**Instructions**

Provide concise answers to the following questions. Submission must be a Word or PDF document and must contain the question text above your answer.

**Chapter 1 Questions**

1. What are the three main purposes of an operating system?  
   - Manage the computer's resources, such as the central processing unit, memory, disk drives, and printers.  
   - Establish a user interface.  
   - Execute and provide services for applications software.
2. We have stressed the need for an operating system to make efficient use of the computing hardware. When is it appropriate for the operating system to forsake this principle and to “waste” resources? Why is such  
   a system not really wasteful?

- When very few tasks need to be handled in software like only I/O from the essential processes.

1. What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?

- Difficult keep OP handle in real-time system.

1. Keeping in mind the various definitions of operating system, consider whether the operating system should include applications such as web browsers and mail programs. Argue both that it should and that it should not, and support your answers.

- I think it depends on what user wishes installed. It’s convenient for users wanna a web browser but inconvenient when the other users wanna remove the useless application with them.

1. How does the distinction between kernel mode and user mode function as a rudimentary form of protection (security)?

- Because of critical resources protecting, only kernel space can access hardware device. So in user mode, it has limited capability to execute.

1. Which of the following instructions should be privileged?
   1. Set value of timer.
   2. Read the clock.
   3. Clear memory.
   4. Issue a trap instruction.
   5. Turn off interrupts.
   6. Modify entries in device-status table.
   7. Switch from user to kernel mode.
   8. Access I/O device.

The answers are 1, 3, 5, 6, 8

1. Some early computers protected the operating system by placing it in a memory partition that could not be modified by either the user job or the operating system itself. Describe two difficulties that you think could arise with such a scheme.

1. It’s impossible to modify the system as user wishes. Maybe some bugs could be happened or we need to install a driver, but we can’t do anything.

2. Sometimes, Operating system need to save important data such as password but now, it must be saved outside, not protected.

1. Some CPUs provide for more than two modes of operation. What are two possible uses of these multiple modes?

- CPU can support multiple modes(by default only kernel space and user space are distinguished). It can be separated into many groups in user mode. Only users in same group can execute the code that belongs to group.

1. Timers could be used to compute the current time. Provide a short description of how this could be accomplished.

- A timer can be set to interrupt, the computer after a specified period. The period may be fixed. A variable timer is generally implemented by a fixed-rate clock and a counter.

1. Give two reasons why caches are useful. What problems do they solve? What problems do they cause? If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the device?

1. Getting data from cache is faster than from main memory.

2. Cache is useful when two or more components need to exchange data.

- Using cache is faster than main memory but a big caches take a lot of time to synchronize with the main memory, so cache can be missed.

1. Distinguish between the client–server and peer-to-peer models of distributed systems.

Client-Server: Client must send requests to server to execute such as log in, server will verify client information to execute. Client-Server model is secure.

Peer to Peer: all connection systems are *peers*. No distinguish between server&client. Each peer can act like server or client depend on whether they are providing or requesting service.Peer-to-Peer model is faster and less expensive than Server-client model.

**Chapter 2 Questions**

1. What is the purpose of system calls?  
   - System calls can allow user space – processes call services of operating system.
2. What is the purpose of the command interpreter? Why is it usually separate from the kernel?

- The command interpreter is the way how users can interface with operating system. It’s lighter, easier to implement but more difficult to use than GUI. The command interpreter contains code to execute commands which it turns into system calls.

The command interpreter is just a software which allow users interact with kernel, so any changes made to the command-line cannot affect to the kernel since the kernel is the most important of operating system, any change made could be dangerous.

1. What system calls have to be executed by a command interpreter or shell in order to start a new process on a UNIX system?

- A fork system call followed by an exec system call need to be performed to start a new process. The fork call clones the currently executing process, while the exec call overlays a new process based on a different executable over the calling process.

1. What is the purpose of system programs?

- System programs are a bundles of system calls. They can solve common problems.

1. What is the main advantage of the layered approach to system design? What are the disadvantages of the layered approach?

- With the layered approach to system design, it’s easier to debug/modify, the changes affect limit the most, we don’t need to touch all sections of operating system.

But it takes a lot of time&effort to design a layered system.

1. List five services provided by an operating system, and explain how each creates convenience for users. In which cases would it be impossible for user-level programs to provide these services? Explain your answer.

a. I/O operations: keyboard, mouse, disk… The users need only specify device then the operating system can handle it all. User programs cannot access the devices.

b. Program Execution: An operating system must be able to load many kinds of activities into the memory and to execute it. The program must be end its execution.

Some of the activities which are performed by the operating system:

- The operating system Loads program into memory

- Handles the program’s execution  
- A mechanism for process synchronization

c. Communication: many processes can communicate with every process through communication lines in the network.  
- Two or more processes may require data to be transferred between the processes.  
- Both the processes can be on one computer or a different computer, but are connected through a computer network.

d. Resource management: When there are multiple jobs running at the same time resources must be allocated to each of them.

- The OS manages all kinds of resources using schedulers.  
- CPU scheduling algorithm is used for better utilization of CPU.

e. Protection: The information stored in a multi-users computer system. When several processes execute at the same time, it should not be possible for any process to interfere with another process. Every process in the computer system must be secured and in control.

1. Why do some systems store the operating system in firmware, while others store it on disk?

- For certain devices, a disk with a file system may be not available for the device. So, the operating system must be stored in firmware.

1. How could a system be designed to allow a choice of operating systems from which to boot? What would the bootstrap program need to do?  
   - When booting, the boot manager(stored at a certain location) will choose the operating system to boot into while the different systems are stored at different partitions.  
   - When we don’t determine which operating system to boot into, the boot manager will boot into the default system. In some cases, boot automatically into the default system without user choice although there are more than 2 operating system on disks.