

Introduction to Operating Systems and Structure

Overview

The practise questions are designed to complement and enhance your knowledge of topics covered in the lectures. Not all answers will be readily found on the lecture notes and slides, and you may be required to engage in some self-learning to complete the questions.

Suggested answers to the questions shall be provided at a later date. It is strongly advised that you attempt these questions on your own, and discuss them with your peers before consulting the suggested answers.

Practise Questions

1. In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.
 - a. What are two such problems?
 - b. Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer.
2. The issue of resource utilization shows up in different forms in different types of operating systems. List what resources must be managed carefully in the following settings
 - a. Mainframe or server systems
 - b. Workstations
 - c. Handheld computers
3. Describe the differences between symmetric and asymmetric multiprocessing.
4. What are three advantages and one disadvantage of multiprocessor systems?
5. What is the purpose of interrupts?
6. What are the differences between a trap and an interrupt? Can traps be generated intentionally by a user program? If so, for what purpose?

7. Direct memory access (DMA) is used for high-speed I/O devices in order to avoid increasing the CPU's execution load.
 - a. How does the CPU interface with the device to coordinate the transfer?
 - b. How does the CPU know when the memory operations are complete?
 - c. The CPU is allowed to execute other programs while the DMA controller is transferring data. Does this process interfere with the execution of the user programs? If so, describe what forms of interference are caused.
8. Many symmetric multiprocessing (SMP) systems have different levels of caches; one level is local to each processing core, and another level is shared among all processing cores. Why are caching systems designed this way?
9. Discuss, with examples, how the problem of maintaining coherence of cached data manifests itself in the following processing environments
 - a. Single-processor systems
 - b. Multiprocessor systems
10. What are the five major activities of an operating system regarding file management?
11. What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of using the microkernel approach?
12. Which instructions should not be permitted in the user mode? Explain your answer for each of the instructions.
 - a. Read device register for a given device
 - b. Read the time-of-day clock
 - c. Disable all interrupts

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