Answers are in blue.

# For Exercises 1–15, mark the answers true and false as follows:



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**CHAPTER 11**

EXERCISES AND ANSWERS

1. **True**
2. **False**
   1. A text file stores binary data that is organized into groups of 8 or 16 bits that are interpreted as characters.

A

* 1. A program written in a high-level language is stored in a text file that is also called a *source file*.

A

* 1. The type of a file determines which kinds of operations can be performed on it.

A

* 1. The current file pointer indicates the end of a file. B
  2. Sequential access and direct access take about the same amount of time to retrieve data.

B

* 1. Some operating systems maintain a separate read pointer and write pointer for a file.

A

* 1. UNIX file permissions allow a group of users to access a file in various ways.

A

* 1. In most operating systems, a directory is represented as a file.

A

* 1. Two files in a directory system can have the same name if they are in different directories.

A

* 1. A relative path is relative to the root of the directory hierarchy. B
  2. An absolute path and a relative path will always be the same length.

B

* 1. An operating system is responsible for managing the access to a disk drive.

A

* 1. The seek time is the amount of time it takes for the heads of a disk to reach a particular cylinder.

A

* 1. The shortest-seek-time-first disk-scheduling algorithm moves the heads the minimum amount it can to satisfy a pending request.

A

* 1. The first-come, first-served disk-scheduling algorithm moves the heads the minimum amount it can to satisfy a pending request.

B

# For Exercises 16–20, match the file extensions with the appropriate file.

1. txt
2. mp3, au, and wav
3. gif, tiff, and jpg
4. doc and wp3
5. java, c, and cpp
   1. Audio file

B

* 1. Image file

C

* 1. Text data file A
  2. Program source file E
  3. Word processing file D

# For Exercises 21–23 , match the symbol with its use.

* + 1. **/**
    2. **\**
    3. **..**
  1. Symbol used to separate the names in a path in a Windows environment.

B

* 1. Symbol used to separate the names in a path in a UNIX environment.

A

* 1. Symbol used to represent the parent directory in a relative path name.

C

# Exercises 24–57 are problems or short-answer questions.

* 1. What is a file?

A file is the smallest amount of information that can be writ- ten to secondary memory. It is a named collection of data, used for organizing secondary memory.

* 1. Distinguish between a file and a directory.

A file is a named collection of data. A directory is a named collection of files.

* 1. Distinguish between a file and a file system.

A file is a named collection of data. A file system is the oper- ating system’s logical view of the files it manages.

* 1. Why is a file a generic concept and not a technical one?

A file is just a named collection of bits (data) in storage. Because there are different operating systems, there are different tech- nical views of a file. Because we are talking from the user’s view not the implementation view, the concept is generic.

* 1. Name and describe the two basic classifications of files.

Text files: Files that contain text. Each byte is an ANSII char- acter or each 2 bytes types is a Unicode character.

Binary files: The bytes in a binary file do not necessarily con- tain characters. These files require a special interpretation.

* 1. Why is the term *binary file* a misnomer?

All files ultimately are just a collection of bits, so why call one file type “binary?” In a binary file, the bits are not interpreted at text. A binary file would just be a stream of uninterpreted bits unless there is an interpretation provided. If a binary file is printed without interpretation, it looks like garbage.

* 1. Distinguish between a file type and a file extension.

A file type is a description of the information contained in the file. A file extension is a part of the file name that follows a dot and identifies the file type.

* 1. What would happen if you give the name “myFile.jpg” to a text file?

It depends on what application program you use to open the file. If you use a program that expects an image file, you would get an error. If you use a program that expects a text file, there would be no problem.

* 1. How can an operating system make use of the file types that it recognizes?

If you click on a file on your desktop and the OS recognizes the file type, then the appropriate application program can be called to open the file. If you are writing Java programs using an integrated environment, then the files saved in the IDE are tagged and clicking on a file automatically opens the file in the IDE.

* 1. How does an operating system keep track of secondary memory?

The OS maintains a table indicating which blocks of memory are free. The OS also maintains a table for each directory that contains information about the files in that directory.

* 1. What does it mean to open and close a file?

Operating systems keep a table of currently open files. The open operation enters the file into this table and places the file pointer at the beginning of the file. The close operation removes the file from the table of open files.

* 1. What does it mean to truncate a file?

Truncating a file means that all the information on the file is erased but the administrative entries remain in the file tables. Occasionally, the truncate operation removes the informa- tion from the file pointer to the end.

* 1. Compare and contrast sequential and direct file access. Both sequential and direct file access find and access a record. In sequential access, the file pointer begins at the beginning of the file and can only move in one direction. Thus, sequential access is linear: The only record that can be accessed is the first or the one immediately following the last one accessed. In direct access, the file pointer can be moved to any specific record and the data accessed from that place.
  2. File access is independent of any physical medium.
     1. How could you implement sequential access on a disk? Sequential access always accesses the next record. You implement sequential access on a disk by not giving the user an access command that takes a record address as a parameter.
     2. How could you implement direct access on a magnetic tape?

Each record on a magnetic tape is conceptually num- bered from the first to the last. Keep a counter of which record was read last. When a user gives an access com- mand to read a specific record, if the record number is beyond the last record read, then records are read and skipped until the correct record is found. If the record number comes before the last record read, the tape is rewound and records are read and skipped until the cor- rect record is found.

* 1. What is a file protection mechanism?

A file protection mechanism is one that an operating system implements that ensures the only valid users can access a particular file.

