

Department of Computer Engineering

Batch:E2 Roll No.: 16010123325

Experiment No. 01

Grade: AA / AB / BB / BC / CC / CD /DD

Signature of the Staff In-charge with date

TITLE: Exploring basic Commands of UNIX: Shell, Processes, Files

AIM: To Explore basic commands for handling File system under Unix/Linux using shell scripts.(Creating groups, chown , chmod , directory name, tty , diff, umask).

Expected Outcome of Experiment:

CO 1. To introduce basic concepts and functions of operating systems.

Books/ Journals/ Websites referred:

1. **Silberschatz A., Galvin P., Gagne G. “Operating Systems Principles”, Willey Eight edition.**
2. **Achyut S. Godbole , Atul Kahate “Operating Systems”, McGraw Hill Third Edition.**
3. **Sumitabha Das “ UNIX Concepts & Applications”, McGraw Hill Second Edition.**

Pre Lab/ Prior Concepts:

An operating system (OS) is a resource manager. It takes the form of a set of software routines that allow users and application programs to access system resources (e.g. the CPU, memory, disks, modems, printers network cards etc.) in safe efficient and abstract way.

- The operating system kernel is in direct control of the underlying hardware. The kernel provides low-level device, memory and processor management functions (e.g. dealing with interrupts from hardware devices, sharing the processor among multiple programs, allocating memory for programs etc.)
- Basic hardware-independent kernel services are exposed to higher-level programs through a library of system calls (e.g. services to create a file, begin execution of a program, or open a logical network connection to another computer).
- Application programs (e.g. word processors, spreadsheets) and system utility programs (simple but useful application programs that come with the operating system, e.g. programs which find text inside a group of files) make use of system calls. Applications and system utilities are launched using a shell (a textual command line interface) or a graphical user interface that provides direct user interaction.

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Operating systems can be distinguished from one another by the system calls, system utilities and user interface they provide, as well as by the resource scheduling policies implemented by the kernel.

UNIX has been a popular OS for more than two decades because of its multi-user, multi-tasking environment, stability, portability and powerful networking capabilities.

Linux is a free open source UNIX OS for PCs.

Linux has all of the components of a typical OS :

- **Kernel**

The Linux kernel includes device driver support for a large number of PC hardware devices (graphics cards, network cards, hard disks etc.), advanced processor and memory management features, and support for many different types of file systems. In terms of the services that it provides to application programs and system utilities, the kernel implements most BSD and SYSV system calls, as well as the system calls described in the POSIX.1 specification.

The kernel (in raw binary form that is loaded directly into memory at system startup time) is typically found in the file `/boot/vmlinuz`, while the source files can usually be found in `/usr/src/linux`.

- **Shells and GUIs**

Linux supports two forms of command input: through textual command line shells similar to those found on most UNIX systems (e.g. `sh` - the Bourne shell, `bash` - the Bourne again shell and `csh` - the C shell) and through graphical interfaces (GUIs) such as the KDE and GNOME window managers.

- **System Utilities**

Virtually every system utility that you would expect to find on standard implementations of UNIX has been ported to Linux. This includes commands such as `ls`, `cp`, `grep`, `awk`, `sed`, `bc`, `wc`, `more`, and so on. These system utilities are designed to be powerful tools that do a single task extremely well (e.g. `grep` finds text inside files while `wc` counts the number of words, lines and bytes inside a file). Users can often solve problems by interconnecting these tools instead of writing a large monolithic application program.

- **Application programs**

Linux distributions typically come with several useful application programs as standard. Examples include the `emacs` editor, `xv` (an image viewer), `gcc` (a C compiler), `g++` (a C++ compiler), `xfig` (a drawing package), `latex` (a powerful typesetting language) and `soffice` (StarOffice, which is an MS-Office style clone that can read and write Word, Excel and PowerPoint files).

