CSCI 210 – Systems Programming
Sample Midterm Exam

First Name, Last Name:

Print your name clearly above. Put your name on each page in case the pages get separated. There are 8 pages in this exam, check that you have them all.

Answer the questions by circling the letter of the correct answer like so:

What is the name of the Mines Linux server, we mainly use for class activities?

(a) alamode
(b) isengard
(c) mordor
(d) quickfox

If you have a question or need additional scratch paper, raise your hand. Each question is worth 3 points. The exam contains a total of **60 points.**
Duration: 90 minutes
You are allowed to bring one double-sided notes sheet.

1. The Bash Shell is capable of all of the following except

  (a) Inspecting the file system
  (b) Executing commands
  (c) Disable booting from a USB flash drive
  (d) Running scripts

2. The two commands below:

```
1  cd ~/../
2  ls -i
```

  accomplish which of the following tasks:

  (a) Change the directory to the parent of the home directory, then list everything inside the directory
  (b) Change the directory to the home directory, then list the soft links of all files
  (c) Change the directory to the parent of the home directory, then list the names and inode identifiers files there
  (d) Change the directory to a subfolder of the root directory, then list the soft links of all files

3. Suppose we want to fool any Vim users into launching Emacs whenever they try to launch Vim (assume the system has one shared user account). The following command can accomplish this:

  (a) `echo "alias vim emacs" >> ~/.bashrc`
  (b) `echo "alias vim=emacs" >> bashrc`
  (c) `echo "alias vim emacs" >> /bashrc`
  (d) `echo "alias vim=emacs" >> ~/.bashrc`

4. All of the following statements are true about shell scripts except:

   (a) Shell scripts can run any command the terminal can run

   (b) Shell scripts can run loops and conditional statements

   (c) Shell scripts can use the '#' symbol to comment out a line

   (d) Shell scripts need to end in .sh to be able to execute

5. Which of the following is a false statement about inodes and linking?

   (a) Removing the source file from a soft link (i.e., the first argument in the `ln` command as shown in the lecture) causes the second file to have a broken link.

   (b) inodes contain the name of the files they are linked to.

   (c) inodes have unique identifiers and can be linked to from multiple sources.

   (d) Hard links to the same file have same inode numbers.

6. Suppose we want to change the permissions of the file `abc`. Which of the following commands is equivalent to

    ```
    chmod u=rx,g=w,o=x abc
    ```

   (a) `chmod 754 abc`
   (b) `chmod 751 abc`
   (c) `chmod 551 abc`
   (d) `chmod 521 abc`

7. Suppose everyone connected to *isengard* is connected through the Mines network and has IP address format 138.67.???.???, where ? represents a digit from 0 to 9. How can we get a ***count*** of intruders that are *not* connected through the Mines network, and append it to the file report.log? Note that the `-v` flag acts as a complement in the grep command.

(a) `who | grep -v -c 138.67.* >> report.log`

(b) `grep -v -c 138.67.*.* who >> report.log`

(c) `ps | grep -v -c 138.67.* >> report.log`

(d) `who | grep -v -c 138.67.* | wc -l >> report.log`

8. Which of the following is false about the `mv` command?

(a) It can be used to rename a file

(b) It can be used to move a directory

(c) It can be used to move a file, if you have only the "read" access to that file

(d) It requires at least two command line arguments: source file/dir and the target file/dir

9. How can you see hidden files in the *root* directory?

(a) `ls -l ~`

(b) `ls -a ~`

(c) `ls -l /`

(d) `ls -a /`

4

For the following 3 questions, assume there is a text file in your home directory called `fox.txt`. It has the following contents (no empty lines and every line ends with the end of line character):

```
The quick
brown Fox
jumped
Over
the dog
the Lazy dog
```

10. When run in your home directory, the following command would produce what output?
    `cat fox.txt | wc -l`

    (a)   The

    (b)   9

    (c)   6

    (d)   dog

11. When run in your home directory, the following command would produce what output?
    `grep -i the fox.txt | grep [A-Z]`

    (a) brown Fox
          Jumped
          Over

    (b) The quick
          the Lazy dog

    (c) The quick
          the dog
          the Lazy dog

    (d) The quick

12. When run in your home directory, the following command would produce what output?
```
head -n 1 fox.txt | tr [a-z] [A-Z]
```

(a)   T

(b)   t

(c)   tHE QUICK

(d)   THE QUICK

13. Assume you have the following executable script named `for.sh`:

```
#!/bin/bash
for word in $@
do
        if [ $word = "dog" ]
        then
            echo one $word
        else
            echo $word not dog
        fi
done
```

Now you execute the following command. What output do you get?
```
./for.sh look for a dog
```

(a) one dog

(b) look not dog
    for not dog
    a not dog
    one dog

(c) dog not dog

(d) look for a dog not dog

14. To "kill" a process running in the foreground, you would press which keys?

    (a) Ctrl + C

    (b) Ctrl + S

    (c) Ctrl + Q

    (d) Ctrl + Z

15. Assume you have the following executable script in home directory titled `fish.sh`:

```
#!/bin/bash
echo -n "$1 fish "
echo '$2' fish
```

    Now you execute the following command from your home directory. What output do you get?
    `./fish.sh 1 3`

    (a) 1 fish $2 fish

    (b) 1 fish
        3 fish

    (c) 1 fish 3 fish

    (d) 1 fish
        $2 fish

16. If you execute an executable script named, `script.sh`, with the following command, what will happen?
`./script.sh &`

    (a) The script will execute at high priority

    (b) The script will execute at low priority

    (c) The script will execute in the foreground

    (d) The script will execute in the background

17. Which of these statements is true of programs and processes?

    (a) Programs and processes are the same thing

    (b) Executing a program creates one or more processes

    (c) Programs execute faster than processes

    (d) Processes cannot start other processes

18. An example output of the command `ps` is given below, which shows that the output is listed in ascending order or process ids (PID).

```
    PID TTY              TIME CMD
2193687 pts/2776 00:00:00 bash
2195400 pts/2776 00:00:00 grep
2196596 pts/2776 00:00:00 cat
2211953 pts/2776 00:00:00 ps
```

If you want to list the running processes sorted with respect to command names, which of the following commands could be used for this purpose?

```
(a)     ps -c 4
(b)     sort -c "CMD" | ps
(c)     ps -cmd
(d)     ps | sort -k4
```

19. Which of these statements is false regarding the C compiler gcc?

    (a) C programs are compiled to the assembly language before creation of the object (.o) code

    (b) It is possible to obtain the object code of some C code with no main function in it using gcc

    (c) It is possible to prevent gcc from running the entire suite of tools on some input C code

    (d) To run gcc, all the source files should be in the same directory where gcc is run

20. Which of these statements is false regarding static and dynamic linking?

    (a) We can find whether a compiled executable is statically or dynamically linked using `ldd`

    (b) Dynamic linking produces larger executables

    (c) Dynamic linking allows multiple programs to share a single copy of a library in memory at runtime

    (d) Static libraries are included in the executable, so they are not needed at runtime