Guide to Operating Systems 6th edition Tomsho Solutions Manual

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Guide to Operating Systems, 6e: Module 1 Solutions

Review Questions

1. Which of the following is a basic function all computers perform? (Choose three.)
a. processing
b. Internet access
c. graphics
d. input
e. email
f. output

Analysis:
a. Correct. The three basic functions that all computers perform are input, processing, and output.
b. Incorrect. Internet access is typically performed by desktop computers running a general-purpose OS, but there are many other types of computers.
c. Incorrect. Graphics are typically performed by desktop computers running a general-purpose OS, but there are many other types of computers.
d. Correct. The three basic functions that all computers perform are input, processing, and output.
e. Incorrect. Email is typically performed by desktop computers running a general-purpose OS, but there are many other types of computers.
f. Correct. The three basic functions that all computers perform are input, processing, and output.

2. Which of the following executes instructions provided by computer programs?
a. NIC
b. USB
c. CPU
d. drive

Analysis:
a. Incorrect. NIC is incorrect because it handles network communication.
b. Incorrect. USB is incorrect because it provides a serial I/O interface.
c. Correct. CPU is correct because it processes instructions.
d. Incorrect. Drive is incorrect because a drive is usually a storage device.

3. You are asked to develop a process that runs in the background and handles network communications. What type of process should you develop?
a. service
b. ISR
c. kernel
d. foreground

Analysis:
a. Correct. Service is correct because it is a process that runs in the background.
b. Incorrect. ISR is incorrect because it is an interrupt service routine that handles interrupts caused by I/O devices.

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c. Incorrect. Kernel is incorrect because it is the core component of an OS.
d. Incorrect. Foreground is incorrect because a foreground process has a user interface and does not run in the background.

4. Which of the following is a feature typically provided by an operating system? (Choose two.)
a. file system
b. spreadsheet
c. database app
d. kernel

Analysis:
a. Correct. The file system and kernel are two components of most OSs.
b. Incorrect. Spreadsheet is incorrect because it is a user application that is installed and uses OS components and services.
c. Incorrect. Database app is incorrect because it is a user application that is installed and uses OS components and services.
d. Correct. The file system and kernel are two components of most OSs.

5. A friend of yours described a program he is writing that runs on a microcontroller and will read sensors and write to devices that control industrial equipment. What type of system is his program most likely working with?
a. general-purpose operating system
b. multiuser operating system
c. embedded system
d. multitasking system

Analysis:
a. Incorrect. General-purpose operating system is incorrect because it is typically used to run business applications on desktop and server computers.
b. Incorrect. A multiuser system might be a feature of an embedded system, but it is also a feature of a general-purpose system.
c. Correct. Embedded system is the best answer because it is a type of computing system used to read sensors and control equipment.
d. Incorrect. A multitasking system might be a feature of an embedded system, but it is also a feature of a general-purpose system.

6. While on a coffee break, your colleague asserts that cooperative multitasking is the best operating system design. What is your response? (Choose three.)
a. A disadvantage of cooperative multitasking is that it relies on each program to decide when to give control back to the operating system.
b. Cooperative multitasking can be faster than other forms of multitasking because it increases the clock speed of the processor.
c. Cooperative multitasking OSs can freeze due to a process getting stuck in an infinite loop.
d. Modern operating systems use preemptive multitasking so that the operating system is fully in control.
e. Cooperative multitasking is best used on real-time operating systems.

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Analysis:
a. Correct. Cooperative multitasking has drawbacks because the performance of the system as a whole is dependent on all the processes playing by the rules and cooperating.
b. Incorrect. This answer is incorrect because cooperative multitasking does not increase the clock speed of the processor.
c. Correct. Cooperative multitasking has drawbacks because the performance of the system as a whole is dependent on all the processes playing by the rules and cooperating.
d. Correct. Cooperative multitasking has drawbacks because the performance of the system as a whole is dependent on all the processes playing by the rules and cooperating.
e. Incorrect. This answer is incorrect because real-time systems require strict timing of running tasks controlled by the OS.

