

Fr. Conceicao Rodrigues College of Engineering Department of Computer Engineering			
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Date of Performance	25/01/2024	SE Computer – Div	A

Aim:

- (a) Study Linux File System, Types of Users, Environment Variables
 (b) Study basic commands, User , File and Process related commands

Lab Outcome:

CSL403.1: Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux.

Problem Statement:

Explore the linux commands.

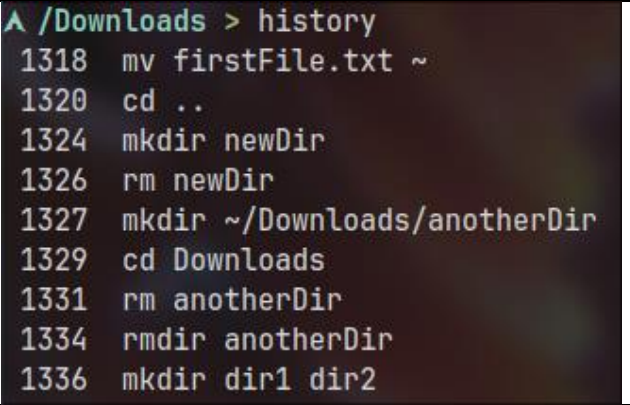
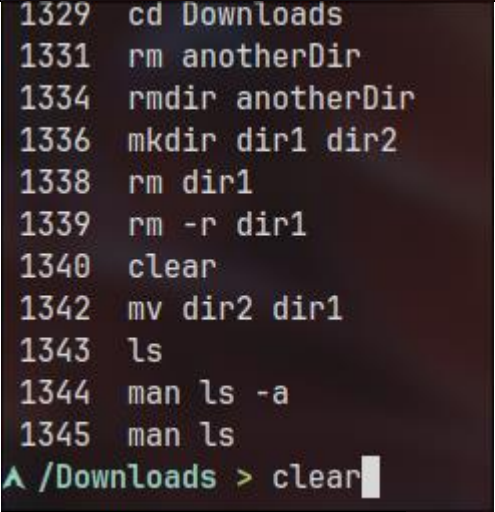
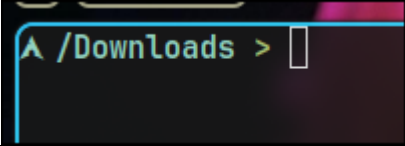
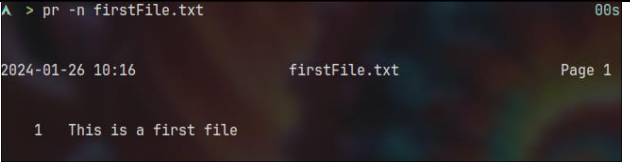
Copy paste the executed instructions here		
Command	Description	Output
Process Commands		
bg	Sends a process to background	<pre> universe@lenovo8:~/9215\$ sleep 100 ^Z [1]+ Stopped sleep 100 universe@lenovo8:~/9215\$ jobs [1]+ Stopped sleep 100 universe@lenovo8:~/9215\$ bg %1 [1]+ sleep 100 & </pre>
fg	To bring a stopped process to foreground	<pre> universe@lenovo8:~/9215\$ jobs universe@lenovo8:~/9215\$ sleep 100 ^Z [1]+ Stopped sleep 100 universe@lenovo8:~/9215\$ jobs [1]+ Stopped sleep 100 universe@lenovo8:~/9215\$ fg %1 sleep 100 </pre>
top	displays the linux processes	<pre> top - 15:41:15 up 1:23, 1 user, load average: 0.97, 0.78, 0.62 Tasks: 276 total, 2 running, 268 sleeping, 0 stopped, 0 zombie %Cpu(s): 2.4 us, 1.4 sy, 0.0 ni, 95.1 id, 0.0 wa, 0.0 hi, 0.1 si, 0.0 st MiB Mem : 7628.0 total, 3378.6 free, 2316.8 used, 1931.6 buff/cache MiB Swap: 16000.0 total, 16000.0 free, 0.0 used, 4623.5 avail Mem PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND 1587 universe 9 -11 1859904 20132 15500 S 8.6 0.3 2:53.67 pulseau+ 1045 root 20 0 557136 82676 48008 S 5.6 1.1 1:59.33 Xorg 7282 universe 20 0 2879548 317648 111324 R 4.0 4.1 1:46.07 Isolater 1796 universe 20 0 527540 80244 62252 S 2.3 1.0 0:34.39 xfwm4 9173 universe 20 0 322188 41092 33176 S 2.3 0.5 0:00.20 xfce4-s+ 6151 universe 20 0 3800252 469152 220292 S 1.3 6.0 5:06.29 firefox 8456 universe 20 0 2596876 175684 92232 S 0.7 2.2 0:13.84 Isolater+ 14 root 20 0 0 0 0 I 0.3 0.0 0:01.96 rcu_sch+ 1287 mysql 20 0 2244644 388412 36728 S 0.3 5.0 0:16.01 mysqld 6274 universe 20 0 2433884 101736 80984 S 0.3 1.3 0:01.95 WebExte+ 6584 root 20 0 0 0 0 I 0.3 0.0 0:00.64 kworker+ 6974 universe 20 0 3039368 516956 139044 S 0.3 6.6 2:36.73 Isolater+ 7040 universe 20 0 2461900 94604 80772 S 0.3 1.2 0:01.15 Isolater+ 8271 root 20 0 0 0 0 I 0.3 0.0 0:03.65 kworker+ 8452 universe 20 0 2628940 150320 104732 S 0.3 1.9 0:06.52 Isolater+ 1 root 20 0 167712 11764 8312 S 0.0 0.2 0:01.81 systemd 2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd </pre>

