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CSC3320

Lab 4 In-lab Assignment

Part 1:

4)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC 3' CSC_Course.txt
CSC 3210        Computer Organization and Programming
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Compute
r Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or
 better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

This command outputs the lines containing the string “CSC 3” in the file ‘CSC_Course.txt’.

5)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC 3|CSC 1' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep -E 'CSC 3|CSC 1' CSC_Course.txt
```

N/A. This command does not print out any output. It’s because the symbol ‘|’ alone is not recognized in basic regular expression command ‘grep <pattern> <file>’, otherwise, we need to insert a backslash escape for basic regular expression to recognize it as a meta-character. To make this print out the output, we can modify the command as the following:

grep ‘CSC 3\|CSC 1’ CSC_Course.txt

This will output the lines containing either the string “CSC 3” or “CSC 1” in the file ‘CSC_Course.txt’.

6)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep -E 'CSC 3|CSC 1' CSC_Course.txt
CSC 1010        Computers and Applications
CSC 1301        Principles of Computer Science I
CSC 1302        Principles of Computer Science II
Prerequisites   CSC 1301 with a "C" or higher
Prerequisites   CSC 1301 or CSC 2301 with a C or higher, or permission of instructor
Prerequisites   (CSC 1301 or DSCI 1301) and (MATH 1113 or MATH 2211) with a C or higher.
Prerequisites   CSC 1302, MATH 2211, and CSC 2510 or MATH 2420 with grades of "C" or higher
Prerequisites   CSC 1301 and CSC 1302 with a C or higher or permission of the department
CSC 3210        Computer Organization and Programming
Prerequisites   CSC 1302, and CSC 2510 or MATH 2420 with A C or higher
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Compute
r Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grades of C or
 better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

The '-E' in this grep command indicates that the pattern we need to file as an Extended Regular Expression (ERE), and ERE does recognize '|' as a special character indicating the matched string will the preceding element or the following element of the '|' character.

This command output the lines containing either the string "CSC 3" or "CSC 1" in the file 'CSC_Course.txt'.

7)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ egrep 'CSC 3|CSC 1' CSC_Course.txt
CSC 1010        Computers and Applications
CSC 1301        Principles of Computer Science I
CSC 1302        Principles of Computer Science II
Prerequisites   CSC 1301 with a "C" or higher
Prerequisites   CSC 1301 or CSC 2301 with a C or higher, or permission of instru
ctor
Prerequisites   (CSC 1301 or DSCI 1301) and (MATH 1113 or MATH 2211) with a C or
 higher.
Prerequisites   CSC 1302, MATH 2211, and CSC 2510 or MATH 2420 with grades of "C
" or higher
Prerequisites   CSC 1301 and CSC 1302 with a C or higher or permission of the de
partment
CSC 3210        Computer Organization and Programming
Prerequisites   CSC 1302, and CSC 2510 or MATH 2420 with A C or higher
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must
 meet the Computer Science Major Eligibility Requirement in order to enroll in t
his course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programmin
g)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming wi
th grades of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data St
ructure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programmin
g)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

egrep uses extended regular expression set for pattern (the same as grep -E), so the special character here does not lose its meaning. Therefore, this command output all the lines containing either the string “CSC 3” or “CSC 1” in the file ‘CSC_Course.txt’.

8)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ fgrep '3.000 Credit hours' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$ fgrep '3.000 Credit hours' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A.

fgrep is used to search fixed-character strings in a file instead of regular expression. This command does not output anything because the file does not contain the string “3.000 Credit hours”.

9)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ fgrep -x  "3.000 Credit hours" CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A. This command doesn’t output anything simply for the same reason as stated in question 8, but we can also see that an option for fgrep is included in here, -x, which means it will print only lines matched entirely.

10)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC.*Programming' CSC_Course.txt
CSC 2301        Introduction to Python Programming
CSC 2302        Python Programming for Data Science
CSC 3210        Computer Organization and Programming
CSC 3320        System-Level Programming
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
CSC 4225        Internetwork Programming
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grade
s of C or better
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