7. You have been asked to recommend an operating system for a project that requires precise timing of I/O devices and deterministic response times to events. Which OS should you recommend?
a. Android
b. VxWorks
c. Linux
d. PDP-10

Analysis:
a. Incorrect. Android, Linux, and PDP-10 do not provide these features, although modified versions of Linux can.
b. Correct. VxWorks is the best answer because it is a real-time OS that provides precise timing and deterministic response times.
c. Incorrect. Android, Linux, and PDP-10 do not provide these features, although modified versions of Linux can.
d. Incorrect. Android, Linux, and PDP-10 do not provide these features, although modified versions of Linux can.

8. Which of the following is best to run on a client operating system?
a. DHCP server
b. Active Directory
c. virtualization
d. Web browser

Analysis:
a. Incorrect. A DHCP server, Active Directory, and virtualization are all designed as server applications, although virtualization is often run on both clients and servers.
b. Incorrect. A DHCP server, Active Directory, and virtualization are all designed as server applications, although virtualization is often run on both clients and servers.
c. Incorrect. A DHCP server, Active Directory, and virtualization are all designed as server applications, although virtualization is often run on both clients and servers.
d. Correct. Web browser is correct because it is designed as a client application.

9. Which component of the operating system gets called when a process must be allocated memory and scheduled to run?
a. kernel
b. user interface

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c. file system
d. application

Analysis:
a. Correct. Kernel is correct because it oversees memory allocation and process scheduling.
b. Incorrect. The user interface is the point of human-computer interaction and communication in a device, such as a keyboard, mouse, or touch screen.
c. Incorrect. The file system is how an OS stores and organizes files—it controls how data is stored and retrieved.
d. Incorrect. An application, or app, is a software program that runs on your computer, such as Web browsers, email programs, word processors, or games.

10. A new application you are installing is critical to business operations and downtime is to be avoided. In addition, fast response times are necessary, so performance must be scaled when more users start using the system. What OS and server hardware feature should you consider implementing on the system on which the application is installed?
a. single-tasking
b. interrupts
c. real-time
d. clustering

Analysis:
a. Incorrect. Single-tasking is a feature that might be found in an OS, but it does not provide load balancing and fault tolerance.
b. Incorrect. Interrupts might be found in an OS, but they do not provide load balancing and fault tolerance.
c. Incorrect. Real-time capabilities might be found in an OS, but they do not provide load balancing and fault tolerance.
d. Correct. Clustering can provide load balancing and fault tolerance.

11. Which of the following best describes the MS-DOS operating system?
a. client
b. real-time
c. standalone
d. embedded

Analysis:
a. Incorrect. Client is incorrect because MS-DOS does not provide client services unless additional software is installed.
b. Incorrect. Real-time is incorrect because MS-DOS is not a real-time system.
c. Correct. Standalone is correct because MS-DOS is a standalone OS that does not have built-in networking capability.
d. Incorrect. Embedded is incorrect because MS-DOS is not designed for embedded applications.

12. Which of the following are you most likely to find in firmware?
a. kernel
b. bootstrap

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c. LILO
d. ISR

Analysis:
a. Incorrect. The kernel is part of the OS that is loaded by a bootstrap.
b. Correct. Bootstrap is correct, as it is a function of the firmware that allows a computer to find and load an operating system.
c. Incorrect. LILO is a bootloader that is loaded by a bootstrap.
d. Incorrect. ISR is an interrupt service routine that handles interrupts and is a component of a device driver, but it is not typically a component of firmware.

13. A colleague asks you where the code for the power-on self-test is located. What do you tell her?
a. bootloader
b. hard disk
c. non-volatile memory
d. random access memory

Analysis:
a. Incorrect. The bootloader does not perform POST functions.
b. Incorrect. While a hard disk is non-volatile, the POST is stored in non-volatile memory like Flash or EPROM that is built into the system board.
c. Correct. Non-volatile memory is correct because the power-on self-test (POST) is usually a part of the firmware, which is stored in non-volatile memory.
d. Incorrect. Random access memory is volatile and loses its contents when power is removed from the system.

