CSc 3320: Systems Programming

Spring 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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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.

- Linux is open-source, while Unix is not open-source. Linux is free and can be easily distributed among developers, Unix, however, is not free. Linux can be easily installed on most hardwares, whereas Unix is installed on servers, working stations, and PCs.
- Some OS on Unix but not on Linux: SunOS, Solaris, AIX, ULTRIX.

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

- Pipe mechanism in UNIX is a way that messages can be passed internally. The output of one process can be used as the input of another process, just like using a pipe to connect two processes.
- Example: $cat sample1.txt | grep 'sample'
- In the example above the cat command will try to display sample1.txt. With '|', the cat process will pipe with the grep process that tries to match the word 'sample'. So the output of the cat process, in this case is the content of sample1.txt, will go in as the input of the grep process to look for the word 'sample'.

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
- /dev contains special or device files, such as hard disks.

- /boot contains files that are used when booting up the OS.
- /usr is the home directory for users. It contains user-land programs and data
- /etc subdictories and system related files.
- /mnt contains directories for mounted devices.
- /sbin contains executable files, and it is a standard subdirectory of root directory.
- /var is also a standard subdirectory of root, and it contains files which the OS writes data on during the operation time.

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

- Multitask: The OS can do multiple processes at a time.
- Multi-user: Many users can log into the OS, and each user will have their own settings.

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?

- This means that users can read, write, execute the file. Groups can read and execute the file. Others can read and execute the file.
- chmod 755 [filename]

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.

- To read a directory means to be able to see what's in there. When you have read permission on a directory you can do the ls command on it.
- To write in directory means to be able to create files, and make subdirectories in it
- To execute in directory means to be able to go inside that directory and make it your working 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’

Answers: aa, aaba, abba, abbbba.

Pattern: the pattern must begin and end with ‘a’. There can be 0 or more occurrences of ‘a’ or/and ‘b’ in between.

8) ‘a(bc)?’

Answers: a, abc

Pattern: the pattern must begin with ‘a’. There can be 0 or more occurrences of ‘bc’ at the end.

9) ‘.[ind]*’

Answers: bi, h, hn, hnd, td, mid

Patter: the pattern can begin with any character except newline. It is followed by any character from [ind] 0 or more times.

10) ‘[a-z]+[a-z]’

Answers: azn, jav, asd

Pattern: The pattern must begin and end with lowercase alphabet letters. It must also have lowercase alphabet letter(s) in between too.

11) ‘[a-z] (\+[a-z])+’

Answers: a+b, v+b+a

Pattern: The pattern must start with a character from ‘a’ to ‘z’

and must have at least one occurrence of ‘+’ and a character from

‘a’ to ‘z’ behind it.

12) ‘a.[bc]+’

Answers: avb, aac, abb, aucb, atcb

Pattern: The pattern must start with ‘a’ and followed by a

character that can be anything except newline. After that, the

pattern is followed by at least one character from [bc] one or

more times.

13) ‘a.[0-9]’

Answer: az9, ac8, at7

Pattern: The pattern should start with ‘a’ and follow by a random character except for a newline. The pattern ends with a digit between 0-9.

14) ‘[a-z]+[\.\?!]’

Answers: t., nz?, ac!

Patterns: The pattern starts with any character from [a-z] once or more, and ends with any character between ‘.’ , ‘?’, ‘!’

15) ‘[a-z]+[\.\?!]\s*[A-Z]’

Answers: b. J, aaa?   B, ht.   W

Patterns: The pattern starts with a character from ‘a’ to ‘z’ one or more times. It is followed by ‘.’ or ‘?’ or ‘!’. After that there can be one or more white space. The pattern ends with capital letter from ‘A’ to ‘Z’.

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

Answers: veryveryverybad weather, verycoolbad weather, verygood weather

Pattern: The pattern starts with one or more occurrences of ‘very’. After that, there should be zero or more occurrences of

‘cool’. Then, it is followed by ‘good’ or ‘bad’. The pattern ends

with white space and ‘weather’.

17) ‘-?[0-9]+’
Answers: 099, -9, -178
Pattern: The pattern should begin with zero or more occurrences of ‘-’ and ends with digits from 0 to 9 one or more times.

18) ‘-?[0-9]*\.?[0-9]*’

Answers: ‘’, -178, -1.9

Pattern: The pattern begins with zero or more occurrences of ‘-’, followed by zero or more occurrences of digits from 0-9, followed by zero or more occurrences of ‘.’, ends with zero or more occurrences of 0-9.

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):\/\/[\w\-_]+(\.[\w\-_]+)+([\w\-\.]*+(.edu)?

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

\+?\d+

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

([.\/]+[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]{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]{2}-[0-9]{4}