ps	report a snapshot of the current processes.	<pre>universe@lenovo8:~/9215\$ ps PID TTY TIME CMD 6135 pts/0 00:00:00 bash 9166 pts/0 00:00:00 ps</pre>
ps <PID>	show to detail of the process based on its process id	<pre>universe@lenovo8:~/9215\$ ps 6151 PID TTY STAT TIME COMMAND 6151 ? SL 4:57 /usr/lib/firefox/firefox</pre>
ps ux	report a snapshot of the user process	<pre>universe@lenovo8:~/9215\$ ps ux USER PID %CPU %MEM VSZ RSS TTY STAT START TIME COMMAND universe 1581 0.0 0.1 18756 10040 ? Ss 14:18 0:00 /lib/systemd/ universe 1582 0.0 0.0 169116 3828 ? S 14:18 0:00 (sd-pam) universe 1587 3.4 0.2 1859904 20132 ? SsSl 14:18 2:46 /usr/bin/puls universe 1589 0.0 0.3 585608 26580 ? SsSl 14:18 0:00 /usr/libexec/ universe 1592 0.0 0.0 240164 7696 ? Sl 14:18 0:00 /usr/bin/gnom universe 1597 0.0 0.0 7932 5036 ? Ss 14:18 0:01 /usr/bin/dbus universe 1612 0.0 0.1 239704 7824 ? Ssl 14:18 0:00 /usr/libexec/ universe 1617 0.0 0.0 378344 5512 ? Sl 14:18 0:00 /usr/libexec/ universe 1624 0.0 0.1 313824 9012 ? Ssl 14:18 0:00 /usr/libexec/ universe 1630 0.0 0.1 316724 8784 ? Ssl 14:18 0:00 /usr/libexec/ universe 1635 0.0 0.2 267916 22468 ? Ssl 14:18 0:00 xfce4-session universe 1636 0.0 0.0 237976 6648 ? Ssl 14:18 0:00 /usr/libexec/ universe 1640 0.0 0.0 235872 6324 ? Ssl 14:18 0:00 /usr/libexec/ universe 1644 0.0 0.0 235700 6332 ? Ssl 14:18 0:00 /usr/libexec/ universe 1747 0.0 0.0 6040 452 ? Ss 14:18 0:00 /usr/bin/ssh- universe 1765 0.0 0.0 305308 6780 ? Ssl 14:18 0:00 /usr/libexec/ universe 1770 0.0 0.0 7376 4236 ? S 14:18 0:00 /usr/bin/dbus universe 1774 0.0 0.0 230212 5864 ? Sl 14:18 0:00 /usr/lib/x86_ universe 1780 0.0 0.0 162832 7796 ? Sl 14:18 0:00 /usr/libexec/ universe 1786 0.0 0.3 227168 24456 ? Sl 14:18 0:00 /usr/bin/xfce universe 1796 0.6 1.0 527540 80244 ? Sl 14:18 0:33 xfwm4 --repla</pre>
kill <PID>	kill an ongoing process that has the same PID as the PID mentioned	<pre>universe@lenovo8:~/9215\$ ps aux grep gimp universe 9311 1.5 1.5 1510520 118212 ? Sl 15:49 0:01 gimp-2.10 universe 9344 0.0 0.2 190328 17812 ? Sl 15:49 0:00 /usr/lib/gimp /2.0/plugin-ins/script-fu/script-fu -gimp 10 9 -run 0 universe 9349 0.0 0.0 8908 712 pts/0 S+ 15:50 0:00 grep --color= auto gimp universe@lenovo8:~/9215\$ kill 9344 universe@lenovo8:~/9215\$ ps aux grep gimp universe 9371 0.0 0.0 8908 720 pts/0 S+ 15:51 0:00 grep --color= auto gimp</pre>
pidof <Process_name>	outputs the pid of the process mentioned	<pre>universe@lenovo8:~/9215\$ pidof firefox 8706 8702 8699 8603 8588 8581 8576 8503 8462 8456 8452 8380 8188 8185 7768 7401 7282 7153 7093 7040 6974 6274 6241 6216 6151</pre>
nice -n <a number between -20 to 19> <process name>	run a program with the modified scheduling priority	<pre>universe@lenovo7:~\$ nice -n 16 firefox universe@lenovo7:~\$</pre>
renice <a number between -20 to 19> -p <PID>	Change the priority of the already running process	<pre>universe@lenovo8:~/9215\$ renice 15 -p 6151 6151 (process ID) old priority 0, new priority 15</pre>
df -h	give the filesystem disk space usage. -h flag is used to convert the output into a readable format	<pre>universe@lenovo8:~/9215\$ df -h Filesystem Size Used Avail Use% Mounted on udev 3.7G 0 3.7G 0% /dev tmpfs 763M 2.2M 761M 1% /run /dev/sda8 192G 23G 159G 13% / tmpfs 3.8G 0 3.8G 0% /dev/shm tmpfs 5.0M 4.0K 5.0M 1% /run/lock tmpfs 3.8G 0 3.8G 0% /sys/fs/cgroup /dev/sda1 96M 31M 66M 32% /boot/efi /dev/sda9 276G 11G 252G 4% /home tmpfs 763M 48K 763M 1% /run/user/1001</pre>
free -m	show the detail of ram and swap memory. -m flag is used to show the output in a readable format	<pre>universe@lenovo8:~/9215\$ free total used free shared buff/cache available Mem: 7809272 2343556 3473676 407400 1992040 4745912 Swap: 16383996 0 16383996</pre>
Environment Variables		

