

CS253 Practice Midterm

Fall Semester, 2026

Please write your name on your test
A page of notes is allowed

Multiple Choice

(3 points each. Circle your answer)

Question 1: Bash is an example of a:

- A. Computer Game
- B. Operating System
- C. Text Editor
- D. Shell
- E. Kernel

Question 3: Running `cd `pwd``

- A. Changes the current directory to your home directory
- B. Changes the current directory to `/tmp`
- C. Changes the current directory to itself (the current directory will remain unchanged after running the command)
- D. Mounts a CD-ROM to the current directory
- E. Has absolutely no effect on anything at all

Question 5: The name “Linux” refers to which part of the operating system?

- A. ssh server
- B. web browser
- C. shell
- D. nut
- E. kernel

Question 7: Which command prints out a file?

- A. `ls`
- B. `cd`
- C. `who`
- D. `cat`
- E. `ssh`

Question 2: 140.160.140.26 is an example of a/an

- A. IP Address
- B. MAC Address
- C. file address
- D. path
- E. server

Question 4: After using `export` to set a shell variable, the variables will

- A. Remain set until you log out, only in the current shell
- B. Remain set until you log out, including for programs you run from that shell
- C. Be available every time you log into that machine
- D. Automatically become available on all Linux machines you use
- E. Be set for all users on the system

Question 6: The symbol `|` is used to indicate a

- A. file
- B. `grep`
- C. pipe
- D. tube
- E. funnel

Question 8: What effect does `echo > the_file` have on `the_file`, assuming `the_file` already exists?

- A. Deletes the contents of `the_file`
- B. No effect at all
- C. Makes a copy of `the_file`
- D. Prints `the_file` out in the terminal
- E. Uses `grep` on `the_file`

Question 9: (6 points) What does the program “grep” do?

Question 10: (6 points) `w` gives output like the following:

```
16:01:48 up 1 day, 20:37,  4 users,  load average: 0.00, 0.01, 0.05
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU WHAT
seth      pts/0    nimrod.lcsc.edu Fri18    44:35m 0.24s  0.24s -bash
seth      pts/1    69.76.19.252  Fri18    44:35m 0.20s  0.20s -bash
seth      pts/2    69.76.19.252  Fri18    44:29m 0.31s  0.10s ssh nimrod
seth      pts/4    69.76.19.252  16:01    2.00s  0.25s  0.04s w
```

How would you use `w` and `grep` to print out only users named “fred”? Give a command which would accomplish this, and use `grep` rather than special options for `w`.

Question 11: (6 points) Building on to the question above, print out only where user fred has logged in from. Contrary to the example above, you can assume that the “FROM” column only contains dot-separated addresses such as nimrod.lcsc.edu or 69.76.19.252, because fred does not have physical access to the machine.

Question 12: (6 points) Suppose you start a process in the background using `&`. How can you stop this process once it is running, without stopping any other processes.

Question 13: (8 points) The following is a directory listing printed by `ls -gG` (like `ls -l`, but without user or group). For each file, show how you would use `chmod` to set the permissions the way they are currently set.

```
-rwx----- 1 1 Mar  9 17:07 a
-rwxr-xr-x 1 1 Mar  9 17:07 b
----- 1 1 Mar  9 17:07 c
-----r-- 1 1 Mar  9 17:08 d
```

Question 14: (2 points) Suppose you are sitting at a Linux computer, and suddenly suspect your friend (who has an account on the system) may be remotely connected to the very computer you are sitting at! How would you verify this suspicion?

Question 15: (4 points) Suppose you run the following commands. What is the output from the last call to `file`

```
seth@Tux:~ $ file syllabus.pdf
syllabus.pdf: PDF document, version 1.5
seth@Tux:~ $ mv syllabus.pdf syllabus.docx
seth@Tux:~ $ file syllabus.docx
```

The following text is the man page for the `shutdown` command.

SHUTDOWN(8)

Linux System Administrator's Manual

SHUTDOWN(8)

NAME

`shutdown` - bring the system down

SYNOPSIS

`/sbin/shutdown [-akrhPHfFnc] [-t sec] time [warning message]`

DESCRIPTION

`shutdown` brings the system down in a secure way. All logged-in users are notified that the system is going down, and `login(1)` is blocked. It is possible to shut the system down immediately or after a specified delay. All processes are first notified that the system is going down by the signal `SIGTERM`. This gives programs like `vi(1)` the time to save the file being edited, mail and news processing programs a chance to exit cleanly, etc. `shutdown` does its job by signalling the `init` process, asking it to change the runlevel. Runlevel 0 is used to halt the system, runlevel 6 is used to reboot the system, and runlevel 1 is used to put the system into a state where administrative tasks can be performed; this is the default if neither the `-h` or `-r` flag is given to `shutdown`. To see which actions are taken on halt or reboot see the appropriate entries for these runlevels in the file `/etc/inittab`.