Description of Unix Commands and options:

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A. Basic and Important UNIX (Linux/macOS) Commands

1. Directory and File Management
2. Viewing and Editing Files
3. Searching and Permissions

B. Process and System Management

1. Process Control
2. System Information

C. Advanced and Useful UNIX Commands

1. Administrative and Remote Operations
2. Searching and Processing Files
3. System Monitoring and Disk Management

Screen Shot of Implemented Commands:

```
kjsce@kjsce-VirtualBox:~$ mkdir notes
kjsce@kjsce-VirtualBox:~$ ls
191  city.txt  Downloads  file3.txt  Pictures  Templates
a.txt Desktop  file1.txt  Music      Public    Videos
b.txt Documents file2.txt  notes      snap
kjsce@kjsce-VirtualBox:~$ ls *.txt
a.txt b.txt city.txt file1.txt file2.txt file3.txt
kjsce@kjsce-VirtualBox:~$ cd Music
kjsce@kjsce-VirtualBox:~/Music$ cd notes
bash: cd: notes: No such file or directory
kjsce@kjsce-VirtualBox:~/Music$ cd ./
kjsce@kjsce-VirtualBox:~/Music$ cd notes
bash: cd: notes: No such file or directory
kjsce@kjsce-VirtualBox:~/Music$ cd ../
kjsce@kjsce-VirtualBox:~$ cd notes
kjsce@kjsce-VirtualBox:~/notes$ touch os.txt
kjsce@kjsce-VirtualBox:~/notes$ ls
os.txt
kjsce@kjsce-VirtualBox:~/notes$ cat > os.txt
Hello this is the file containing notes of OS
kjsce@kjsce-VirtualBox:~/notes$ cat os.txt
Hello this is the file containing notes of OS
kjsce@kjsce-VirtualBox:~/notes$ cat > psot.txt
^C
kjsce@kjsce-VirtualBox:~/notes$ cat > psot.txt
```

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```
bash: cd: notes: No such file or directory
kjsce@kjsce-VirtualBox:~/Music$ cd ../
kjsce@kjsce-VirtualBox:~$ cd notes
kjsce@kjsce-VirtualBox:~/notes$ touch os.txt
kjsce@kjsce-VirtualBox:~/notes$ ls
os.txt
kjsce@kjsce-VirtualBox:~/notes$ cat > os.txt
Hello this is the file containing notes of OS
kjsce@kjsce-VirtualBox:~/notes$ cat os.txt
Hello this is the file containing notes of OS
kjsce@kjsce-VirtualBox:~/notes$ cat > psot.txt
^C
kjsce@kjsce-VirtualBox:~/notes$ cat > psot.txt
Hello this is the file containing notes of PSOT
kjsce@kjsce-VirtualBox:~/notes$ cat psot.txt
Hello this is the file containing notes of PSOT
kjsce@kjsce-VirtualBox:~/notes$ cat os.txt psot.txt>cat both.txt
cat: both.txt: No such file or directory
kjsce@kjsce-VirtualBox:~/notes$ cat os.txt psot.txt> both.txt
kjsce@kjsce-VirtualBox:~/notes$ cat both.txt
Hello this is the file containing notes of OS
Hello this is the file containing notes of PSOT
kjsce@kjsce-VirtualBox:~/notes$ pwd
/home/kjsce/notes
kjsce@kjsce-VirtualBox:~/notes$ cp os.txt both.txt
```


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```
kjsce@kjsce-VirtualBox:~/notes$ cat os..txt
cat: os..txt: No such file or directory
kjsce@kjsce-VirtualBox:~/notes$ cat os.txt
Hello this is the file containing notes of OS
kjsce@kjsce-VirtualBox:~/notes$ cat both.txt
Hello this is the file containing notes of OS
kjsce@kjsce-VirtualBox:~/notes$ cat > today.txt
mkdir - make directory
cd - change directory
ls - list
cat- with files
cp - copy contents to file
kjsce@kjsce-VirtualBox:~/notes$ head today.txt
mkdir - make directory
cd - change directory
ls - list
cat- with files
cp - copy contents to file
kjsce@kjsce-VirtualBox:~/notes$ id
uid=1000(kjsce) gid=1000(kjsce) groups=1000(kjsce),4(adm),24(cdrom),27(sudo),30(dialout),46(plugdev),100(users),114(lpadmin)
kjsce@kjsce-VirtualBox:~/notes$
```