PATH	This contains list of directories separated by ':' where the system looks for executable files. Files in this dirs can be executed just by invoking their name instead of the whole path	<pre>^ > echo \$PATH /home/vivalchemy/.dotfiles/scripts:/usr/local/sbin:/usr/local/bin:/usr/bin:/usr/bin/site_perl:/usr/bin/vendor_perl:/usr/bin/core_perl</pre>
USER	The name of the user of the current session	<pre>^ > echo \$USER vivalchemy</pre>
HOME	Path for the user's home directory	<pre>^ > echo \$HOME /home/vivalchemy</pre>
EDITOR	Path to the editor which edits the contents of a file	<pre>^ > echo \$EDITOR /usr/bin/nvim</pre>
UID	Current user unique id	<pre>^ > echo \$UID 1000</pre>
TERM	Default terminal emulator	<pre>^ > echo \$TERM alacritty</pre>
SHELL	Default shell of the user	<pre>^ > echo \$SHELL /bin/zsh</pre>
NOTE: never put space between variable_name, = and value		
export <VARIABLE>=<VALUE>	Creates a environment variabel for the current shell as well as its subshell.	<pre>^ > export EDITOR="/usr/bin/nvim" ^ > echo \$EDITOR /usr/bin/nvim</pre>
<VARIABLE>=<VALUE>	Creates a new variable	<pre>^ > TERM=alacritty ^ > echo \$TERM alacritty</pre>
unset <VARIABLE>	Removes a variable	<pre>^ > NAME="vivian" ^ > echo \$NAME vivian ^ > unset NAME ^ > echo \$NAME</pre>
echo \$<VARIABLE>	prints the variables value	<pre>^ > NAME="vivian" ^ > echo \$NAME vivian</pre>
Basic linux commands		

