CSc 3320: Systems Programming

Fall 2021

Homework

1: Total points 100

Submission instructions:

1. Create a Google doc for each homework assignment submission.
2. Start your responses from page 2 of the document and copy these instructions on page 1.
3. Fill in your name, campus ID and panther # in the fields provided. If this information is missing in your document TWO POINTS WILL BE DEDUCTED per submission.
4. Keep this page 1 intact on all your submissions. If this *submissions instructions* page is missing in your submission TWO POINTS WILL BE DEDUCTED per submission.
5. Each homework will typically have 2-3 PARTS, where each PART focuses on specific topic(s).
6. Start your responses to each PART on a new page.
7. If you are being asked to write code copy the code into a separate txt file and submit that as well.
8. If you are being asked to test code or run specific commands or scripts, provide the evidence of your outputs through a screenshot and copy the same into the document.
9. Upon completion, download a .PDF version of the document and submit the same.

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Panther #: 002473603

PART 1

Answer the following questions briefly. Provide clear and succinct reasoning.

Points per question = 5

1. Tell the differences between Unix and Linux. Then please list some operating systems (at least three) which belong to Unix but not Linux.

- Unix is older than Linux. Unix was first developed by AT&T Bell Laboratories, whereas Linux was developed by a man named Linus.
- Although both have same commands and interfaces, they have entirely different source code.
- Purpose of developing Linux was to make a Unix-like operating system, that is free and open-source. Hence, Linux is free as compared to Unix whose some versions are proprietary while others are free/open source.
- Unix is basically an operating system, whereas Linux refers to kernel, and together with packages, Linux distributions act like an operating system.
- Three operating systems that belong to Unix:
    1. NetBSD
    2. Solaris
    3. Mac OS

2. What is the pipe mechanism in UNIX? And show one command using pipe and explain how the pipe works in it?

- Pipe mechanism refers to concept that output of one process will be used as input for other process, and together these processes create a pipeline.
- `cat file.txt | head -4,` here cat will open file whose output will be taken as input by head because of pipe '|' command, and only first 4 lines of file will be displayed.

3. In a Linux system, you can issue the command **ls /** to check the sub directories under root. Please describe the meanings of directory /bin, /dev, /boot, /usr, /etc, /mnt, /sbin, /var separately. For example, you can say that /bin contains binary executable files.

- /bin → contains binary executable files, required for minimal functionality of system.
- /dev → contains device files for devices.
- /boot → contains data required for boot process.
- /usr → contains lots of things, user's libraries, programs, documentation, etc.
- /etc → contains configuration files.
- /mnt → mountpoints for mounting storage devices.
- /sbin → executable programs, only available to admin (root user)
- /var → files to which system writes data during its operation.

4. What is the meaning of Multitask and Multi-user in a Unix system?

- Multitask → Multiple programs can run at one time.
- Multiuser → Multiple users can work at the same time.

5. What does -rwxr-xr-x mean in terms of permissions for a file? What is the exact unix command (with the octal representation) for changing the permissions to this setting?

- Here, r represents read, w represents write and x represents execute.
- Last 3 characters represent permission for files to users outside group
- Mid 3 characters represent permissions granted to users within group.
- First 3 characters represent permissions granted to user himself.
- rwxr-xr-x So, user has all three permissions whereas others have only read and execute permissions.
- Command: chmod 755 filename.extension

6. In class, you have learned the meaning of read, write and execute permission for regular files. However, these permissions are also applied to directories. So please describe the meaning of read, write, and execute permission for directory.

- Read → see contents of directory.
- Write → create file in directory.
- Execute → enter in directory (making his/her current directory).

Part II-a

Regular Expression
Find outcomes for each given basic/extended regular expression (maybe multiple correct answers)

Points per question: 2.5

Example:
'ab+a' (*extended regex*)

***Answer**: aba , abba ; Pattern : The matched string should begin and end with 'a' and 'b' occurs at least once between leading and ending 'a')*

Note: 7) to 10) are basic regexes; Note: 11) to 18) are extended regexes.

7) 'a[ab]*a' matches with string starting with a, followed by a or b or none or more, then ending with a, such as aaa, aba, aa, aaaaa, abbba.

8) 'a(bc)?' matches strings such as abc, a.

9) '.[ind]*' all strings, (except line change) as . matches any single character followed by next character and [] says to do any one of them but * says one or more of previous.

10) '[a-z]+[a-z]' matches string starting and ending with any lower case alphabet from a to z and any number of lower case letters between them, such as in, word.

11) '[a-z] (\+[a-z])+' matches nothing.

