CDAC MUMBAI

Concepts of Operating System
Assignment 1

Problem 1: Read the instructions carefully and answer accordingly. If there is any need to insert some data then do that as well.

a) **Navigate and List:**
   a. Start by navigating to your home directory and list its contents. Then, move into a directory named "LinuxAssignment" if it exists; otherwise, create it.

- **Navigate to your home directory**:
  cd
- **List the contents of your home directory**:
  ls
- **Check if the "LinuxAssignment" directory exists, and create it if necessary**:
  mkdir LinuxAssignment
- **Move into the "LinuxAssignment" directory**:
  cd LinuxAssignment

```
cdac@Raviraj:~$ pwd
/home/cdac
cdac@Raviraj:~$ cd
cdac@Raviraj:~$ ls
cdac@Raviraj:~$ mkdir LinuxAssignment
cdac@Raviraj:~$ cd LinuxAssignment
cdac@Raviraj:~/LinuxAssignment$ pwd
/home/cdac/LinuxAssignment
cdac@Raviraj:~/LinuxAssignment$
```

b) **File Management:**
   a. Inside the "LinuxAssignment" directory, create a new file named "file1.txt". Display its contents.

- **Navigate to the "LinuxAssignment" directory**:
  cd LinuxAssignment/
- **Create a new file named "file1.txt"**:
  touch file1.txt
- **Display the contents of "file1.txt"** (it will be empty initially):
  cat file1.txt

- **Add some text to the file**:
  nano file1.txt
- **Display the contents again to verify**:
  cat file1.txt

```
cdac@Raviraj:~$ pwd
/home/cdac
cdac@Raviraj:~$ ls
LinuxAssignment
cdac@Raviraj:~$ cd LinuxAssignment/
cdac@Raviraj:~/LinuxAssignment$ touch file1.txt
cdac@Raviraj:~/LinuxAssignment$ ls
file1.txt
cdac@Raviraj:~/LinuxAssignment$ cat file1.txt
cdac@Raviraj:~/LinuxAssignment$ nano file1.txt
cdac@Raviraj:~/LinuxAssignment$ cat file1.txt
Hello
Welcome to PG-DAC Mumbai

cdac@Raviraj:~/LinuxAssignment$
```

c) **Directory Management:**

a. Create a new directory named "docs" inside the "LinuxAssignment" directory.

- **Navigate to the "LinuxAssignment" directory**:
  cd LinuxAssignment/
- **Create a new directory named "docs" inside "LinuxAssignment"**:
  mkdir docs
- **Verify that the directory was created**:
  ls

```
cdac@Raviraj:~$ pwd
/home/cdac
cdac@Raviraj:~$ cd LinuxAssignment/
cdac@Raviraj:~/LinuxAssignment$ mkdir docs
cdac@Raviraj:~/LinuxAssignment$ ls -l
total 8
drwxr-xr-x 2 cdac cdac 4096 Feb 26 22:04 docs
-rw-r--r-- 1 cdac cdac   32 Feb 26 21:57 file1.txt
cdac@Raviraj:~/LinuxAssignment$ ls
docs  file1.txt
cdac@Raviraj:~/LinuxAssignment$
```

d) **Copy and Move Files:**

a. Copy the "file1.txt" file into the "docs" directory and rename it to "file2.txt".

- **Navigate to the "LinuxAssignment" directory**:
  cd LinuxAssignment/
- **Copy "file1.txt" to the "docs" directory and rename it to "file2.txt"**:
  cp file1**.txt docs/file2.txt**

  Or
  Copy "file1.txt" to the "docs" directory:
  cp file1.txt docs/
  Rename "file1.txt" to "file2.txt" inside the "docs" directory:
  mv docs/file1.txt docs/file2.txt

- **Verify that "file2.txt" exists in the "docs" directory**:
  cd docs/
  ls

```
cdac@Raviraj:~$ pwd
/home/cdac
cdac@Raviraj:~$ cd LinuxAssignment/
cdac@Raviraj:~/LinuxAssignment$ cp file1.txt docs/file2.txt
cdac@Raviraj:~/LinuxAssignment$ cd docs/
cdac@Raviraj:~/LinuxAssignment/docs$ ls
file2.txt
cdac@Raviraj:~/LinuxAssignment/docs$
```

e) **Permissions and Ownership:**

a. Change the permissions of "file2.txt" to allow read, write, and execute permissions for the owner and only read permissions for others. Then, change the owner of "file2.txt" to the current user.