ls -al	It list the files and dirs in the current directory -a: list all hidden as well as non hidden -l: Gives detailed information	<pre> A > ls Documents dotfiles Downloads Media Pictures Projects A > ls -a . .config Downloads Pictures .ssh .. Documents .local .pki .vscode-oss .cache dotfiles Media Projects .python_history A > ls -l total 0 drwxr-xr-x 1 vivalchemy users 222 Jan 22 13:58 Documents drwxr-xr-x 1 vivalchemy users 264 Jan 21 13:24 dotfiles drwxr-xr-x 1 vivalchemy users 30 Jan 26 09:40 Downloads drwxr-xr-x 1 vivalchemy users 0 Jan 20 02:40 Media drwxr-xr-x 1 vivalchemy users 220 Jan 22 09:59 Pictures drwxr-xr-x 1 vivalchemy users 90 Jan 24 19:36 Projects </pre>
ls -R	Displays the files recursively	<pre> A /Pictures > ls -R .: Screenshots diagram-export-10-01-2024-21_10_01.svg re wallpapers diagram-export-10-01-2024-22_01_57.png ./Screenshots: 26Jan24_10h24m54s.png 26Jan24_10h35m38s.png 26Jan24_1 26Jan24_10h26m00s.png 26Jan24_10h36m41s.png 26Jan24_1 26Jan24_10h28m04s.png 26Jan24_10h38m48s.png 26Jan24_1 26Jan24_10h32m14s.png 26Jan24_10h40m17s.png 26Jan24_1 26Jan24_10h33m47s.png 26Jan24_10h40m25s.png ./wallpapers: 0pnty165wo9c1.png 0vd7x9h7s2ac1.jpeg </pre>
cat <filename>	View the content of a file	<pre> A > cat firstFile.txt This is a first file </pre>
cat > <filename>	Create a new file	<pre> A > cat > file; This is a new file ^C A > cat file This is a new file </pre>
cat <file1> <file2> > <output_file>	Merge two or more files into one file	<pre> A > cat firstFile.txt secondFile.txt > file A > cat file This is a first file This is a second file </pre>
rm <filename>	Remove a file	<pre> A > ls Documents Downloads Pictures file secondFile.txt dotfiles Media Projects firstFile.txt A > rm file A > ls Documents Downloads Pictures firstFile.txt dotfiles Media Projects secondFile.txt </pre>
mv <input_file> <output_file>	Rename a file	<pre> A > ls Documents Downloads Pictures firstFile.txt dotfiles Media Projects secondFile.txt A > cat firstFile.txt This is a first file A > mv firstFile.txt file A > ls Documents Downloads Pictures file dotfiles Media Projects secondFile.txt A > cat firstFile.txt cat: firstFile.txt: No such file or directory A > cat file This is a first file </pre>

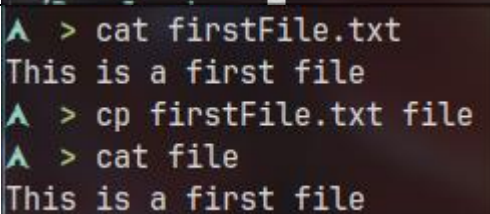
sudo <command>	Give admin privileges to a command	<pre> A > pacman -Syyu error: you cannot perform this operation unless you are root. A > sudo pacman -Syyu [sudo] password for vivalchemy: :: Synchronizing package databases... </pre>
mv <file> <directory>	Move file to the new location	<pre> A /Downloads > ls 9922_py_ex1.pdf firstFile.txt A /Downloads > mv firstFile.txt ~ A /Downloads > ls 9922_py_ex1.pdf A /Downloads > cd .. A > ls Documents Downloads Pictures firstFile.txt dotfiles Media Projects secondFile.txt </pre>
mkdir <directory_name>	Make a new directory in the current location	<pre> A > ls Documents Downloads Pictures firstFile.txt dotfiles Media Projects secondFile.txt A > mkdir newDir A > ls Documents Downloads newDir Projects secondFile.txt dotfiles Media Pictures firstFile.txt </pre>
mkdir <directory_location>/<directory_name>	Make the new directory in different location	<pre> A > mkdir ~/Downloads/anotherDir A > ls Documents Downloads newDir Projects secondFile.txt dotfiles Media Pictures firstFile.txt A > cd Downloads A /Downloads > ls anotherDir 9922_py_ex1.pdf </pre>
rmdir <directory_name>	Remove an empty directory	<pre> A /Downloads > ls anotherDir 9922_py_ex1.pdf A /Downloads > rmdir anotherDir A /Downloads > ls 9922_py_ex1.pdf </pre>
mv <input_dir> <output_dir>	Rename the directory	<pre> A /Downloads > ls dir2 9922_py_ex1.pdf A /Downloads > mv dir2 dir1 A /Downloads > ls dir1 9922_py_ex1.pdf </pre>
man <command>	Display the manual page for that command	<pre> A /Downloads > man ls </pre> <div> <p>LS(1) User Commands LS(1)</p> <p>NAME</p> <p>ls - list directory contents</p> <p>SYNOPSIS</p> <p>ls [OPTION]... [FILE]...</p> <p>DESCRIPTION</p> <p>List information about the FILES (the current directory by default). Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.</p> <p>Mandatory arguments to long options are mandatory for short options too.</p> </div>

