

Things to know by February 23

Warning. This is not guaranteed to be an inclusive list of things to know.

Know something about the following terms:

access permissions	BSD	cache	critical regions
delayed write	directories	file system	files
free list	hashing	inode	kernel mode
link	locking	path names	pipes
processes	random access	reference counts	Dennis Richie
superuser	System V	Ken Thompson	UNIX
user mode			

Know how to “draw” the major data structures of the file system and how they are changed by system calls.

Know enough about the C interface to Unix, *e.g.*, `argc` and `argv`, and the major file system calls, *e.g.*, `open`, to be able to “trace” C programs.

Be sure you understand the assigned homework problems. In Chapter 5 (pp. 140-145), look at exercises 1, 6, 16, 19, 28, and 32. Think about how to write the program suggested in exercise 15. Think about exercise 9.

The midterm will cover Chapters 1 through 5 of the textbook. However, don’t spend a lot of trying to understand all races and deadlocks (Figures 4.16 and 4.17 – pp. 82-83, Figures 5.30, Section 5.16.2).

You were given a copy of last year’s first midterm as part of handout #3 on the first day of class. You might want to review that. The last three pages of this handout is a *copy* of the first midterm in Comp 190 in the Spring 1988 semester.

Midterm 1–February 24 **1988**
Closed book section (64 points)

The exam is to be turned in at 1:50 pm. Work the closed book section first and turn it in before you consult your books and notes to work on the open book section. For the closed book section, write your answers on the exam itself. For the open book section, write your answers on separate pieces of paper.

University regulations require that you sign the following pledge on the first page of your turned-in exam.

I have neither received nor given any unauthorized aid on this exam. _____

Problem 1. (24 points–4 points each)

Give short definitions (one or two phrases or sentences) of the following terms.

inode

link count

process

kernel mode

mutual exclusion

file descriptor

Problem 2. (16 points–4 points each)

Give a brief description of what the following UNIX system calls do at the user level. *You don't need to describe the implementation!*

`lseek(fd, offset, reference)`

`chdir(pathname)`

`pipe(fdptr)` *–don't worry about which end is which*

`close(fd)`

Problem 3. (5 points)

Which two Turing award winning computer scientists developed the original UNIX system and what company did they work for at the time?

Problem 4. (4 points)

Suppose a C program starting with the following header:

```
main(argc, argv)
    int argc;
    char *argv[];
```

is compiled and the compiled code is stored in the file `gigo`. If the command:

```
% gigo hello world
```

is executed, what is the value of `argc` and the array elements of `argv`?

Problem 5. (9 points)

Consider the “delayed write.” Name one advantage and one danger of using this technique in an operating system. Name one way of lessening the dangers of the delayed write.

Problem 6. (6 points)

What is the difference between a logical file address and a physical disk address? How are they associated with each other?

Midterm 1–February 24 **1988**

Open book section (36 points)

The exam is to be turned in at 1:50 pm. The closed book section should be turned in before you open your books and notes to work the open book section. For the open book section, write your answers on separate pieces of paper.

You are logged into `napoleon`, your current directory is `/4.2/usr/src`, and you run a C program containing the system call:

```
fd = open("unc/sleepy", O_RDONLY);
```

where `fd` is declared to be an integer variable. (The third argument to `open` is required only when a file is being created.) The following facts hold about the `napoleon` file system.

- Directory `/` is protected 0755. Its inode number is 2.
- Directory `/4.2` is protected 0755. Its inode number is 2129.
- Directory `/4.2/usr` is protected 0555. Its inode number is 2131.
- Directory `/4.2/usr/src` is protected 0755. Its inode number is 2.
- Directory `/4.2/usr/src/unc` is protected 0755. Its inode number is 2.
- Directory `/4.2/usr/src/unc/sleepy` is protected 0755. Its inode number is 14579.
- Device `/dev/dsk/c24d0s0` is mounted on directory `/`.
- Device `/dev/dsk/c24d2s2` is mounted on directory `/4.2/usr/src`.
- Device `/dev/dsk/c24d2s3` is mounted on directory `/4.2/usr/src/unc`.

Assuming that the directory `/4.2/usr/src/unc/sleepy` has not been accessed in a very long time, describe the steps the operating system takes in executing the `open` system call. You don't need to draw detailed pictures but show how the major data structures of the operating system kernel are changed. Also, mention how reference and link counts are changed. Occasionally, you will need to make assumptions about things such as file systems numbers, or presence of blocks in buffer cache. Go ahead and make them, just be sure to state them clearly.