**CHAPTER 1**

* 1. **INTRODUCTION**

**Practice Exercises**

1 What are the three main purposes of an operating system?

Resource Allocation

Supervision(giám sát)

Managing I/O devices

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?

It may be appropiate for operating systems to forsake the principle to make efficient use of the computer hardware and waste resources in case of single-user systems. In such systems, the use of computer resources must be maximized for the user.

* Such a system is not really wasteful because although a graphical user interface may waste CPU cycles, but by maximizing the use of the system, it optimizes the user's interaction with the system.

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

The main difficulty is keeping the operating system within the fixed time constraints of a real-time system.

4 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.

* As per computer architecture, the computer system is categorised into four major components: application programs, operating system, hardware, and user. The mail program and web browser belongs to application program, not to operating system.
* Operating system is defined as the program, which is running all the time on the computer system. But the mail programs and the web browsers do not run all the time on the system. Hence they cannot be regarded as operating systems.
* Operating System is defined as the program which acts as the interface between the hardware and the computer user, controlling and allocating the resources, thus they are part of the operating system.
* Also, the operating systems generally include all those applications which are provided by vendors. As many vendors provide mail programs and web browsers along with operating systems, they are also included in operating systems.

5 How does the distinction between kernelmode and usermode function as a rudimentary form of protection (security) system?

6 Which of the following instructions should be privileged(đặc quyền)?

Yellow is kernel mode

a. Set value of timer.

b. Read the clock.

c. Clear memory.

d. Issue a trap instruction.

e. Turn off interrupts.

f. Modify entries in device-status table.

g. Switch from user to kernel mode.

h. Access I/O device.

7 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.

The critical(quan trọng) data such as passwords and access control information(thông tin kiểm soát truy cập) that are required(yêu cầu) by or generated(tạo ra) by the operating system would have to be passed through or stored in unprotected memory slots and would be accessible to unauthotized users.

The operating system could never be updated or patched(sửa chữa), since it is not modifiable or accessible by the user or the operating system itself(bản thân hệ điều hành).

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

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

Chương trình cài timer khoảng 1 thời gian trong tương lai và đi vào chế độ sleep.Khi nó được đánh thức bởi sự kiện ngắt , nó có thể update dữ liệu(local state) ,sử dụng cơ chế update này để đếm số ngắt mà nó đạt được.Sau đó tiếp tục lặp lại process này, cài đặt timer interrupts và update dữ liệu(local state) của nó khi ngắt được gọi

10 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?

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

**Exercises**

12 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.

13 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 minicomputer systems

b. Workstations connected to servers

c. Mobile computers

14 Under what circumstances would a user be better off using a time- sharing system than a PC or a single-user workstation?

15 Describe the differences between symmetric and asymmetric multipro- cessing. What are three advantages and one disadvantage of multiprocessor systems?

16 How do clustered systems differ from multiprocessor systems?What is required for twomachines belonging to a cluster to cooperate to provide a highly available service?

17 Consider a computing cluster consisting of two nodes running a database. Describe two ways in which the cluster software can manage access to the data on the disk. Discuss the beneﬁts and disadvantages of each.

18 How are network computers different from traditional personal computers? Describe some usage scenarios in which it is advantageous to use network computers.

19 What is the purpose of interrupts? How does an interrupt differ from a trap? Can traps be generated intentionally by a user program? If so, for what purpose?

20 Direct memory access 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.

21 Some computer systems do not provide a privileged mode of operation in hardware. Is it possible to construct a secure operating system for these computer systems? Give arguments both that it is and that it is not possible.

22 Many 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?

23 Consider an SMP systemsimilar to the one shown in Figure 6. Illustrate with an example how data residing in memory could in fact have a different value in each of the local caches.

24 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

c. Distributed systems

25 Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs.

26 Which network conﬁguration—LAN or WAN—would best suit the following environments?

a. A campus student union

b. Several campus locations across a statewide university system

c. A neighborhood

27 Describe some of the challenges of designing operating systems for mobile devices compared with designing operating systems for traditional PCs.

28 What are some advantages of peer-to-peer systems over client-server systems?

29 Describe some distributed applications that would be appropriate for a peer-to-peer system.

30 Identify several advantages and several disadvantages of open-source operating systems. Include the types of people who would ﬁnd each aspect to be an advantage or a disadvantage.