history	Display the command that you used in the past	 <pre> ^ /Downloads > history 1318 mv firstFile.txt ~ 1320 cd .. 1324 mkdir newDir 1326 rm newDir 1327 mkdir ~/Downloads/anotherDir 1329 cd Downloads 1331 rm anotherDir 1334 rmdir anotherDir 1336 mkdir dir1 dir2 </pre>
clear	clears the terminal screen	 <pre> 1329 cd Downloads 1331 rm anotherDir 1334 rmdir anotherDir 1336 mkdir dir1 dir2 1338 rm dir1 1339 rm -r dir1 1340 clear 1342 mv dir2 dir1 1343 ls 1344 man ls -a 1345 man ls ^ /Downloads > clear </pre>  <pre> ^ /Downloads > </pre>
pr	Formatting a file while it prints on the terminal -x Divides the data into 'x' columns -h "header" Assigns "header" value as the report header -t Does not print the header and top/bottom margins -d Double spaces the output file -n Denotes all line with numbers -l page length Defines the	 <pre> ^ > pr -n firstFile.txt </pre> <pre> 2024-01-26 10:16 firstFile.txt Page 1 1 This is a first file </pre>

	lines (page length) in a page. Default is 56 -o margin Formats the page by the margin number	
lp <filename> or lpr <filename>	Sends the file to the printer to print	<pre>A > lp firstFile.txt lp: Error - No default destination. A > lpr firstFile.txt lpr: Error - No default destination.</pre> <p>I don't have a printer</p>
sudo apt-get install <package_name>	Install a package on your system Note: Only works on debian based distros	<pre>A > sudo apt-get install cmatrix sudo: apt-get: command not found</pre>
mail -s "<Subject>" -account "<receiver_email_id>"	Sends an email via terminal	<pre>home@VirtualBox:~\$ mail -s "News Today" abc@ymail.com Hi, The news for today follows. 1. Abs named as the biggest company. 2.</pre>
rm -rf	removes a file -r: remove the files in a directory recursively -f: removes them forcefully	<pre>A > rm -rf /</pre>

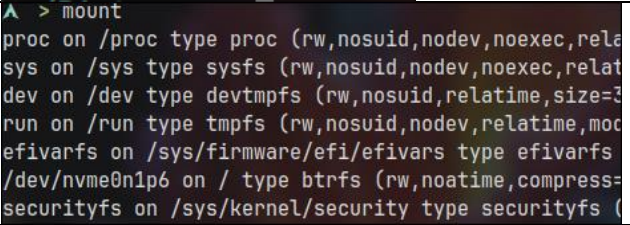
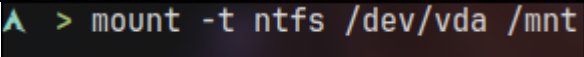
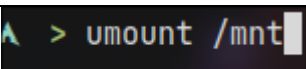
User Commands

sudo adduser <username>	add a new user	<pre>aqsa@aqsa-VirtualBox:~\$ sudo adduser linuxuser3 Adding user `linuxuser3' ... Adding new group `linuxuser3' (1006) ... Adding new user `linuxuser3' (1004) with group `linuxuser3' ... Creating home directory `/home/linuxuser3' ... Copying files from `/etc/skel' ... New password: Retype new password: passwd: password updated successfully Changing the user information for linuxuser3 Enter the new value, or press ENTER for the default Full Name []: linuxuser3 Room Number []: Work Phone []: Home Phone []: Other []: Is the information correct? [Y/n] y ← Press "Y" aqsa@aqsa-VirtualBox:~\$</pre>
sudo passwd <username>	change the passwd of the user	<pre>A > sudo passwd vivalchemy [sudo] password for vivalchemy: New password: Retype new password: passwd: password updated successfully</pre>
sudo userdel -r <username>	delete the user	<pre>A > sudo userdel -r newUser [sudo] password for vivalchemy: A > su newUser su: user newUser does not exist or the user entry does not contain all the required fields</pre>

