



**NATIONAL TEXTILE**

**UNIVERSITY**

DEPARTMENT OF COMPUTER SCIENCE

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**SECTION SE: 5th (A)**

**Operating systems Lab3-homework**

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## Part 1: File and Directory Operations

1. Create the following directory structure in your home directory.

```
Lab_3/  
├── docs/  
│   └── drafts/  
├── data/  
│   ├── raw/  
│   └── processed/  
└── scripts/
```

root@DESKTOP-GFUS3VG: /home/Lab\_3

```
docs  
root@DESKTOP-GFUS3VG:/home/Lab_3# mkdir data/raw  
mkdir: cannot create directory 'data/raw': No such file or directory  
root@DESKTOP-GFUS3VG:/home/Lab_3# mkdir -p data/raw  
root@DESKTOP-GFUS3VG:/home/Lab_3# ls  
data docs  
root@DESKTOP-GFUS3VG:/home/Lab_3# cd data  
root@DESKTOP-GFUS3VG:/home/Lab_3/data# mkdir processed  
root@DESKTOP-GFUS3VG:/home/Lab_3/data# ls  
processed raw  
root@DESKTOP-GFUS3VG:/home/Lab_3/data# cd ..  
root@DESKTOP-GFUS3VG:/home/Lab_3# mkdir scripts  
root@DESKTOP-GFUS3VG:/home/Lab_3# ls  
data docs scripts  
root@DESKTOP-GFUS3VG:/home/Lab_3# ls docs  
drafts intro.txt notes.txt summary.txt  
root@DESKTOP-GFUS3VG:/home/Lab_3# ls data  
processed raw  
root@DESKTOP-GFUS3VG:/home/Lab_3# ls scripts  
root@DESKTOP-GFUS3VG:/home/Lab_3#
```

**2. Inside docs/ : Create three files: intro.txt , notes.txt , summary.txt . Add at least two lines of text into each using echo >> . Copy summary.txt into the drafts/ folder using cp command.**

IN this,I used **touch and echo** to create and write into files.Also ,I used **cp** to copy summary.txt into drafts and I showed my results using **cat and ls** command

```
root@DESKTOP-GFUS3VG:/home# mkdir Lab_3
root@DESKTOP-GFUS3VG:/home# cd Lab_3
root@DESKTOP-GFUS3VG:/home/Lab_3# mkdir docs
root@DESKTOP-GFUS3VG:/home/Lab_3# cd docs
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# touch intro.txt notes.txt summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# ls
intro.txt  notes.txt  summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# echo "Hi I am eman faisal and i am learning os">intro.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# cat intro.txt
Hi I am eman faisal and i am learning os
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# echo "hi eman here.learning commands">notes.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# cat notes.txt
hi eman here.learning commands
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# mkdir drafts
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# ls
drafts  intro.txt  notes.txt  summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# cp summary.txt drafts
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# ls
drafts  intro.txt  notes.txt  summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# cd drafts
root@DESKTOP-GFUS3VG:/home/Lab_3/docs/drafts# ls
summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs/drafts# _
```

**3. Inside data/raw/ : Create two files: raw1.txt , raw2.txt . Append the current date into raw1.txt using the date command. Move raw2.txt into processed/ using mv . The syntax is: mv source destination.**

```
root@DESKTOP-GFUS3VG: /home/Lab_3/data
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# date >> raw1.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# cat raw1.txt
Mon Oct  6 22:29:41 PDT 2025
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# cd..
cd..: command not found
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# cd ..
root@DESKTOP-GFUS3VG:/home/Lab_3/data# mv raw2.txt processed
mv: cannot stat 'raw2.txt': No such file or directory
root@DESKTOP-GFUS3VG:/home/Lab_3/data# mv raw/raw2.txt processed
root@DESKTOP-GFUS3VG:/home/Lab_3/data# ls
processed  raw
root@DESKTOP-GFUS3VG:/home/Lab_3/data# cd raw
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# ls
raw1.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# ls processed
ls: cannot access 'processed': No such file or directory
root@DESKTOP-GFUS3VG:/home/Lab_3/data/raw# cd ..
root@DESKTOP-GFUS3VG:/home/Lab_3/data# ls processed
raw2.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/data# _
```

4. Inside scripts/ : Create a script named hello.sh with the following content: echo "Hello World"  
pwd ls -lh

```
root@DESKTOP-GFUS3VG: /home/Lab_3/scripts
GNU nano 7.2      hello.sh *
exho "hello world"
pwd
ls -lh
```

5. Display the directory structure recursively and take a screenshot: ls -R

```
.:  
hello.sh  
root@DESKTOP-GFUS3VG:/home/Lab_3/scripts# cd .  
root@DESKTOP-GFUS3VG:/home/Lab_3# ls -R  
.:  
data docs scripts  
  
./data:  
processed raw  
  
./data/processed:  
raw2.txt  
  
./data/raw:  
raw1.txt  
  
./docs:  
drafts intro.txt notes.txt summary.txt  
  
./docs/drafts:  
summary.txt  
  
./scripts:  
hello.sh  
root@DESKTOP-GFUS3VG:/home/Lab_3#
```

**Part 2: Practice with Basic Linux Commands** Run the following commands inside Lab\_3/ and note their outputs.

- `pwd` → Show current working directory.
- `whoami` → Display the current logged-in user.
- `touch extra.txt` → Create an empty file.
- `cat intro.txt` → Display file contents.
- `rm extra.txt` → Delete a file.
- `history | tail -n 5` → Show your last 5 executed commands.
- `clear` → Clear the terminal.