CSC 4330        Programming Language Concepts
CSC 4370        Web Programming
CSC 4380        Windowing Systems Programming
CSC 4760        Big Data Programming
Students must meet the Computer Science Major Eligibility Requirement in order to enroll
 in this course. Crosslisted with CSC 6760. This course will cover the technologies, too
ls, frameworks and languages that are most commonly used in Big Data Programming. Focus
will be on algorithms for analyzing and mining massive datasets, graphs and social netwo
rk data. Topics include the storage, management, processing and analysis of massive data
sets, as well as Big Data governance, security, and privacy issues.
CSC 4840        Advanced Computer Graphics Programming
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

This command indicates that the matched pattern in the file ‘CSC_Course.txt’ must start with ‘CSC’ and end with ‘Programming’, and it picks up any characters except a line break in between.

11)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep '^CSC.*Programming$' CSC_Course.txt
CSC 2301        Introduction to Python Programming
CSC 3210        Computer Organization and Programming
CSC 3320        System-Level Programming
CSC 4225        Internetwork Programming
CSC 4370        Web Programming
CSC 4380        Windowing Systems Programming
CSC 4760        Big Data Programming
CSC 4840        Advanced Computer Graphics Programming
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

This command output all the lines that must start with ‘CSC’ and the end of that line must be ‘Programming’.

12)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep --color 'CSC[^3]*3{2}' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A

The command has the option ‘--color', which is used to modify the color-highlight of the matched string in the output. The matched string for this command should start with ‘CSC’ and end with ‘33’, and there should be no ‘3’ character in between, e.g., CSC1233.

13)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ egrep --color -w 'CSC[^3]*3{2}[^3]*' CSC_Course.t
xt
CSC 3320        System-Level Programming
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet th
e Computer Science Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System-Level Programming with grade
s of C or better
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
CSC 4330        Programming Language Concepts
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

egrep indicates the looking for pattern is written in extended regular expression.

‘--color' is used to modify the color-highlight option in the output.

The ‘-w’ option makes the command matches only pattern that are presented in the whole word, instead of the pattern that is found as a substring.

The matched pattern should start with ‘CSC’. After that, the following character can be any other than ‘3’ or none. Next it must be a ‘33’ and end with any character excepts for ‘3’.

This command output all the line containing the pattern with option mentioned above.

14)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC.*C++' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$ grep 'CSC.*C++' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A

grep indicates the pattern is in basic regular expression, which means it doesn't recognize '+' as a special character.

15)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ egrep 'CSC.*C\+\+' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A

This command uses 'egrep' meaning it uses extended regular expression, there for it will treat '\+\+' as literally. Since there are no pattern that end with 'C\+\+' in the file CSC_Course.txt, it doesn't output anything.

16)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ egrep 'CSC.*C++' CSC_Course.txt
CSC 1010        Computers and Applications
CSC 1301        Principles of Computer Science I
CSC 1302        Principles of Computer Science II
Prerequisites   CSC 1301 with a "C" or higher
Prerequisites   CSC 1301 or CSC 2301 with a C or higher, or permission of instructor
CSC 2510        Theoretical Foundations of Computer Science
Prerequisites   (CSC 1301 or DSCI 1301) and (MATH 1113 or MATH 2211) with a C or higher.
Prerequisites   CSC 1302, MATH 2211, and CSC 2510 or MATH 2420 with grades of "C" or hig
her
CSC 2920        Ethical and Social Issues in Computing
Prerequisites   CSC 1301 and CSC 1302 with a C or higher or permission of the department
CSC 3210        Computer Organization and Programming
Prerequisites   CSC 1302, and CSC 2510 or MATH 2420 with A C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
CSC 4210        Computer Architecture
Prerequisites   CSC 3210 with grade of C or higher
CSC 4220        Computer Networks
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
CSC 4221        Wireless Networks & Mobile Computing
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet th
e Computer Science Major Eligibility Requirement in order to enroll in this course
CSC 4222        Cyber Security
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
```

The command outputs all the lines containing the matched string that start with 'CSC' and end with a 'C' with one or more occurrence as it treat '+' as a quantifier (special character).