- **Change permissions of "file2.txt"**
  chmod 744 ~/LinuxAssignment/docs/file2.txt

  Explanation of chmod 744:
  - **7 (Owner)** → The first digit (7) represents the **owner's** permissions:
    r(read)
    w(write)
    x(Execute)
    7 is derived from: rwx = 4+2+1 = 7
  - **4 (Group)** → The second digit (4) represents the **group's** permissions
    r (read) only
    4 is driver from: r-- = 4+0+0 = 4
  - **4 (Others)** → The third digit (4) represents **others'** permissions:

```
r (read) only
4 is driver from: r-- = 4+0+0 = 4
```

```
cdac@Raviraj:~$ cd
cdac@Raviraj:~$ chmod 744 ~/LinuxAssignment/docs/file2.txt
cdac@Raviraj:~$ cd LinuxAssignment/docs/
cdac@Raviraj:~/LinuxAssignment/docs$ ls -l
total 4
-rwxr--r-- 1 cdac cdac 32 Feb 26 22:18 file2.txt
cdac@Raviraj:~/LinuxAssignment/docs$
```

- **Change the owner of "file2.txt" to the current user**
  chown $USER:$USER ~/LinuxAssignment/docs/file2.txt

  Explanation of `chown $USER:$USER file2.txt`:
  - **`chown`** → Command used to change file ownership
  - **`$USER`** → This automatically substitutes the currently logged-in username.
  - **`$USER:$USER`** →
    - The **first `$USER`** represents the **owner** of the file.
    - The **second `$USER`** represents the **group** to which the owner belongs.
  - **`~/LinuxAssignment/docs/file2.txt`** → Specifies the file whose ownership is being changed.

- **Verify the changes**
  ls -l ~/LinuxAssignment/docs/file2.txt

```
cdac@Raviraj:~/LinuxAssignment/docs$ cd
cdac@Raviraj:~$ chown $USER:$USER ~/LinuxAssignment/docs/file2.txt
cdac@Raviraj:~$ ls -l ~/LinuxAssignment/docs/file2.txt
-rwxr--r-- 1 cdac cdac 32 Feb 26 22:18 /home/cdac/LinuxAssignment/docs/file2.txt
cdac@Raviraj:~$ cd LinuxAssignment/docs
cdac@Raviraj:~/LinuxAssignment/docs$ ls -l
total 4
-rwxr--r-- 1 cdac cdac 32 Feb 26 22:18 file2.txt
cdac@Raviraj:~/LinuxAssignment/docs$
```

f) **Final Checklist:**
   a. Finally, list the contents of the "LinuxAssignment" directory and the root directory to ensure that all operations were performed correctly.

- **List contents of "LinuxAssignment" directory**
  ls -l ~/LinuxAssignment/

```
cdac@Raviraj:~$ ls -l ~/LinuxAssignment/
total 8
drwxr-xr-x 2 cdac cdac 4096 Feb 26 22:18 docs
-rw-r--r-- 1 cdac cdac   32 Feb 26 21:57 file1.txt
cdac@Raviraj:~$
```

Or

cd LinuxAssignment/

ls –l

```
cdac@Raviraj:~$ cd LinuxAssignment/
cdac@Raviraj:~/LinuxAssignment$ ls -l
total 8
drwxr-xr-x 2 cdac cdac 4096 Feb 26 22:18 docs
-rw-r--r-- 1 cdac cdac   32 Feb 26 21:57 file1.txt
cdac@Raviraj:~/LinuxAssignment$
```

- **List contents of the root directory**

```
cdac@Raviraj:~/LinuxAssignment$ cd
cdac@Raviraj:~$ ls -l
total 4
drwxr-xr-x 3 cdac cdac 4096 Feb 26 22:04 LinuxAssignment
cdac@Raviraj:~$
```

g) **File Searching:**

a. Search for all files with the extension ".txt" in the current directory and its subdirectories.
b. Display lines containing a specific word in a file (provide a file name and the specific word to search).

- **Search for all `.txt` files in the current directory and its subdirectories**

find . -type f -name "*.txt"

Explanation:

`find .` → Starts searching from the current directory (`.`).

`-type f` → Looks for files (not directories).