sudo passwd -l <username>	remove the password of the user	
sudo usermod -a -G “<list_of_groups> ” <username>	add new groups to the user. Tip: You can check the default group in the file /etc/group	
sudo deluser <username> <group>	Remove a user from a group	
finger	give the information on all users	
finger <username>	Gives the details the user	
File system Commands		
cat <file>	Print the file content in stdout	
cd <directory>	Change the working directory	
cp <input_file> <output_file>	Copy the file content from one file to another	
file <filename>	Identifies the file type based on its contents	
find <filename> or find <dir>	finds the file or directory	

head <filename>	prints the first few lines of a file	<pre>^ > wc -l firstFile.txt 100 firstFile.txt ^ > head firstFile.txt 1 lines 2 lines 3 lines 4 lines 5 lines 6 lines 7 lines 8 lines 9 lines 10 lines</pre>	
tail <filename>	prints the last few lines of a file	<pre>^ > tail firstFile.txt 91 lines 92 lines 93 lines 94 lines 95 lines 96 lines 97 lines 98 lines 99 lines 100 lines</pre>	
ls <directory>	prints the contents of the directory	<pre>^ > ls Downloads dir1 9922_py_ex1.pdf</pre>	
mkdir <directory>	make a new directory	<pre>^ /Downloads > ls 9922_py_ex1.pdf ^ /Downloads > mkdir dir1 ^ /Downloads > ls dir1 9922_py_ex1.pdf</pre>	

more <filename>	Pages through the file contents one screenful at a time	<pre> 20 lines 21 lines 22 lines 23 lines 24 lines 25 lines 26 lines 27 lines 28 lines 29 lines 30 lines 31 lines 32 lines 33 lines 34 lines --More-- (33%) </pre>
pwd	prints the current working directory	<pre> A > pwd /home/vivalchemy </pre>
rm <filename>	remove the file	<pre> A > ls Documents Downloads newDir Projects firstFile.txt dotfiles Media Pictures file.md secondFile.txt A > rm file.md A > ls Documents Downloads newDir Projects secondFile.txt dotfiles Media Pictures firstFile.txt </pre>
rmdir <dirname>	Removes an empty directory	<pre> A /Downloads > ls dir1 9922_py_ex1.pdf A /Downloads > rmdir dir1 A /Downloads > ls 9922_py_ex1.pdf </pre>
whereis <filename>	shows the location of the command's binary, source, and man pages	<pre> A > whereis nvim pass nvim: /usr/bin/nvim /usr/lib/nvim /usr/share/nvim /usr/share/man/man1/nvim.1.gz </pre>
which <filename>	Shows the location of the file in your path	<pre> A > which nvim /usr/bin/nvim </pre>
df	Shows the disk usage	<pre> A > df Filesystem 1K-blocks Used Available Use% Mounted on dev 3920188 0 3920188 0% /dev run 3934792 1344 3933448 1% /run efivarfs 192 149 39 80% /sys/firmware/efi/efivars /dev/nvme0n1p6 209716224 10346580 198199356 5% / tmpfs 3934792 114188 3820604 3% /dev/shm /dev/nvme0n1p6 209716224 10346580 198199356 5% /.snapshots /dev/nvme0n1p6 209716224 10346580 198199356 5% /home /dev/nvme0n1p6 209716224 10346580 198199356 5% /var_log tmpfs 3934796 37456 3897340 1% /tmp /dev/nvme0n1p1 262144 85080 177064 33% /boot/efi tmpfs 786956 4140 782816 1% /run/user/1000 </pre>

du	Show the disk usage of the sub-directories		
mount	Shows the mounted filesystems		
mount -t <file_system> <device_to_mount> > <mount_location>	Mount the device to a specific location	 no output generated for successful execution. Use lsblk to verify	
umount <mounted_device> >	Removes a mounted drive	 no output generated for successful execution. Use lsblk to verify	

References:**Section (a)**

<https://www.geeksforgeeks.org/linux-file-hierarchy-structure/>
<https://www.guru99.com/file-permissions.html>

Environment Variables: <https://www.guru99.com/linux-environment-variables.html>

Section (b)

Basic Commands <https://www.guru99.com/must-know-linux-commands.html>

Process Commands: <https://www.guru99.com/managing-processes-in-linux.html>

User Commands: <https://www.guru99.com/linux-admin.html>

or <https://www.tutorialspoint.com/unix/unix-user-administration.htm>

File Commands: <https://www.tutorialspoint.com/unix/unix-file-system.htm>

On time Submission(2)	Knowledge of Topic(4)	Implementation and Demonstraion(4)	Total (10)
Signature of Faculty		Date of Submission	