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```
kjsce@kjsce-VirtualBox:~/notes$ ls
both.txt  cat  os.txt  psot.txt  today.txt
kjsce@kjsce-VirtualBox:~/notes$ cat today.txt
mkdir - make directory
cd - change directory
ls - list
cat- with files
cp - copy contents to file
kjsce@kjsce-VirtualBox:~/notes$ cat>longfile.txt
abc
def
hij
klm
nop
qrd
tuv
wxy
z
as
wr
qwerty
uipo
lkj
hgf
dsa
```

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```

wxy
z
as
wr
qwerty
uipo
lkj
hgf
dsa
zxc
vbn
mqw
ert
yui
opa
kjsce@kjsce-VirtualBox:~/notes$ ls
both.txt  cat  longfile.txt  os.txt  psot.txt  today.txt
kjsce@kjsce-VirtualBox:~/notes$ rm cat
kjsce@kjsce-VirtualBox:~/notes$ ls
both.txt  longfile.txt  os.txt  psot.txt  today.txt
kjsce@kjsce-VirtualBox:~/notes$ █
  
```

```

kjsce@kjsce-VirtualBox:~$ ls
191      b.txt      Documents  Music      snap      Videos
1.txt    command   Downloads  newname.txt source.txt
2.txt    command.txt file1.txt  os_lab     student
aditya   Desktop   file2.txt  Pictures    Templates
a.txt    destination.txt file.txt   Public     try1.txt
kjsce@kjsce-VirtualBox:~$ ls -lrth
total 104K
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Videos
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Templates
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Public
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Pictures
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Music
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Downloads
drwxr-xr-x 2 kjsce kjsce 4.0K Jul 16 17:32 Documents
--wx-wx-wx 1 kjsce kjsce 413 Jul 16 21:07 b.txt
drwxrwxr-x 2 kjsce kjsce 4.0K Jul 23 22:29 191
-rw-rw-r-- 1 kjsce kjsce 11 Jul 24 15:11 a.txt
drwxrwxr-x 2 kjsce kjsce 4.0K Jan 8 15:26 student
drwxrwxr-x 2 kjsce kjsce 4.0K Jan 9 15:25 os_lab
-rw-rw-r-- 1 kjsce kjsce 27 Jan 9 15:41 try1.txt
drwxr-xr-x 3 kjsce kjsce 4.0K Jan 9 16:22 Desktop
drwxrwxr-x 4 kjsce kjsce 4.0K Jan 9 16:36 aditya
drwx----- 5 kjsce kjsce 4.0K Jan 14 11:37 snap
  
