SA1 Operating Systems Lecture Practice Test (Sample)

Study Guide

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Questions

1. Which service model allows the storage of data and applications via the internet?

A. Infrastructure as a Service (IaaS)

B. Platform as a Service (PaaS)

C. Software as a Service (SaaS)

D. Network as a Service (NaaS)

2. Which term describes an instance of a program that is currently being executed?

A. Thread

B. Task

C. Process

D. Session

3. What does a bootloader do in a computer system?

A. It manages system memory allocation

B. It initializes system hardware and loads the operating system

C. It provides a graphical user interface

D. It executes user commands and scripts

4. _____ is a defense of the system against internal and external attacks.

A. Defense

B. Security

C. Protection

D. Quarantine

5. What is the primary purpose of paging in memory management?

A. To ensure contiguous allocation of physical memory

B. To break memory into fixed-size blocks for efficient allocation

C. To completely eliminate the use of physical memory

D. To provide exclusive access to memory for each process

6. What is indicated by the program counter in a process?

- **A. The memory usage of the process**
- **B. The address of the next instruction to be executed**
- **C. The total runtime of the process**
- **D. The number of active child processes**

7. In a computer system operation, what is true about device controllers?

- **A. Each device controller has a local buffer**
- **B. All device controllers share the same buffer**
- **C. Device controllers do not use buffers**
- **D. Local buffers are only for the CPU**

8. What type of computing specifically refers to handheld smartphones and tablet computers?

- **A. Virtual Computing**
- **B. Client-server**
- **C. Cloud Computing**
- **D. Mobile Computing**

9. What defines asymmetric multiprocessing?

- **A. All processors share the same task equally**
- **B. Processors have specific roles and may run different processes**
- **C. Processors only perform I/O operations**
- **D. All processors are equal in terms of performance**

10. What should an operating system be able to detect within a computer system?

- **A. Malware**
- **B. Errors**
- **C. File types**
- **D. Software programs**

Answers

1. C
2. C
3. B
4. B
5. B
6. B
7. A
8. D
9. B
10. B

Explanations

1. Which service model allows the storage of data and applications via the internet?

A. Infrastructure as a Service (IaaS)

B. Platform as a Service (PaaS)

C. Software as a Service (SaaS)

D. Network as a Service (NaaS)

The correct choice pertains to Software as a Service (SaaS), which is a cloud computing service model that enables users to access applications and data via the internet. In this model, the service provider hosts the software and manages everything from infrastructure to application maintenance, making it easily accessible over the web. With SaaS, users can use software applications without needing to install or maintain them on their local devices. This model offers a high degree of convenience and flexibility, allowing users to access services from any internet-connected device, which is particularly beneficial for collaboration and remote work. Notably, popular examples of SaaS providers include applications like Google Workspace and Microsoft 365, where both data storage and application functionalities are provided online. The other service models, while related to cloud computing, serve different purposes. Infrastructure as a Service (IaaS) focuses on providing virtualized computing resources over the internet, while Platform as a Service (PaaS) offers a platform for developers to build and deploy applications without handling the underlying infrastructure. Network as a Service (NaaS) refers to the provision of network services over the internet, which does not encompass the storage of applications or data in the same manner as SaaS.

2. Which term describes an instance of a program that is currently being executed?

A. Thread

B. Task

C. Process

D. Session

A process is defined as an instance of a program that is currently being executed. When a program is loaded into memory and begins execution, it becomes a process. This includes not only the code of the program but also its current activity, which consists of the program counter, the contents of the processor's registers, and the variables that are in use. Processes are fundamental to the operating system's ability to manage multitasking, as they allow the CPU to handle various tasks simultaneously. Each process operates in its own memory space, thus providing isolation and security from other processes. In contrast, while threads can also be running instances of a program, they are generally considered as smaller units of a process that can run concurrently within the same memory space of a process. The other terms, such as tasks and sessions, do not specifically refer to an instance of a program in execution as clearly as "process" does. A task can refer to a more abstract concept of work that needs to be done, possibly incorporating multiple processes, and a session is related to a user's interaction period with the computer, which may involve one or many processes, but does not singly represent an executing program instance.

