Exam #1 Study Suggestions

Major Areas

Computer System Overview
Operating System Overview
Process and Thread Management
Concurrency

Computer System Overview

Basic elements of a computer
The fetch-execute cycle
Dual-mode operation and privileged instructions
Interrupts
The fetch-execute cycle with interrupts
Interrupt processing
DMA (direct memory access)

Review Questions

1. What are the major components of a modern computer?
2. What is dual-mode operation?
3. What are interrupts and how are they processed?
4. What is the difference between a hardware interrupt and a software interrupt (exception or trap)?
5. What is an ISR (interrupt service routine)?
6. What is DMA (direct memory access)?
7. What is limited direct execution?

Operating System Overview

Major functions of an operating system
Evolution of operating systems
Linux system organization
The Linux kernel and system calls

Review Questions

8. What are the major functions of an operating system?
9. What are the four major advances in operating systems according to Denning?
10. What are the main characteristics of a simple batch operating system?
11. What are the main characteristics of a multiprogrammed batch operating system?
12. What are the main characteristics of a time sharing operating system?
Process and Thread Management

Process basics
Five state model
Suspended processes and the seven state model
Process description (PCBs, OS tables)
Kernel execution models
Traditional UNIX process management
Thread basics
Modern Linux process management
Thread implementations (user-level threads, kernel-level threads, combined approaches)
POSIX threads library

Review Questions

13. What is a process? What is the relationship between a process and a PCB (process control block)?

14. What is an instruction trace of a process?

15. What is the five-state process model? What are the states in the model, and what causes the transitions between the different states?

16. What is the seven-state process model? What two states (and associated transitions) are different from the five-state process model?

17. What data structures are typically used by the operating system to manage processes?

18. What information is typically stored in a PCB (process control block)?

19. What is a mode switch? What is a process switch?

20. What is the purpose of each state and each transition between states in the UNIX Process State Transition Diagram (Stallings, Figure 3.17)?

21. How are processes managed in a traditional UNIX environment?

22. What is a thread? How is a thread different from a process?

23. How are processes and threads managed in a modern Linux environment?

Concurrency

Principles of concurrency
The Critical Section Problem
Software support for mutual exclusion (Peterson’s algorithm)
Hardware support for mutual exclusion (atomic machine language instructions)
Semaphores
The producer/consumer problem
The readers/writers problem

Review Questions

24. What is the Critical Section Problem?

25. What are the constraints on a solution to the Critical Section Problem?
26. What are the characteristics of a software solution to the Critical Section Problem?

27. What are the characteristics of a hardware solution to the Critical Section Problem?

28. What are semaphores? What are the basic operations on semaphores?

29. How are semaphores used to solve the Critical Section Problem?

30. How are semaphores used to coordinate separate tasks?

31. What is the Producer/Consumer problem?

32. What is the Readers/Writers problem?