General Operating System Questions

1. **What is the main function of an operating system?**
   - **A)** Execute the machine code directly
   - **B)** Manage and coordinate the system hardware and software
   - **C)** Translate high-level code into machine code
   - **D)** Increase CPU speed
   - **Correct answer: B**

2. **Which of the following is *not* a component of the operating system?**
   - **A)** Memory Manager
   - **B)** Device Manager
   - **C)** File system
   - **D)** Compiler
   - **Correct answer: D**

3. **What is the main function of a *system call*?**
   - **A)** Allow the user to access the CPU directly
   - **B)** Allow user programs to request services from the operating system
   - **C)** Organize the memory structure
   - **D)** Manage the network
   - **Correct answer: B**

4. **In an operating system, which of these hardware protection levels is the most privileged?**
   - **A)** User level
   - **B)** Kernel level
   - **C)** Intermediate level
   - **D)** Application level
   - **Correct answer: B**

5. **The *program counter* (PC) register contains:**
   - **A)** The memory address of the first instruction of each process
   - **B)** The memory address of the operands of an instruction
   - **C)** The address in memory of the next instruction to be executed
   - **D)** The time quantum associated with each process
   - **Correct answer: C**

CPU Scheduling Exercises

6. **Suppose we have the following processes with arrival times and execution times. What is the average waiting time with First Come First Serve (FCFS) algorithm?**
    - **Processes and execution times:**
        - P1: Arrival = 0, Execution = 6 ms
        - P2: Arrival = 0, Execution = 8 ms
        - P3: Arrival = 0, Execution = 7 ms
        - P4: Arrival = 0, Execution = 3 ms
    - **A)** 8.75 ms
    - **B)** 10.5 ms
    - **C)** 9.25 ms
    - **D)** 10.25 ms
    - **Correct answer: B**

7. **Suppose we have the following processes with arrival times and execution times. What is the average waiting time with First Come First Serve (FCFS) algorithm?**
    - **Processes and execution times:**
        - P1: Arrival = 0 ms, Execution = 6 ms
        - P2: Arrival = 2 ms, Execution = 8 ms
        - P3: Arrival = 4 ms, Execution = 7 ms
        - P4: Arrival = 6 ms, Execution = 3 ms
    - **A)** 5.75 ms
    - **B)** 6.5 ms
    - **C)** 7.25 ms
    - **D)** 8 ms
    - **Correct answer: C**

8. **With a time quantum of 2 ms in Round Robin, what will be the execution order and average waiting time for the following processes?**
    - **Processes and execution times:**
        - P1: Arrival = 0 ms, Execution = 3 ms
        - P2: Arrival = 0 ms, Execution = 5 ms
        - P3: Arrival = 0 ms, Execution = 2 ms
        - P4: Arrival = 0 ms, Execution = 7 ms
    - **A)** Average waiting time: 5.5 ms
    - **B)** Average waiting time: 7.25 ms
    - **C)** Average waiting time: 6.75 ms
    - **D)** Average waiting time: 8 ms
    - **Correct answer: B**

9. **With a time quantum of 4 ms in Round Robin, what will be the execution order and average waiting time for the following processes?**
   - **Processes and execution times:**
     - P1: Arrival = 0 ms, Execution = 8 ms
     - P2: Arrival = 1 ms, Execution = 5 ms
     - P3: Arrival = 2 ms, Execution = 10 ms
     - P4: Arrival = 3 ms, Execution = 4 ms
   - **A)** Average waiting time: 12.75 ms
   - **B)** Average waiting time: 13.25 ms
   - **C)** Average waiting time: 11.75 ms
   - **D)** Average waiting time: 12.25 ms
   - **Correct answer: A**

10. **With the Shortest Job First (SJF) algorithm, what will be the execution order and average waiting time?**
    - **Processes and execution times:**
      - P1: Arrival = 0 ms, Execution = 8 ms
      - P2: Arrival = 0 ms, Execution = 4 ms
      - P3: Arrival = 0 ms, Execution = 2 ms
      - P4: Arrival = 0 ms, Execution = 6 ms
    - **A)** Average waiting time: 5.5 ms
    - **B)** Average waiting time: 5 ms
    - **C)** Average waiting time: 4.5 ms
    - **D)** Average waiting time: 6 ms
    - **Correct answer: B**

11. **With the Shortest Job First (SJF) algorithm, what will be the execution order and average waiting time?**
    - **Processes and execution times:**
      - P1: Arrival = 0 ms, Execution = 7 ms
      - P2: Arrival = 1 ms, Execution = 4 ms
      - P3: Arrival = 2 ms, Execution = 1 ms
      - P4: Arrival = 3 ms, Execution = 4 ms
    - **A)** Average waiting time: 5.5 ms
    - **B)** Average waiting time: 5 ms
    - **C)** Average waiting time: 4.5 ms
    - **D)** Average waiting time: 5.25 ms
    - **Correct answer: D**

