

15. In the context of virtual memory, what is the purpose of the Translation Lookaside Buffer (TLB)? (2 points)
    - ○ To store frequently used disk blocks in memory
    - ● To cache recent virtual-to-physical address translations
    - ○ To manage the swapping of pages between memory and disk
    - ○ To implement demand paging algorithms

16. Which of the following is NOT a preemptive scheduling technique? (2 points)
    - ○ Round Robin
    - ○ Shortest Remaining Time First
    - ● First-Come, First-Served
    - ○ Multilevel Feedback Queue

17. Which of the following is NOT a strategy for deadlock prevention? (2 points)
    - ○ Resource ordering
    - ○ Mutual exclusion elimination
    - ● Hold and wait condition allowance
    - ○ Circular wait prevention

18. Which of the following best describes the concept of a "race condition"? (2 points)
    - ○ A situation where two processes compete for CPU time
    - ● A scenario where the outcome depends on the relative timing of events

- ○ A condition where a process is stuck waiting for a resource
- ○ A state where multiple processes are executing in perfect parallel

19. What is the primary purpose of a reentrant function in multi-threaded programming? (2 points)

- ○ To allow recursive calls
- ● To ensure thread safety when called simultaneously by multiple threads
- ○ To implement mutual exclusion
- ○ To optimize function execution speed

20. Which of the following is NOT a typical responsibility of a device driver? (2 points)

- ○ Translating OS commands into specific hardware instructions
- ○ Managing device-specific data structures
- ● Implementing file system operations
- ○ Handling device interrupts

21. What is the main purpose of the "fork bomb" in the context of operating systems? (2 points)

- ○ To test the robustness of the process creation mechanism
- ● To implement a denial-of-service attack by exhausting system resources
- ○ To optimize process scheduling in multi-core systems
- ○ To create a large number of child processes for parallel processing

22. Which of the following is NOT a benefit of using threads over processes? (2 points)

- ○ Faster context switching
- ○ Shared memory space
- ● Independent memory protection
- ○ Easier inter-thread communication

23. What is the main advantage of the Shortest Job First (SJF) scheduling algorithm? (2 points)

- ● It minimizes the average waiting time for a given set of processes
- ○ It guarantees fairness by giving each process equal CPU time
- ○ It prevents starvation by prioritizing long-running processes
- ○ It is the easiest algorithm to implement in real operating systems

24. What is thrashing in the context of virtual memory? (2 points)

- ○ A security vulnerability where processes can access each other's memory
- ● A situation where the CPU is idle most of the time due to excessive page faults
- ○ A method of optimizing memory access by predicting future page references

○ The process of clearing unused pages from memory to free up space

25. Which page replacement algorithm suffers from Belady's anomaly? (2 points)

○ Least Recently Used (LRU)

● First-In-First-Out (FIFO)

○ Optimal Page Replacement

○ Clock Algorithm

26. Which of the following best describes the concept of "false sharing" in multi-core systems? (2 points)

○ A security vulnerability where processes can access each other's memory

● A situation where threads on different cores inadvertently interfere with each other's cache lines

○ A condition where processes share resources they don't actually need

○ A method of optimizing memory usage by sharing read-only pages

27. Which of the following is NOT a benefit of paging in memory management? (2 points)

○ Eliminates external fragmentation

○ Allows physical memory to be non-contiguous

○ Provides memory protection between processes

● Guarantees that all pages will be of equal size to process segments

28. Which of the following is NOT a characteristic of a real-time operating system? (2 points)

○ Deterministic behavior

○ Priority-based scheduling

● Time-sharing between processes

○ Minimal interrupt latency

29. In contiguous memory allocation, what is the term for the problem where memory becomes divided into small, unusable fragments? (2 points)

○ Memory leakage

● External fragmentation

○ Internal fragmentation

○ Memory thrashing

30. Which of the following is NOT a common method for file system implementation? (2 points)

○ Contiguous Allocation

○ Linked Allocation

○ Indexed Allocation

- [x] Quantum Allocation

31. In the context of race conditions, what does the term "critical section" refer to? (2 points)

- [x] A section of code that can only be executed by one process at a time
- [ ] A section of the CPU that handles high-priority tasks
- [ ] A section of memory that is shared between multiple processes
- [ ] A section of the operating system that manages process scheduling

32. Which of the following best describes the concept of a "spinlock"? (2 points)

- [x] A locking mechanism that uses busy-waiting
- [ ] A technique for avoiding deadlocks in multi-threaded programs
- [ ] A method for scheduling processes in a round-robin fashion
- [ ] A type of lock that automatically releases after a set time period