`-name "*.txt"` → Finds files ending with `.txt`.

```
cdac@Raviraj:~$ find . -type f -name "*.txt"
./LinuxAssignment/docs/file2.txt
./LinuxAssignment/file1.txt
cdac@Raviraj:~$
```

- **Display lines containing a specific word in a file**

  grep "Mumbai" file1.txt

```
cdac@Raviraj:~/LinuxAssignment$ grep "Mumbai" file1.txt
Welcome to PG-DAC Mumbai
```

grep -n “Mumbai” File1.txt

```
cdac@Raviraj:~/LinuxAssignment$ grep -n "Mumbai" file1.txt
2:Welcome to PG-DAC Mumbai
cdac@Raviraj:~/LinuxAssignment$
```

h) **System Information:**

a. Display the current system date and time.

- **Display the current System date and time:**

  date

```
cdac@Raviraj:~/LinuxAssignment$ date
Wed Feb 26 23:25:13 UTC 2025
cdac@Raviraj:~/LinuxAssignment$
```

  - **Display only date:**

    date +“%y-%m-%d”

```
cdac@Raviraj:~/LinuxAssignment$ date +"%y-%m-%d"
25-02-26
cdac@Raviraj:~/LinuxAssignment$
```

  - **Display only time:**

    date +“%H:%M:%S”

```
cdac@Raviraj:~/LinuxAssignment$ date +"%H:%M:%S"
23:31:25
cdac@Raviraj:~/LinuxAssignment$
```

  - **show date in custom format (eg- DD-MM-YYYY)**

    date +“%d-%m-%y %H:%M:%S”

```
cdac@Raviraj:~/LinuxAssignment$ date +"%d-%m-%y %H:%M:%S"
26-02-25 23:33:53
cdac@Raviraj:~/LinuxAssignment$
```

i) **Networking:**

a. Display the IP address of the system.
b. Ping a remote server to check connectivity (provide a remote server address to ping).

- **Display the IP Address of the System**

ip a

```
cdac@Raviraj:~/LinuxAssignment$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group defaul
t qlen 1000
    link/ether 00:15:5d:27:c7:c5 brd ff:ff:ff:ff:ff:ff
    inet 172.29.23.151/20 brd 172.29.31.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe27:c7c5/64 scope link
       valid_lft forever preferred_lft forever
```

Or

hostname -I

```
cdac@Raviraj:~/LinuxAssignment$ hostname -I
172.29.23.151
cdac@Raviraj:~/LinuxAssignment$
```

- **Ping a Remote Server to Check Connectivity**

ping -c 4 google.com

Explanation:

`ping` sends packets to the given server to check if it is reachable.

`-c 4` sends only 4 packets and stops.

```
cdac@Raviraj:~/LinuxAssignment$ ping -c 4 google.com
PING google.com (142.250.70.110) 56(84) bytes of data.
64 bytes from pnbomb-ac-in-f14.1e100.net (142.250.70.110): icmp_seq=1 ttl=52 time=272 ms
64 bytes from pnbomb-ac-in-f14.1e100.net (142.250.70.110): icmp_seq=2 ttl=52 time=157 ms
64 bytes from pnbomb-ac-in-f14.1e100.net (142.250.70.110): icmp_seq=3 ttl=52 time=110 ms
64 bytes from pnbomb-ac-in-f14.1e100.net (142.250.70.110): icmp_seq=4 ttl=52 time=151 ms

--- google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3203ms
rtt min/avg/max/mdev = 109.819/172.581/271.823/60.151 ms
cdac@Raviraj:~/LinuxAssignment$
```

j) **File Compression:**

a. Compress the "docs" directory into a zip file.
b. Extract the contents of the zip file into a new directory.

- **Compress the "docs" directory into a zip file**

  zip -r docs.zip docs

  Explanation:
  - `zip` is the command to create a ZIP archive.
  - `-r` (recursive) ensures that all files and subdirectories are included.
  - `docs.zip` is the name of the output ZIP file.
  - `docs` is the directory being compressed.

```
cdac@Raviraj:~/LinuxAssignment$ zip -r docs.zip docs
  adding: docs/ (stored 0%)
  adding: docs/file2.txt (stored 0%)
cdac@Raviraj:~/LinuxAssignment$
```

- **Extract the contents of the zip file into a new directory**

  mkdir extracted_docs

  unzip docs.zip -d extracted_docs

```
cdac@Raviraj:~/LinuxAssignment$ mkdir extracted_docs
cdac@Raviraj:~/LinuxAssignment$ unzip docs.zip -d extracted_docs
Archive:  docs.zip
   creating: extracted_docs/docs/
 extracting: extracted_docs/docs/file2.txt
cdac@Raviraj:~/LinuxAssignment$
```

k) **File Editing:**

a. Open the "file1.txt" file in a text editor and add some text to it.
b. Replace a specific word in the "file1.txt" file with another word (provide the original word and the word to replace it with).