3. What does a bootloader do in a computer system?

A. It manages system memory allocation

B. It initializes system hardware and loads the operating system

C. It provides a graphical user interface

D. It executes user commands and scripts

The bootloader is a crucial component of a computer system's startup process. Its primary role is to initialize the system hardware and load the operating system into memory so that the system can begin functioning. When a computer is powered on, the bootloader is one of the first pieces of software that runs. After the initial power-on self-test (POST) checks, it locates the operating system—typically stored on a hard drive or SSD—and loads it into memory, transferring control to it. This process ensures that the operating system is ready to manage the hardware and provide the necessary services for user applications. Other choices do not accurately describe the bootloader's function. While system memory allocation is a task of the operating system rather than the bootloader, the graphical user interface is part of an operating system's features. Similarly, executing user commands and scripts is a function of the operating system's shell or command line interface, not the bootloader. Thus, the choice clarifies the unique and essential role of the bootloader in the overall booting process of a computer system.

4. _____ is a defense of the system against internal and external attacks.

A. Defense

B. Security

C. Protection

D. Quarantine

The concept of security encompasses a range of strategies and measures designed to protect a system from both internal and external threats. Security includes the implementation of protocols, policies, and technologies that safeguard sensitive data, ensure confidentiality, and maintain the integrity and availability of systems. This involves not just defending against direct attacks, such as hacking or malware, but also protecting against potential internal vulnerabilities, such as insider threats. While the other terms may relate to specific aspects of safeguarding a system—such as protection focusing on physical and logical barriers or quarantine addressing the isolation of potentially harmful elements—security is the comprehensive term that captures the ultimate goal of defending a system robustly against all possible threats. Therefore, selecting security reflects the broader framework necessary to ensure the safety and resilience of computing systems against a wide array of attack vectors.

5. What is the primary purpose of paging in memory management?

A. To ensure contiguous allocation of physical memory

B. To break memory into fixed-size blocks for efficient allocation

C. To completely eliminate the use of physical memory

D. To provide exclusive access to memory for each process

The primary purpose of paging in memory management is to break memory into fixed-size blocks, known as pages. This technique allows the operating system to manage memory more efficiently by using smaller units, which helps in avoiding issues like fragmentation. By dividing memory into these fixed-size pages, the operating system can store them in non-contiguous locations in physical memory. This flexibility allows for better utilization of memory and facilitates the allocation and deallocation processes. Additionally, paging contributes to a simplified memory management model because it allows processes to use virtual memory that does not need to be contiguous in physical memory. This means that processes can be loaded into any available memory, thereby optimizing the use of physical resources. This system can also enhance system stability and performance, allowing for smoother multitasking and better resource allocation among multiple processes.

6. What is indicated by the program counter in a process?

A. The memory usage of the process

B. The address of the next instruction to be executed

C. The total runtime of the process

D. The number of active child processes

The program counter (PC) is a crucial component of a computer's CPU that tracks the execution of a program. Specifically, it holds the memory address of the next instruction that the processor is expected to execute. This allows the CPU to know where to fetch the following instruction from memory, ensuring that the program runs in the correct sequence. Having the program counter incremented correctly is essential for the flow of control in a program. When an instruction is executed, the program counter updates to point to the next instruction, whether it's sequential or depends on branching due to conditions or loops. This mechanism enables the CPU to manage the execution of multiple processes efficiently, ensuring that each process can resume correctly from the point it was last executing. Understanding the role of the program counter is fundamental in grasping how processes and instructions are managed within an operating system.