33. In the context of CPU scheduling, what does the term "convoy effect" refer to? (2 points)

- [x] A situation where short processes wait for a long process to release the CPU
- [ ] A scenario where multiple processes compete for the same I/O device
- [ ] The tendency of processes to arrive in groups
- [ ] The effect of prioritizing I/O-bound processes over CPU-bound processes

34. What is the primary purpose of the working set model in virtual memory management? (2 points)

- [ ] To implement demand paging
- [x] To prevent thrashing
- [ ] To optimize disk I/O operations
- [ ] To implement segmentation

35. What is the main purpose of the "nice" value in Unix-like operating systems? (2 points)

- [x] To set process priorities
- [ ] To determine the amount of memory allocated to a process
- [ ] To specify the maximum CPU time a process can use
- [ ] To define the number of I/O operations a process can perform

36. Which of the following is NOT a typical state of a process in an operating system? (2 points)

- [ ] Running
- [ ] Ready
- [ ] Blocked
- [x] Compiling

37. What is the main disadvantage of the First-Come, First-Served (FCFS) scheduling algorithm? (2 points)

- ○ It can lead to starvation of short processes
- ○ It requires complex implementation in the operating system
- ○ It doesn't work well with multi-core processors
- ● It can result in poor utilization of CPU and I/O devices

38. What is the primary difference between preemptive and non-preemptive scheduling? (2 points)

- ○ Preemptive scheduling allows voluntary release of the CPU
- ○ Non-preemptive scheduling allows interruption of running processes
- ○ Non-preemptive scheduling is only used in real-time systems
- ● Preemptive scheduling allows interruption of running processes

39. What is the main advantage of multithreading over multiprocessing? (2 points)

- ○ Better utilization of multicore processors
- ○ Increased security and isolation between execution units
- ● Reduced memory overhead and faster context switching
- ○ Simplified programming model with no need for synchronization

40. Which of the following best describes the concept of a "zombie process" in operating systems? (2 points)

- ○ A process that consumes excessive CPU resources
- ● A process that has terminated but still has an entry in the process table
- ○ A process that is stuck in an infinite loop
- ○ A process that has been infected by malware

41. Which of the following best describes a thread? (2 points)

- ○ A heavy-weight process with its own memory space
- ● A light-weight process that shares memory with other threads in the same process
- ○ An isolated execution environment with no shared resources
- ○ A virtual machine running on top of the operating system

42. What is the primary purpose of a shadow page table in virtual memory systems? (2 points)

- ○ To implement copy-on-write functionality
- ○ To optimize TLB performance
- ● To support hardware-assisted virtualization
- ○ To implement demand paging

43. What is the primary purpose of the Process Control Block (PCB) in an operating system? (2 points)

- ○ To store the actual code of the process
- ● To maintain information about the state of a process
- ○ To allocate CPU time to processes
- ○ To manage inter-process communication

44. In the context of process creation, which system call is used in Unix-like operating systems to create a new process? (2 points)

- ● fork()
- ○ exec()
- ○ spawn()
- ○ create()

45. In the context of virtual memory, what does the term "copy-on-write" refer to? (2 points)

- ● A technique for optimizing memory usage by sharing read-only pages
- ○ A method for copying data between processes
- ○ A way of implementing demand paging
- ○ A strategy for handling page faults

46. A contiguous area of storage allocated to a file (2 points)

- ● To implement exception handling
- ○ The maximum size a file can grow to
- ○ A type of file permission
- ○ A method of file compression

47. In the context of concurrency, what does the term "happens-before" relationship signify? (2 points)

- ○ A guarantee that one operation will always execute before another
- ○ A strict ordering of events in a distributed system
- ○ A method for prioritizing process execution
- ● A way of defining the visibility of memory operations between threads

48. Which of the following is NOT a common technique for handling priority inversion? (2 points)

- ○ Priority inheritance
- ○ Priority ceiling protocol
- ● Random boosting
- ○ Priority donation

49. What is the primary difference between a semaphore and a mutex? (2 points)

- ○ Semaphores can only have binary values, while mutexes can have multiple values
- ○ Mutexes can be used for signaling between processes, while semaphores cannot
- ● Semaphores can be used for signaling between processes, while mutexes are used for mutual exclusion
- ○ Mutexes can only be used within a single process, while semaphores can be used across multiple processes

50. Which of the following best describes the concept of "thrashing" in an operating system? (2 points)

- ○ A situation where the CPU is overloaded with too many processes
- ● A condition where excessive paging occurs, leading to severe performance degradation
- ○ A security vulnerability where processes can access each other's memory
- ○ A method of optimizing disk I/O by predicting future access patterns