- **Open "file1.txt" in a text editor and add text**
  - **using nano**

    nano file1.txt

```
cdac@Raviraj:~/LinuxAssignment$ nano file1.txt
cdac@Raviraj:~/LinuxAssignment$ cat file1.txt
Hello
Welcome to PG-DAC Mumbai
Good Morning
```

- **using vi**

  vi file1txt

```
cdac@Raviraj:~/LinuxAssignment$ vi file1.txt
cdac@Raviraj:~/LinuxAssignment$ cat file1.txt
Hello
Welcome to PG-DAC Mumbai
Good Morning
PG-DAC
cdac@Raviraj:~/LinuxAssignment$
```

- **Replace a specific word in "file1.txt" with another word**

  Syntax -

  sed -i 's/oldword/newword/g' file1.txt

  sed -i 's/Morning/Afternoon/g' file1.txt

```
cdac@Raviraj:~/LinuxAssignment$ cat file1.txt
Hello
Welcome to PG-DAC Mumbai
Good Morning
PG-DAC
cdac@Raviraj:~/LinuxAssignment$ sed -i 's/Morning/Afternoon/g' file1.txt
cdac@Raviraj:~/LinuxAssignment$ cat file1.txt
Hello
Welcome to PG-DAC Mumbai
Good Afternoon
PG-DAC
cdac@Raviraj:~/LinuxAssignment$
```

Problem 2: Read the instructions carefully and answer accordingly. If there is any need to insert some data then do that as well.

a. Suppose you have a file named "data.txt" containing important information. Display the first 10 lines of this file to quickly glance at its contents using a command.

- **head -10 file1.txt**

```
cdac@Raviraj:~/LinuxAssignment$ head -10 file1.txt
Hello
Welcome to PG-DAC Mumbai
Good Afternoon
PG-DAC
Hii
Rahul
Rohan
soham
omkar
Raj
```

b. Now, to check the end of the file for any recent additions, display the last 5 lines of "data.txt" using another command.

- **tail -5 data.txt**

```
cdac@Raviraj:~/LinuxAssignment$ tail -5 file1.txt
soham
omkar
Raj
ok
Bye
cdac@Raviraj:~/LinuxAssignment$
```

c. In a file named "numbers.txt," there are a series of numbers. Display the first 15 lines of this file to analyze the initial data set.

- **touch numbers.txt**
- **head -15 numbers.txt**

```
cdac@Raviraj:~/LinuxAssignment$ touch numbers.txt
cdac@Raviraj:~/LinuxAssignment$ nano numbers.txt
cdac@Raviraj:~/LinuxAssignment$ head -15 numbers.txt
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
```

d. To focus on the last few numbers of the dataset, display the last 3 lines of "numbers.txt".

- **tail -3 numbers.txt**

```
cdac@Raviraj:~/LinuxAssignment$ tail -3 numbers.txt
18
19
20
```