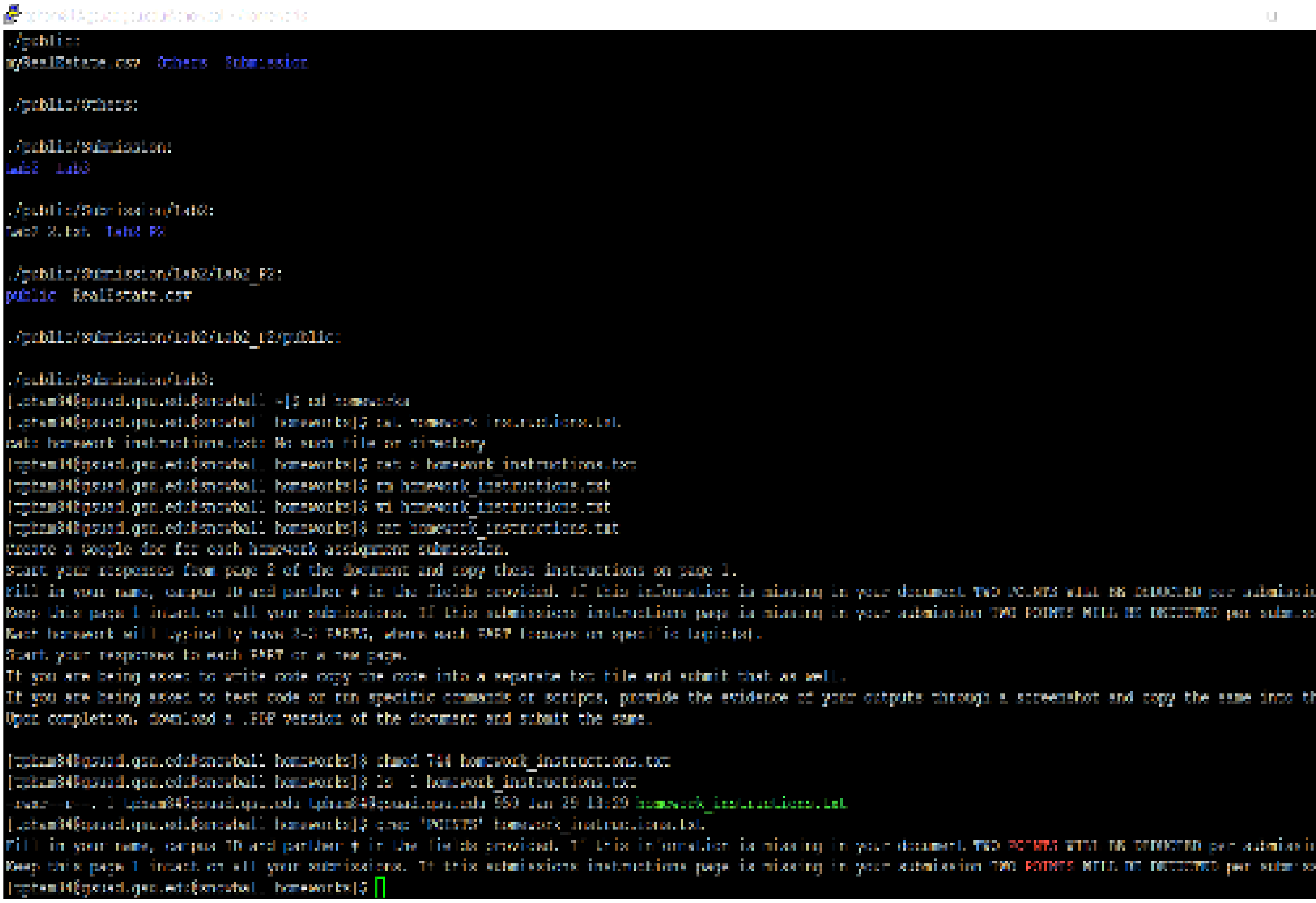
Part III

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.

1. Make *homeworks* directory by using command *mkdir ./homeworks*
2. Move to *homeworks* directory to work using command *cd homeworks*
3. Create a file *homework_instructions.txt* using vi editor. Type the command *vi homework_instructions.txt*. You will enter edit mode in vi edit and start typing the instructions.
4. After done typing, we press *esc* to exit edit mode. We save and exit vi editor using the command *:wq*.
5. We need to change the permission of this file so that only the user can edit and everyone else can only read. We do this by typing command *chmod 744 homework_instructions.txt*
6. To find word 'POINTS' in the file, we type *grep 'POINTS' homework_instructions.txt*.



```
./public:
myRealEstate.csv  Others  Submission

./public/Others:

./public/Submission:
Lab2  Lab3

./public/Submission/Lab2:
Lab2 X.txt  Lab2_FX

./public/Submission/Lab2/Lab2_FX:
public  RealEstate.csv

./public/Submission/Lab2/Lab2_FX/public:

./public/Submission/Lab3:
[tpham34@gsuad.gsu.edu@snowball ~]$ cd homeworks
[tpham34@gsuad.gsu.edu@snowball homeworks]$ cat homework_instructions.txt
cat: homework_instructions.txt: No such file or directory
[tpham34@gsuad.gsu.edu@snowball homeworks]$ cat > homework_instructions.txt
[tpham34@gsuad.gsu.edu@snowball homeworks]$ rm homework_instructions.txt
[tpham34@gsuad.gsu.edu@snowball homeworks]$ vi homework_instructions.txt
[tpham34@gsuad.gsu.edu@snowball homeworks]$ cat homework_instructions.txt
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Upon completion, download a .PDF version of the document and submit the same.

[tpham34@gsuad.gsu.edu@snowball homeworks]$ chmod 744 homework_instructions.txt
[tpham34@gsuad.gsu.edu@snowball homeworks]$ ls -l homework_instructions.txt
-rwxr--r--. 1 tpham34@gsuad.gsu.edu tpham34@gsuad.gsu.edu 950 Jan 29 13:29 homework_instructions.txt
[tpham34@gsuad.gsu.edu@snowball homeworks]$ grep 'POINTS' homework_instructions.txt
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[tpham34@gsuad.gsu.edu@snowball homeworks]$ 
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