12) 'a.[bc]+' aeb, abc, a1b, acc a followed by any 1 character

(wildcard) followed by b or c.

13) 'a.[0-9]' aa1, a90 a followed by any one character(wildcard)

followed by a number (0-9).

14) '[a-z]+[\.\?!]' hi!, stopped. Starting with lowercase alphabet,

followed by lowercase alphabet or none, ending with . or !

15) ‘[a-z]+[\.\?!]\s*[A-Z]’ start with a-z followed by . ending with

A-Z. sub. If, c.I

16) ‘(very)+(cool)?(good|bad) weather’ very cool good weather,

very bad weather

17) ‘-?[0-9]+’ numbers starting with – or none such as, -1, 005678

18) ‘-?[0-9]*\.?[0-9]*’ matches null and . and numbers (start wd – or none) .,-1, 0056

Part II-b

Regular Expression
Write down the extended regular expression for following questions. E.g. Social security number in the format of 999-99-9999. Answer: [0-9]{3}-[0-9]{2}-[0-9]{4}

Points per question: 5

19) Valid URL beginning with "http://" and ending with ".edu" (e.g. http://cs.gsu.edu, http://gsu.edu)

(^http:\/\/)(.+)(\.edu$)

20) Non-negative integers. (e.g. 0, +1, 3320)

(?<![-0-9])[0-9]+

21) A valid absolute pathname in Unix (e.g. /home/ylong4, /test/try.c)

((\/)[a-z]+[0-9]*)+(\.[a-z]+)?

22) Identifiers which can be between 1 and 10 characters long, must start with a letter or an underscore. The following characters can be letters or underscores or digits. (e.g. number, _name1, isOK).

[a-z_A-Z][0-9a-z_A-Z]{1,10}

23) Phone number in any of the following format: 9999999999,999-999-9999, (999)-999-9999. (Note: all of these formats should be matched by a single regular expression)

([0-9]{10}|[0-9]{3}-[0-9]{3}-[0-9]{4}|\([0-9]{3}\)-[0-9]{3}-[0-9]{4})

Part III

Programming

Points per question: 15

24. Create a file named homework_instructions.txt using VI editor and type in it all the submission instructions from page1 of this document. Save the file in a directory named *homeworks* that you would have created. Set the permissions for this file such that only you can edit the file while anybody can only read. Find and list (on the command prompt) all the statements that contain the word POINTS. Submit your answer as a description of what you did in a sequential manner (e.g. Step1 … Step 2… and so on..). Add a screenshot to your answer as a proof of evidence.

Step 1: mkdir homeworks
Create directory

Step 2: cd homeworks
Open directory

Step 4: vi homework_instructions.txt
Create and Open file with vi text editor

Step 5: Copied instructions and pasted them in vi by following steps:

- ESC
- :set paste
- i
- right click
- ESC

Step6→ :x
Save and exit vi editor.

Step 7: chmod 744 homework_instructions.txt
Change of permissions (I have all rwx and others have read permissions only)

Step 8: grep -n POINTS homework_instructions.txt
Print line# followed by statements containing word POINTS

Statements containing POINTS:

```
[aiftikhar2@gsuad.gsu.edu@snowball homeworks]$ grep -n POINTS homework_in
structions.txt
4:3.    Fill in your name, campus ID and panther # in the fields provided
. If this information is missing in your document TWO POINTS WILL BE DEDU
CTED per submission.
5:4.    Keep this page 1 intact on all your submissions. If this submissi
ons instructions page is missing in your submission TWO POINTS WILL BE DE
DUCTED per submission.
[aiftikhar2@gsuad.gsu.edu@snowball homeworks]$
```

Full file:

```
[aiftikhar2@gsuad.gsu.edu@snowball homeworks]$ cat -n homework_instructio
ns.txt
     1  Submission instructions:
     2  1.      Create a Google doc for each homework assignment submissi
on.
     3  2.      Start your responses from page 2 of the document and copy
 these instructions on page 1.
     4  3.      Fill in your name, campus ID and panther # in the fields
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nds or scripts, provide the evidence of your outputs through a screenshot
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    10  9.      Upon completion, download a .PDF version of the document
and submit the same.
    11
[aiftikhar2@gsuad.gsu.edu@snowball homeworks]$
```

File Permissions:

```
[aiftikhar2@gsuad.gsu.edu@snowball homeworks]$ ls -l homework_instruction
s.txt
-rwxr--r--. 1 aiftikhar2@gsuad.gsu.edu aiftikhar2@gsuad.gsu.edu 1011 Oct
 1 13:52 homework_instructions.txt
[aiftikhar2@gsuad.gsu.edu@snowball homeworks]$
```