14. You're writing a program that must enable and disable interrupts. In which CPU mode must your program operate?
a. user mode
b. real-time mode
c. POST mode
d. kernel mode

Analysis:
a. Incorrect. User mode is a lower priority and is not used for interrupt handling.
b. Incorrect. Real-time mode is not a valid CPU mode.
c. Incorrect. POST mode is not a valid CPU mode.
d. Correct. Interrupts must be handled in kernel mode because they require high priority, and CPU instructions for enabling and disabling interrupts are only allowed in kernel mode.

15. Your manager has asked you to terminate a process running on a Linux server. Before you can terminate the process, what information do you need?
a. the PID
b. the file handle
c. the IRQ number
d. the I/O address

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Analysis:
a. Correct. PID is correct because it is the process ID, which the kill program and other programs that can terminate processes use to specify the process that should be terminated.
b. Incorrect. The file handle cannot be used to terminate a process. It is an identifier for a file that contains all the information the file system needs to locate and access the file.
c. Incorrect. The IRQ number cannot be used to terminate a process. Interrupt request (IRQ) lines are the pins on a CPU that change state (from on to off or vice versa) when an interrupt signal is generated by an I/O device.
d. Incorrect. The I/O address cannot be used to terminate a process. Unique input/output (I/O) addresses are assigned to every I/O port on your computer to allow it to easily recognize and locate devices attached to it.

16. Which of the following are ways that a process is created? (Choose two.)
a. by the bootloader
b. by the BIOS POST routine
c. by a file handle
d. by the user

Analysis:
a. Correct. The bootloader and the user can request processes to be loaded and run.
b. Incorrect. The BIOS POST routine is part of the firmware and terminates before processes can be created.
c. Incorrect. A file handle is an identifier for an open file and has no role in process creation.
d. Correct. The bootloader and the user can request processes to be loaded and run.

17. Which of the following is performed by the BIOS? (Choose two.)
a. runs the power-on self-test
b. starts the operating system
c. manages the file system
d. allocates memory to applications

Analysis:
a. Correct. The BIOS runs the POST and contains the code to start the OS.
b. Correct. The BIOS runs the POST and contains the code to start the OS.
c. Incorrect. Once the OS is started, it is responsible for managing the file system and allocating memory.
d. Incorrect. Once the OS is started, it is responsible for managing the file system and allocating memory.

18. Which method of I/O handling uses a round-robin technique?
a. interrupts
b. NMI
c. polling
d. RTOS

Analysis:
a. Incorrect. Interrupts are the opposite of polling because with interrupts, the I/O device tells the OS when it needs servicing and the OS responds in the order the interrupts occur.

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b. Incorrect. NMI means non-maskable interrupt and is not a method for handling I/O.
c. Correct. Polling is correct. With polling, the OS checks each I/O device in turn to see if it needs servicing, a technique called round-robin.
d. Incorrect. RTOS means real-time OS and is not a method for handling I/O.

19. Which type of operating system is most likely to be part of an embedded system?
a. task-switching
b. cooperative multitasking
c. real-time
d. batch processing

Analysis:
a. Incorrect. Task-switching is a method for running and loading processes, but it does not necessarily provide deterministic processing.
b. Incorrect. Cooperative multitasking is a method for running and loading processes, but it does not necessarily provide deterministic processing.
c. Correct. Real-time is correct because many embedded systems need to respond in a timely and deterministic manner to changes in outside conditions.
d. Incorrect. Batch processing is a method for running and loading processes, but it does not necessarily provide deterministic processing.