7. In a computer system operation, what is true about device controllers?

A. Each device controller has a local buffer

B. All device controllers share the same buffer

C. Device controllers do not use buffers

D. Local buffers are only for the CPU

Device controllers are specialized hardware components that manage input and output operations for various devices, such as disk drives, printers, and network cards. Each device controller having a local buffer is true because these buffers serve as temporary storage areas that hold data being transferred to and from the device. This setup allows for efficient communication between the device and the rest of the computer system. The local buffer helps to match the speed differences between the CPU and the I/O device. For example, while the CPU can process instructions at a much faster rate than most I/O devices can send or receive data, the buffer allows the CPU to continue executing other tasks instead of waiting for the I/O operations to complete. This mechanism enhances overall system performance and responsiveness. In contrast, shared buffers wouldn't provide the same level of efficiency since access to a single shared buffer could lead to bottlenecks and increased contention among devices. Further, asserting that device controllers do not use buffers overlooks the critical role these buffers play in managing data flow and ensuring that the system operates smoothly. Additionally, local buffers are exclusive to device controllers and are not intended solely for the CPU. This distinction is vital for understanding how device controllers optimize data handling in a computer system.

8. What type of computing specifically refers to handheld smartphones and tablet computers?

A. Virtual Computing

B. Client-server

C. Cloud Computing

D. Mobile Computing

Mobile computing specifically refers to the use of handheld devices such as smartphones and tablet computers. This term encompasses the ability to use these devices in a variety of locations, allowing for communication and data access on the go. The key aspect of mobile computing is its focus on portability, which enables users to perform tasks anywhere, taking advantage of wireless connections. This concept not only includes the hardware (the mobile devices themselves) but also the software and services that facilitate connectivity and functionality, enhancing the usability of applications in a mobile environment. Mobile computing often relies on technologies like mobile networks, wireless broadband, and GPS, which are integral to smartphones and tablets. In contrast, virtual computing typically involves running operating systems or applications in a virtual environment on a powerful server rather than on portable devices. Client-server computing describes a model where client computers communicate with a central server, while cloud computing refers to the delivery of computing services over the internet. Both of these concepts do not specifically highlight the portability and user mobility that characterize mobile computing.

9. What defines asymmetric multiprocessing?

A. All processors share the same task equally

B. Processors have specific roles and may run different processes

C. Processors only perform I/O operations

D. All processors are equal in terms of performance

Asymmetric multiprocessing is characterized by the division of labor between processors where each processor has specific roles or functions. This means that processors may not operate on the same tasks concurrently; instead, they can be assigned different processes based on certain criteria, such as the type of workload or the specific function needed. For example, one processor might handle user interface tasks while another manages background processes. This arrangement can lead to more efficient use of resources because each processor can be optimized for its assigned role. In contrast, the other options suggest scenarios that do not accurately reflect the nature of asymmetric multiprocessing. For instance, the idea that all processors share the same task equally aligns more with symmetric multiprocessing, where tasks are distributed evenly among all processors. Additionally, the notion that processors only perform I/O operations is too restrictive and does not encapsulate the variety of functions that processors in an asymmetric system might undertake. Lastly, claiming that all processors are equal in terms of performance contradicts the very idea of asymmetric architecture, where different processors may have different capabilities and responsibilities.

10. What should an operating system be able to detect within a computer system?

A. Malware

B. Errors

C. File types

D. Software programs

An operating system (OS) plays a crucial role in maintaining the overall health and stability of a computer system. One of its primary responsibilities is to detect and manage errors that may occur within the hardware or software components. When errors arise, whether they are due to memory faults, hardware malfunctions, or software bugs, an operating system has mechanisms in place to identify these issues. For instance, it can monitor system resource usage and respond to anomalies such as memory leaks or conflicts, and it can also track system processes to detect failures. The OS may log these errors, alert the user, or take predefined actions to ameliorate the impact of the error, such as terminating a malfunctioning process. Recognizing errors is essential for ensuring system reliability, as it allows the OS to take corrective measures. This can prevent crashes, data loss, and other negative effects that may disrupt the user's experience or compromise data integrity. While the OS can also have features related to other options, such as managing software programs or recognizing file types, the core function of error detection is fundamental to the operating system's role in maintaining a stable operating environment.