* 1. How does UNIX implement file protection?

UNIX implements file protection by associating with each file a 3x3 table in which the rows are Owner, Group, and World and the columns are Read, Write/Delete, and Execute. The contents of each cell in the table are Boolean values meaning yes and no. For example, a yes in the cell (Owner, Execute) means that the owner of the file can execute it. A no in the cell (World, Write/Delete) means that permission to write or delete a file is not granted to anyone who is not the owner of the file or within a specified group. (Group is a list of those considered part of the group.)

* 1. Given the following file permission, answer these questions.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Read** | **Write/Delete** | **Execute** |
| **Owner** | Yes | Yes | Yes |
| **Group** | Yes | Yes | No |
| **World** | Yes | No | No |

* + 1. Who can read the file? Anyone can read the file.
    2. Who can write or delete the file?

The owner and members of the group can write or delete the file.

* + 1. Who can execute the file?

Only the owner can execute the file.

* + 1. What do you know about the content of the file? Because the owner has permission to execute the file, it must contain an executable program.
  1. What is the minimum amount of information a directory must contain about each file?

A directory must contain the file name, the file type, the address on disk where the file is stored, the current size of the file, and permission information.

* 1. How do most operating systems represent a directory? As a file.
  2. Answer the following questions about directories.
     1. directory that contains another directory is called what? Parent directory
     2. directory contained within another directory is called what?

Subdirectory

* + 1. The directory that is not contained in any other directory is called what?

Root directory

* + 1. The structure showing the nested directory organization is called what?

Directory tree

* + 1. Relate the structure in (d) to the binary tree data struc- ture examined in Chapter 8.

A directory tree and a binary tree are both hierarchical structures in which there is only one way to reach any subtree. The root directory is equivalent to the root of the binary tree. In a binary tree, each node can have none, one, or two child nodes. In a directory tree, each node can have any number of subdirectories.

* 1. What is the directory called in which you are working at any one moment?

Working directory

* 1. What is a path?

A path is a text string that specifies the location of a file or subdirectory.

* 1. Distinguish between an absolute path and a relative path. An absolute path is a path that begins at the root directory and includes all successive subdirectories. A relative path is a path that begins at the current working directory and includes all successive subdirectories.
  2. Show the absolute path to each of the following files or direc- tories using the directory tree shown in Figure 11.4:
     1. QTEffects.qtx C:\WINDOWS\System\QuickTime\QTEffects.qtx
     2. brooks.mp3

C:\My Documents\downloads\brooks.mp3

* + 1. Program Files C:\Program Files
    2. 3dMaze.scr C:\WINDOWS\System\3dMaze.scr
    3. Powerpnt.exe

C:\Program Files\MS Office\Powerpnt.exe

* 1. Show the absolute path to each of the following files or direc- tories using the directory tree shown in Figure 11.5:
     1. tar

/bin/tar

* + 1. access.old

/etc/mail/access.old

* + 1. named.conf

/etc/named.conf

* + 1. smith

/home/smith

* + 1. week3.txt

/home/smith/reports/week1.txt

* + 1. printall

/home/jones/utilities/printall

* 1. Assuming the current working directory is C:\WINDOWS\ System, give the relative path name to the following files or directories using the directory tree shown in Figure 11.4:
     1. QTImage.qtx QuickTime\QTImage.qtx
     2. calc.exe

..\calc.exe

* + 1. letters

..\..\My Documents\letters

* + 1. proj3.java

..\..\My Documents\csc101\proj3.java

* + 1. adobep4.hlp adobep4.hlp
    2. WinWord.exe

..\..\Program Files\MS Office\Winword.exe

* 1. Show the relative path to each of the following files or direc- tories using the directory tree shown in Figure 11.5:
     1. localtime when working directory is the root directory

/etc/localtime

* + 1. localtime when the working directory is etc localtime
    2. printall when the working directory is utilities

printall

* + 1. week1.txt when the working directory is man2

../reports/week1.txt

* 1. What is the worst bottleneck in a computer system? Transferring data to and from secondary memory is the worst bottleneck.
  2. Why is disk scheduling concerned more with cylinders than with tracks and sectors?

Seek time (the time to find the right cylinder) is more time consuming than locating which track or which sector, so seek time is the time to minimize.

* 1. Name and describe three disk scheduling algorithms.

First-come, first-serve (FCSC): The requests are handled in the order in which they are generated.

Shortest-seek-time-first (SSTF): The request closest to the read/write heads is handled next.

SCAN: The read/write heads move back and forth, handling the closest in the direction in which they are moving.

**Use the following list of cylinder requests in Exercises 54–56. They are listed in the order in which they were received.**

**40, 12, 22, 66, 67, 33, 80**

* 1. List the order in which these requests are handled if the FCFS algorithm is used. Assume that the disk is positioned at cyl- inder 50.

40, 12, 22, 66, 67, 33, 80

* 1. List the order in which these requests are handled if the SSTF algorithm is used. Assume that the disk is positioned at cyl- inder 50.

40, 33, 22, 12, 66, 67, 80

* 1. List the order in which these requests are handled if the SCAN algorithm is used. Assume that the disk is positioned at cylinder 50 and the read/write heads are moving toward the higher cylinder numbers.

66, 67, 80, 40, 33, 22, 12

* 1. Explain the concept of starvation.

In the SSTF algorithm, it is possible for some requests never to be serviced because requests closer to the read/write heads keep being issued.