OPTIONS

- `-a` Use `/etc/shutdown.allow`.
- `-k` Don't really shutdown; only send the warning messages to everybody.
- `-r` Reboot after shutdown.
- `-h` Halt or power off after shutdown.
- `-P` Halt action is to turn off the power.
- `-H` Modifier to the `-h` flag. Halt action is to halt or drop into boot monitor on systems that support it. Must be used with the `-h` flag.
- `-f` Skip `fsck` on reboot.
- `-F` Force `fsck` on reboot.
- `-n` [DEPRECATED] Don't call `init(8)` to do the shutdown but do it yourself. The use of this option is discouraged, and its results are not always what you'd expect.
- `-c` Cancel a waiting shutdown. ("shutdown now" is no longer waiting.) With this option it is of course not possible to give the time argument, but you can enter explanatory message arguments on the command line that will be sent to all users.
- `-t sec` Tell `init(8)` to wait `sec` seconds between sending processes the warning and the kill signal, before changing to another runlevel.
- `time` When to shutdown.
- `warning message`
Message to send to all users.

The time argument can have different formats. First, it can be an absolute time in the format hh:mm, in which hh is the hour (1 or 2 digits) and mm is the minute of the hour (in two digits). Second, it can be in the format +m, in which m is the number of minutes to wait. The word now is an alias for +0.

If shutdown is called with a delay, it will create the advisory file /etc/nologin which causes programs such as login(1) to not allow new user logins. This file is created five minutes before the shutdown sequence starts. Shutdown removes this file if it is stopped before it can signal init (i.e. it is cancelled or something goes wrong). It also removes it before calling init to change the runlevel.

The -f flag means 'reboot fast'. This only creates an advisory file /fastboot which can be tested by the system when it comes up again. The boot rc file can test if this file is present, and decide not to run fsck(1) since the system has been shut down in the proper way. After that, the boot process should remove /fastboot.

The -F flag means 'force fsck'. This only creates an advisory file /forcefsck which can be tested by the system when it comes up again. The boot rc file can test if this file is present, and decide to run fsck(1) with a special 'force' flag so that even properly unmounted file systems get checked. After that, the boot process should remove /forcefsck.

The -n flag causes shutdown not to call init, but to kill all running processes itself. shutdown will then turn off quota, accounting, and swapping and unmount all file systems.

ACCESS CONTROL

shutdown can be called from init(8) when the magic keys CTRL-ALT-DEL are pressed, by creating an appropriate entry in /etc/inittab. This means that everyone who has physical access to the console keyboard can shut the system down. To prevent this, shutdown can check to see if an authorized user is logged in on one of the virtual consoles. If shutdown is called with the -a argument (add this to the invocation of shutdown in /etc/inittab), it checks to see if the file /etc/shutdown.allow is present. It then compares the login names in that file with the list of people that are logged in on a virtual console (from /var/run/utmp). Only if one of those authorized users or root is logged in, it will proceed. Otherwise it will write the message

```
shutdown: no authorized users logged in
```

to the (physical) system console. The format of /etc/shutdown.allow is one user name per line. Empty lines and comment lines (prefixed by a #) are allowed. Currently there is a limit of 32 users in this file.

Note that if /etc/shutdown.allow is not present, the -a argument is ignored.

HALT OR POWEROFF

The -H option just sets the init environment variable INIT_HALT to HALT, and the -P option just sets that variable to POWEROFF. The shutdown script that calls halt(8) as the last thing in the shutdown sequence should check these environment variables and call halt(8) with the right options for these options to actually have any effect. Debian 3.1 (sarge) supports this.

FILES

```
/fastboot
/etc/inittab
/etc/init.d/halt
/etc/init.d/reboot
/etc/shutdown.allow
```

NOTES

A lot of users forget to give the time argument and are then puzzled by the error message shutdown produces. The time argument is mandatory; in 90 percent of all cases this argument will be the word now.

Init can only capture CTRL-ALT-DEL and start shutdown in console mode. If the system is running the X window System, the X server processes all key strokes. Some X11 environments make it possible to capture CTRL-ALT-DEL, but what exactly is done with that event depends on that environment.

Shutdown wasn't designed to be run setuid. /etc/shutdown.allow is not used to find out who is executing shutdown, it ONLY checks who is currently logged in on (one of the) console(s).

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SEE ALSO

fsck(8), init(8), halt(8), poweroff(8), reboot(8)

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SHUTDOWN(8)

Question 16: (*8 points*) Using only `shutdown` (not `sleep`, etc), how would you warn all users that the computer is going to shut down in 5 minutes? Only warn the users - don't actually shut down the computer.

Question 17: (*8 points*) How would you insert the contents of a file called `message` for the warning message? You can use backtics and other commands other than `shutdown` for this question.

Question 18: (*2 points*) Is it possible to cancel an impending shutdown?

Question 19: (5 points) Suppose the system administrator has replaced the “ls” command with one that doesn’t list files, but rather shows an ASCII art picture of a “land shark”. How could you use echo to print out a directory listing instead?

Question 20: (5 points) After a while, you determine that the administrator didn’t actually remove ls, but rather moved it to /sbin. Now that you know where it is, give a suggestion for how you would restore proper functionality to your terminal.

Question 21: (10 points) Given the following sequence of commands, what will be printed next?

```
seth@nimrod:~ $ cat one.c
#include<stdio.h>
#include<string.h>
#include<stdlib.h>
int main(){
    // phrase is a C-style string
    char *phrase = getenv("PHRASE");
    // strlen(phrase) will return the length of phrase
    // strlen(phrase) - 1 is the index of the last character
    for(int i = strlen(phrase) - 1; i >= 0; i--){
        printf("%c", phrase[i]); // %c is a single character
    }
    printf("\n");
    return 0;
}
seth@nimrod:~ $ gcc one.c
seth@nimrod:~ $ export PHRASE="one two"
seth@nimrod:~ $ ./a.out
```