```

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```
-rw-rw-r-- 1 kjsce kjsce 8 Jan 14 12:43 source.txt
drwxrwxr-x 2 kjsce kjsce 4096 Jan 8 15:26 student
drwxr-xr-x 2 kjsce kjsce 4096 Jul 16 17:32 Templates
-rw-rw-r-- 1 kjsce kjsce 27 Jan 9 15:41 try1.txt
drwxr-xr-x 2 kjsce kjsce 4096 Jul 16 17:32 Videos
kjsce@kjsce-VirtualBox:~$ mkdir new
kjsce@kjsce-VirtualBox:~$ cd new
kjsce@kjsce-VirtualBox:~/new$ ls
kjsce@kjsce-VirtualBox:~/new$ cat>os.txt
Hello this file contains notes of os
OS is operating systemskjsce@kjsce-VirtualBox:~/new$
kjsce@kjsce-VirtualBox:~/new$ cat os.txt
Hello this file contains notes of os
OS is operating systemskjsce@kjsce-VirtualBox:~/new$ cd
kjsce@kjsce-VirtualBox:~$ mkdir board
kjsce@kjsce-VirtualBox:~$ touch board/board{1..3}.txt
kjsce@kjsce-VirtualBox:~$ ls
191 a.txt command.txt Downloads Music Pictures student
1.txt board Desktop file1.txt new Public Templates
2.txt b.txt destination.txt file2.txt newname.txt snap try1.txt
aditya command Documents file.txt os_lab source.txt Videos
kjsce@kjsce-VirtualBox:~$ cd board
kjsce@kjsce-VirtualBox:~/board$ ls
board1.txt board2.txt board3.txt
```


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```
kjsce@kjsce-VirtualBox:~/board$ ls -lrth
total 0
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board3.txt
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board2.txt
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board1.txt
kjsce@kjsce-VirtualBox:~/board$ cd
kjsce@kjsce-VirtualBox:~$ sudo chown -c aditi board2.txt
[sudo] password for kjsce:
chown: invalid user: 'aditi'
kjsce@kjsce-VirtualBox:~$ uname
Linux
kjsce@kjsce-VirtualBox:~$ w
 14:52:13 up 38 min,  1 user,  load average: 0.08, 0.05, 0.05
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU WHAT
kjsce     tty2      -             14:14    38:39   0.07s   0.07s /usr/libexec/gn
kjsce@kjsce-VirtualBox:~$ mkdir aditi
kjsce@kjsce-VirtualBox:~$ ls
191      a.txt      Desktop      file2.txt    os_lab      student
1.txt    board      destination.txt file.txt      Pictures    Templates
2.txt    b.txt      Documents    Music        Public      try1.txt
aditi    command    Downloads    new          snap        Videos
aditya   command.txt file1.txt     newname.txt  source.txt
kjsce@kjsce-VirtualBox:~$ cd aditi
kjsce@kjsce-VirtualBox:~/aditi$ cat>notes.txt
```

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```
kjsce@kjsce-VirtualBox:~/aditi$ cd
kjsce@kjsce-VirtualBox:~$ sudo adduser aditi
info: Adding user `aditi' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `aditi' (1001) ...
info: Adding new user `aditi' (1001) with group `aditi (1001)' ...
info: Creating home directory `/home/aditi' ...
info: Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
Changing the user information for aditi
Enter the new value, or press ENTER for the default
    Full Name []: Aditi
    Room Number []: B210
    Work Phone []: 9999999999
    Home Phone []: 9888888888
    Other []: 877777777
Is the information correct? [Y/n] y
info: Adding new user `aditi' to supplemental / extra groups `users' ...
info: Adding user `aditi' to group `users' ...
kjsce@kjsce-VirtualBox:~$ w
14:56:08 up 42 min,  1 user,  load average: 0.09, 0.10, 0.07
```

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```

USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU WHAT
kjsce     tty2     -               14:14    42:34  0.07s  0.07s /usr/libexec/gn
kjsce@kjsce-VirtualBox:~$ sudo chown -c aditi board2.txt
chown: cannot access 'board2.txt': No such file or directory
kjsce@kjsce-VirtualBox:~$ cd board
kjsce@kjsce-VirtualBox:~/board$ sudo chown -c aditi board2.txt
changed ownership of 'board2.txt' from kjsce to aditi
kjsce@kjsce-VirtualBox:~/board$ ls -l
total 0
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board1.txt
-rw-rw-r-- 1 aditi kjsce 0 Jan 14 14:48 board2.txt
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board3.txt
kjsce@kjsce-VirtualBox:~/board$ sudo addgroup notes
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `notes' (GID 1002) ...
kjsce@kjsce-VirtualBox:~/board$ chgrp notes board1.txt
chgrp: changing group of 'board1.txt': Operation not permitted
kjsce@kjsce-VirtualBox:~/board$ chgrp notes board2.txt
chgrp: changing group of 'board2.txt': Operation not permitted
kjsce@kjsce-VirtualBox:~/board$ w
 15:01:20 up 47 min,  1 user,  load average: 0.08, 0.08, 0.07
USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU WHAT
kjsce     tty2     -               14:14    47:46  0.07s  0.07s /usr/libexec/gn
kjsce@kjsce-VirtualBox:~/board$ sudo chgrp notes board2.txt