20. Which aspect of security and protection services verifies that an account has permission to perform an action on an operating system?
a. authentication
b. determinism
c. preemption
d. authorization

Analysis:
a. Incorrect. Authentication is not correct because it verifies the identity of an account but does not authorize specific actions that can be performed by the account.
b. Incorrect. Determinism is a term associated with process handling and is not associated with security.
c. Incorrect. Preemption is a term associated with process handling and is not associated with security.
d. Correct. Authorization is correct because it allows an account to perform actions on a computer.

Hands-On Projects

Hands-On Project 1-1: Exploring the History of the Computer

Answers to questions posed in this project can be found at the Web sites shown in the project.

Critical Thinking: Activities

This module has no critical thinking activities.

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Critical Thinking: Case Projects

Case Project 1-1: Basic Operating System Functions

Answers will vary but the presentation should include at least some of these elements:

- User interface
- Storage management
- Process and service management
- Memory and I/O management
- Security and resource protection
- The kernel
- Brief discussion of the types of operating systems (real-time vs. general-purpose)
- Current OSs that should be discussed: Windows 10, Windows Server 2016/2019, Linux varieties, macOS

Grading Rubric

Category	***Description***	***Points Possible***	***Points Earned***
Content of Posting	1. Presentation should include at least four of the six OS elements and a description of each (this answer counts for 60 percent of the possible points, and should be up to 200 words) 2. Types of OSs should be briefly described: real-time vs. general-purpose (20 percent, 100 words) 3. Current OS choices for servers and clients should be listed and described (20 percent, 100 words)	45	
Format of Posting	Grammar, spelling, punctuation	5	
	Total Points	50	

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Case Project 1-2: Device Drivers

The discussion should include the definition of a device driver and then its importance in today's operating systems. It might also include a short discussion on IRQs and ISRs and the fact that drivers run in kernel mode, so any problems with them can lead to OS failures. On Windows systems, drivers should be signed to verify that they come from a trusted source, because a driver that contains malware can severely damage a system due to running in kernel mode.

Grading Rubric

Category	*Description*	*Points Possible*	*Points Earned*
Content of Posting	Device driver discussion (100 words)	20	
Format of Posting	Grammar, spelling, punctuation	5	
	Total Points	25	

Case Project 1-3: Choosing a New Server

The options for a server operating system include the following systems mentioned in this text:

- Windows Server 2016 or Server 2019; Windows Server 2012 is too close to its end of life to consider on new servers.
- UNIX/Linux
- macOS Server

While this topic hasn't been discussed yet, students might consider that the server OS and client OS often work best together when both OSs are from the same vendor.

Grading Rubric

Category	*Description*	*Points Possible*	*Points Earned*
Content of Posting	Discussion of positives and negatives of modern server OSs and recommendation (200 words)	30	
Format of Posting	Grammar, spelling, punctuation	5	
	Total Points	35	

Case Project 1-4: Choosing New Desktop Systems

Candidates for the desktop operating system should include:

- Windows 10 1903 version at least. Windows 7 is too close to its end of life to keep or consider for new systems.
- Linux—A client-specific distribution such as Ubuntu or Fedora Workstation.
- macOS—Mojave is the latest version as of this writing, but Catalina should be out by the time this book is published.

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Modern operating system capabilities to look for include:

- A secure authentication system and the ability to secure files and folders
- Malware protection and a built-in firewall
- Compatibility with the server OS for seamless access to shared resources
- Excellent hardware support with easy access to drivers for new devices
- Regular updates to patch security vulnerabilities that are discovered by malware authors

Cost is another factor to consider. For example, many Linux distributions can be obtained for free as open source software. Also, applications that run on Linux computers are often free, such as software from OpenOffice.org. Some public institutions have adopted Linux and open source software because of the costs. However, hidden costs exist for retraining users and making the transition to new systems.

Grading Rubric

Category	***Description***	***Points Possible***	***Points Earned***
Content of Posting	Discussion of modern client OSs and their advantages and disadvantages; explanation of the capabilities needed while factoring in costs (200 words)	30	
Format of Posting	Grammar, spelling, punctuation	5	
	Total Points	35	

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