Optional Part:

1)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ sed -E -n 's/(CSC 3[0-9]{3})(.*)/\1/p' CSC_Course.txt
CSC 3210
CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3210
Prerequisites   CSC 3210
Prerequisites   CSC 3320
Prerequisites   CSC 2720 and CSC 3320
Prerequisites   CSC 2720 and CSC 3320
Prerequisites   CSC 2720 (Data Structures) and CSC 3320
Prerequisites   CSC 2720 Data Structure and CSC 3320
Prerequisites   CSC 3210
Prerequisites   CSC 2720 (Data Structures) and CSC 3320
Prerequisites   CSC 3210
Prerequisites   CSC 3320
Prerequisites   CSC 2720, CSC 3210
Prerequisites   CSC 2720 and CSC 3210
Prerequisites   CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3320
Prerequisites   CSC 3320
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

sed performs an action on all lines that match a particular condition.

-E (option): use extended regular expressions rather than basic regular expressions.

-n (option): suppress the automatic printing of pattern space.

Capturing Group 1 is string that starts with ‘CSC 3’ and ends with any 3 digits.

Capturing Group 2 is any character excepts a line break with infinite occurrence or none.

s/ (action): substitute group 1 with itself (group 1 – ‘\1’).

/p (action): print all lines containing the pattern above in the file ‘CSC_Course.txt’.

2.

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ awk -F'-' '/(CSC 3[0-9]{3})(.*)/{print $1}' CSC_Course.txt
CSC 3210        Computer Organization and Programming
CSC 3320        System
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3210 with a C or higher
Prerequisites   CSC 3210 with grade of C or higher
Prerequisites   CSC 3320 and either MATH 3020 or MATH 3030 with a C or higher
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher.Students must meet the Computer Scienc
e Major Eligibility Requirement in order to enroll in this course
Prerequisites   CSC 2720 and CSC 3320 with grades of "C" or higher
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 2720 Data Structure and CSC 3320 System
Prerequisites   CSC 3210 Computer Organization and Programming, CSC 2720 Data Structure
Prerequisites   CSC 2720 (Data Structures) and CSC 3320 (System Level Programming)
Prerequisites   CSC 3210 and CSC 3320 with grades of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 2720, CSC 3210, and CSC 3320 with a C or higher
Prerequisites   CSC 2720 and CSC 3210 with grades of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a C or higher
Prerequisites   CSC 3320 with grade of "C" or higher
Prerequisites   CSC 3320 with grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
Prerequisites   CSC 3320 with a grade of C or higher
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

-F'-' (option): uses '-' as the field separator

$1: refer to the first field.

printf $1: print out the first field, each field is separated by '-', in the file 'CSC_Course.txt'.

3.

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ sed -E -n 's/(CSC [0-9]{4})( - )(.*)/\3/p' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$ sed -E -n 's/(CSC [0-9]{4})( - )(.*)/\3/p' CSC_Course.txt
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A

The option is the same as in the command in question 1.

Capturing Group 1: string that starts with CSC and end with any 4 digits.

Capturing Group 2: ' - '.

Capturing Group 3: Any character excepts line break with infinite occurrence or none.

s/: substitute group 1 with group 3 ('\3').

/p: print all lines containing the pattern above in the file 'CSC_Course.txt'.

4)

```
[choang7@gsuad.gsu.edu@snowball Lab4]$ sed -E -n 's/(CSC [0-9]{4})( - )(.*)/\3/p' CSC_Course.txt|
> sort
[choang7@gsuad.gsu.edu@snowball Lab4]$ sed -E -n 's/(CSC [0-9]{4})( - )(.*)/\3/p' CSC_Course.txt| sort
[choang7@gsuad.gsu.edu@snowball Lab4]$
```

N/A

But the command is the same as explained in question 3 excepts for addition ‘sort’ command, which is used to sort the context of the supposed output in lexicographical order.