```

```

kjsce@kjsce-VirtualBox:~/board$ ls -l
total 0
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board1.txt
-rw-rw-r-- 1 aditi notes 0 Jan 14 14:48 board2.txt
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board3.txt
kjsce@kjsce-VirtualBox:~/board$ sudo chmod u+rwx board1.txt
kjsce@kjsce-VirtualBox:~/board$ ls -l
total 0
-rwxrw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board1.txt
-rw-rw-r-- 1 aditi notes 0 Jan 14 14:48 board2.txt
-rw-rw-r-- 1 kjsce kjsce 0 Jan 14 14:48 board3.txt
kjsce@kjsce-VirtualBox:~/board$ ls
board1.txt board2.txt board3.txt
kjsce@kjsce-VirtualBox:~/board$

```


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Conclusion:

This experiment provided a hands-on introduction to basic UNIX/Linux commands, focusing on file management, process control, and system operations. By using commands like chown, chmod and chgrp we gained practical experience in managing files and permissions. The knowledge acquired will help in efficiently administering UNIX/Linux systems and performing essential tasks like file handling, system monitoring, and process management. This foundation is essential for anyone working in a UNIX environment.

Post Lab Multiple Choice Questions

1. What does the -r option do when used with the rm command?
 - a) Removes files recursively
 - b) Removes files forcefully
 - c) Removes files interactively
 - d) Removes files silently

Answer: Removes files recursively

2. Which command is used to move a file from one location to another?
 - a) cp
 - b) mv
 - c) rm
 - d) touch

Answer: mv

3. What is the purpose of the -n option in the cat command?
 - a) Displays the file contents in reverse order
 - b) Displays the file contents with line numbers
 - c) Displays the file contents in uppercase
 - d) Displays the file contents in lowercase

Answer: Displays the file contents with line numbers

4. Which command is used to search for a specific pattern in a file?
 - a) find
 - b) grep
 - c) locate
 - d) chmod

Answer: grep

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Post Lab Descriptive Questions

1. Explain how do you read and interpret syntax of any OS command.

- ☐ **Command Name:** The instruction to execute (e.g., ls, rm).
- ☐ **Options/Flags:** Modify command behavior (e.g., -r).
- ☐ **Arguments:** Targets for the command (e.g., file names or directories).
- ☐ **Example:** ls -l /home/user
 - ls (command), -l (option), /home/user (argument).

Explain different functions of the operating systems.

- **Process Management:** Manages execution of processes.
- **Memory Management:** Allocates and manages memory.
- **File System Management:** Handles file storage and retrieval.
- **Device Management:** Manages hardware devices.
- **Security:** Controls access and authentication.

2. • **User Interface:** Provides command-line or graphical interface.

3. What are the default permissions assigned by Unix for Directory.

In UNIX, when a directory is created, it has default permissions of **755**:

- **Owner:** Read (r), Write (w), Execute (x) — Full access.
- **Group:** Read (r), Execute (x) — Can list and access the directory but cannot modify it.
- **Others:** Read (r), Execute (x) — Can list and access the directory but cannot modify it.

In numeric terms, this is represented as:

- **7** (Owner) = Read (4) + Write (2) + Execute (1)
- **5** (Group) = Read (4) + Execute (1)
- **5** (Others) = Read (4) + Execute (1)

Thus, the default permission for a directory is **755**, which allows full access to the owner, and read/execute access to group members and others.

Date: 14/01/2025

Signature of faculty in-charge