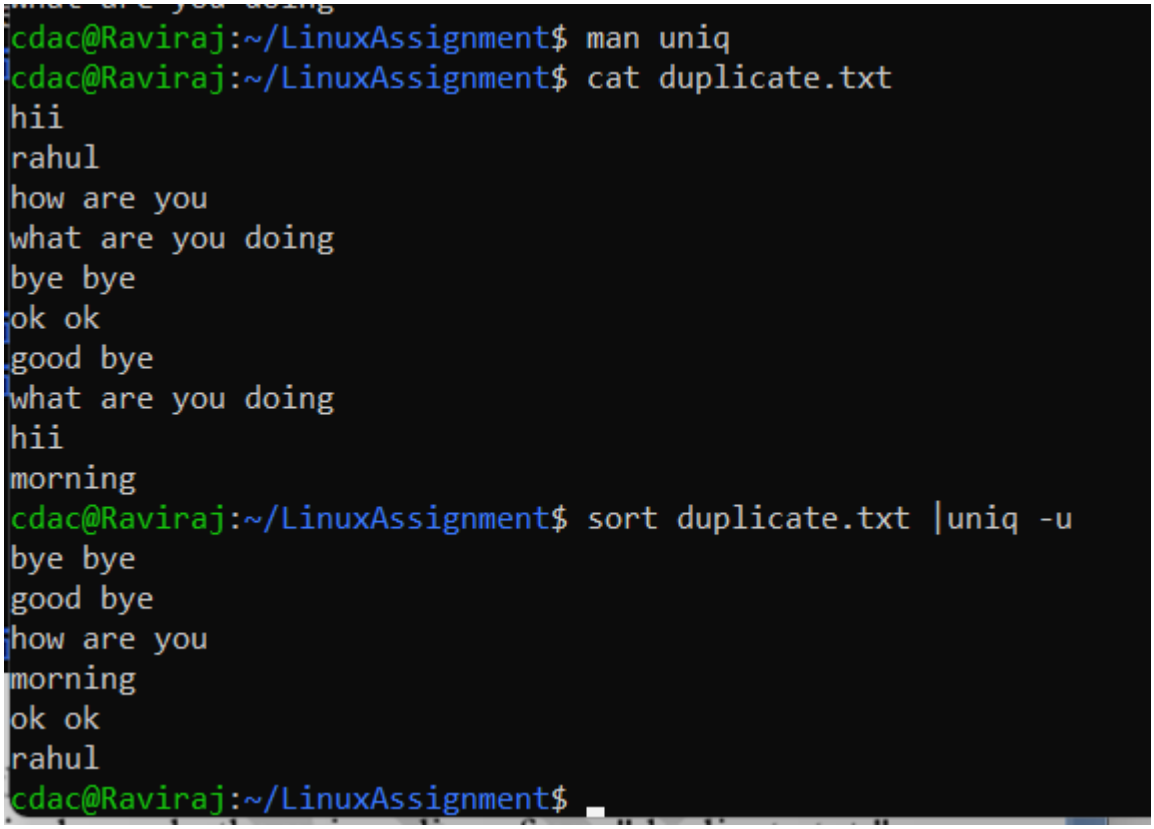
e. Imagine you have a file named "input.txt" with text content. Use a command to translate all lowercase letters to uppercase in "input.txt" and save the modified text in a new file named "output.txt."

- **touch input.txt**
- **tr 'a-z' 'A-Z' < input.txt > output.txt**

```
cdac@Raviraj:~/LinuxAssignment$ touch input.txt
cdac@Raviraj:~/LinuxAssignment$ nano input.txt
cdac@Raviraj:~/LinuxAssignment$ cat input
cat: input: No such file or directory
cdac@Raviraj:~/LinuxAssignment$ cat input.txt
hii
raj
good
morning
cdac@Raviraj:~/LinuxAssignment$ tr 'a-z' 'A-Z' <input.txt > output.txt
cdac@Raviraj:~/LinuxAssignment$ cat output.txt
HII
RAJ
GOOD
MORNING
cdac@Raviraj:~/LinuxAssignment$
```

f. In a file named "duplicate.txt," there are several lines of text, some of which are duplicates. Use a command to display only the unique lines from "duplicate.txt."

- **sort duplicate.txt | uniq –u**



g. In a file named "fruit.txt," there is a list of fruits, but some fruits are repeated. Use a command to display each unique fruit along with the count of its occurrences in "fruit.txt."

- **sort fruit.txt | uniq –c | sort –nr**

  Explanation:

  - `sort fruit.txt` → Sorts the file so that duplicate fruit names are grouped together.
  - `uniq -c` → Counts occurrences of each unique fruit.
  - `sort -nr` → Sorts the output numerically (`-n`) in descending order (`-r`), so the most frequent fruit appears first.

```
cdac@Raviraj:~/LinuxAssignment$ cat fruit.txt
apple
orange
banana
mango
apple
mango
greps
greps
pineapple
cdac@Raviraj:~/LinuxAssignment$  sort fruit.txt | uniq -c | sort -nr
      2 mango
      2 greps
      2 apple
      1 pineapple
      1 orange
      1 banana
cdac@Raviraj:~/LinuxAssignment$
```

-