12. **With the Shortest Remaining Time First (SRTF) algorithm, what is the average waiting time?**
    - **Processes and execution times:**
      - P1: Arrival = 0 ms, Execution = 6 ms
      - P2: Arrival = 2 ms, Execution = 4 ms
      - P3: Arrival = 4 ms, Execution = 3 ms

■ P4: Arrival = 6 ms, Execution = 5 ms
- ○ **A)** 3.5 ms
- ○ **B)** 4 ms
- ○ **C)** 2.7 ms
- ○ **D)** 4.6 ms
- ○ **Correct answer: B**

13. **With Shortest Remaining Time First (SRTF) algorithm, what is the average waiting time?**
    - ○ **Processes and execution times:**
        - ■ P1: Arrival = 0 ms, Execution = 8 ms
        - ■ P2: Arrival = 1 ms, Execution = 4 ms
        - ■ P3: Arrival = 2 ms, Execution = 9 ms
        - ■ P4: Arrival = 3 ms, Execution = 5 ms
    - ○ **A)** 6.5 ms
    - ○ **B)** 4.25 ms
    - ○ **C)** 5.8 ms
    - ○ **D)** 6.25 ms
    - ○ **Correct answer: A**

14. **Suppose processes alternate CPU and I/O in a Round Robin system with a time quantum of 3 ms. What will be the average waiting time for the processes?**
    - ○ **Processes and CPU/I/O execution times:**
        - ■ P1 = 5 ms (CPU), 2 ms (I/O), 4 ms (CPU)
        - ■ P2 = 7 ms (CPU), 3 ms (I/O)
        - ■ P3 = 4 ms (CPU), 5 ms (I/O), 3 ms (CPU)
    - ○ **A)** 9.67 ms
    - ○ **B)** 10.5 ms
    - ○ **C)** 10.67 ms
    - ○ **D)** 11 ms
    - ○ **Correct answer: C**

Creating Processes and Threads

15. **Upon a successful fork() system call, what will be the value returned to the child process created?**
    - ○ **A)** 0 to the child, PID of the child to the parent
    - ○ **B)** PID of the child to both parent and child
    - ○ **C)** 0 to parent, parent's PID to child
    - ○ **D)** 0 to the child, 0 to the parent
    - ○ **Correct answer: A**

16. **What does thread termination mean in a multithreaded process?**
    - ○ **A)** The parent process terminates automatically

- **B)** All threads in the process terminate
- **C)** The process continues to run with the remaining threads
- **D)** The operating system restarts the thread
- **Correct answer: C**

17. **Which system call allows the parent process to wait for the child process to complete?**
    - **A)** exec()
    - **B)** wait()
    - **C)** join()
    - **D)** sleep()
    - **Correct answer: B**

18. **When a thread accesses a shared variable, what is the risk without proper synchronization measures?**
    - **A)** Deadlock
    - **B)** Race conditions
    - **C)** Starvation
    - **D)** Mutual exclusion
    - **Correct answer: B**

19. **Why can using threads improve performance in an application?**
    - **A)** Threads require more memory than the process
    - **B)** Threads allow parallel execution within a process
    - **C)** Threads reduce CPU usage
    - **D)** Threads replace the process
    - **Correct answer: B**

Synchronization (Lock, Semaphores, Monitor)

20. **Which of the following statements is true about binary semaphores?**
    - **A)** They can only take values 0 or 1
    - **B)** They are more efficient than locks
    - **C)** They cannot be used for access control
    - **D)** They do not require synchronization
    - **Correct answer: A**

21. **What is the main advantage of using monitors for synchronization?**
    - **A)** They allow non-exclusive access to resources
    - **B)** They avoid race condition problems more easily
    - **C)** They are faster than semaphores
    - **D)** They do not require access blocks
    - **Correct answer: B**

22. Which of the following synchronization mechanisms uses a counter to manage access to a multiple resource?
- **A)** Monitor
- **B)** Counting semaphore
- **C)** Mutex
- **D)** Binary lock
- **Correct answer: B**

23. What is a deadlock in terms of process synchronization?
- **A)** A process waiting to terminate
- **B)** An area of memory occupied by multiple processes
- **C)** A situation where no process can advance because it is blocked
- **D)** A simultaneous access to a shared variable
- **Correct answer: C**

24. What is the main difference between mutex and semaphore?
- **A)** Mutexes are counters, semaphores are not
- **B)** Semaphores only protect global variables
- **C)** Mutexes allow only a single process at a time, semaphores allow more than one.
- **D)** Semaphores cannot cause deadlocks
- **Correct answer: C**