Take screenshots of commands and outputs.

---

```
root@DESKTOP-GFUS3VG:/home/Lab_3# pwd
/home/Lab_3
root@DESKTOP-GFUS3VG:/home/Lab_3# whoami
root
root@DESKTOP-GFUS3VG:/home/Lab_3# touch extra.txt
root@DESKTOP-GFUS3VG:/home/Lab_3# ls
data docs extra.txt scripts
root@DESKTOP-GFUS3VG:/home/Lab_3# cat intro.txt
cat: intro.txt: No such file or directory
root@DESKTOP-GFUS3VG:/home/Lab_3# cd docs
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# cat intro.txt
Hi I am eman faisal and i am learning os
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# cd ..
root@DESKTOP-GFUS3VG:/home/Lab_3# rm extra.txt
root@DESKTOP-GFUS3VG:/home/Lab_3# ls
data docs scripts
root@DESKTOP-GFUS3VG:/home/Lab_3# history | tail -n 5
331 cat intro.txt
332 cd ..
333 rm extra.txt
334 ls
335 history | tail -n 5
root@DESKTOP-GFUS3VG:/home/Lab_3# clear_
```

### Part 3: File Permissions and Ownership.

1. Change the permissions of hello.sh so that: Owner → Read, Write & Execute Group → Read, Write & Execute Others → No permissions Run the script using: Take a screenshot of its output.



```
root@DESKTOP-GFUS3VG: /home/Lab_3/scripts
root@DESKTOP-GFUS3VG:/home/Lab_3# cd scripts
root@DESKTOP-GFUS3VG:/home/Lab_3/scripts# ls -l hello.sh
-rw-r--r-- 1 root root 30 Oct  6 23:04 hello.sh
root@DESKTOP-GFUS3VG:/home/Lab_3/scripts# chmod 770 hello.sh
root@DESKTOP-GFUS3VG:/home/Lab_3/scripts# ls -l hello.sh
-rwxrwx--- 1 root root 30 Oct  6 23:04 hello.sh
root@DESKTOP-GFUS3VG:/home/Lab_3/scripts#
```

Part 2,3 and 4:

2. Change the permissions of intro.txt using numeric notation so that: Owner → Read & Write Group → Read & Write Others → Read only
3. Change the permissions of notes.txt using symbolic notation so that others don't have any permission on it.
4. Verify all changes with: ls-l

COMMANDS AND OUTPUT:

```
root@DESKTOP-GFUS3VG:/home/Lab_3# ls
data docs scripts
root@DESKTOP-GFUS3VG:/home/Lab_3# cd docs
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# ls
drafts intro.txt notes.txt summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# chmod 664 intro.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# chmod o= notes.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# ls -l
total 12
drwxr-xr-x 2 root root 4096 Oct  6 10:58 drafts
-rw-rw-r-- 1 root root  41 Oct  6 10:55 intro.txt
-rw-r----- 1 root root  31 Oct  6 10:56 notes.txt
-rw-r--r-- 1 root root   0 Oct  6 22:03 summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs#
```

## PART 4:

1. Count the number of lines, words, and characters in notes.txt using wc .

```
root@DESKTOP-GFUS3VG: /home/Lab_3/docs
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# wc -l notes.txt
1 notes.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# wc -w notes.txt
4 notes.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# wc -m notes.txt
31 notes.txt
```

2. Show only the first 2 lines of summary.txt using head -n 2 . Take screenshots.

```
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# echo "hi i am eman faisal.i study os.we are
studying OS in 5th semester.happily learning it.we have 2 labs and one class.hdbubu
e dhdf jddn dbbufbf. jhwuw hddbdd." > summary.txt
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# head -n 2 summary.txt
hi i am eman faisal.i study os.we are studying OS in 5th semester.happily learning
it.we have 2 labs and one class.hdbubue dhdf jddn dbbufbf. jhwuw hddbdd.
root@DESKTOP-GFUS3VG:/home/Lab_3/docs#
```

3. Show the last line of summary.txt using tail -n 1 .

```
root@DESKTOP-GFUS3VG: /home/Lab_3/docs
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# tail -n 1 summary.txt
hi i am eman faisal.i study os.we are studying OS in 5th semester.happily learning
it.we have 2 labs and one class.hdbubue dhdf jddn dbbufbf. jhwuw hddbdd.
root@DESKTOP-GFUS3VG:/home/Lab_3/docs#
```

4. Search for a keyword (of your choice) in intro.txt using grep

```
root@DESKTOP-GFUS3VG:/home/Lab_3/docs# grep "eman" intro.txt
Hi I am eman faisal and i am learning os
root@DESKTOP-GFUS3VG:/home/Lab_3/docs#
```



## Part 5: Linux Process Commands

1. Explore Processes Use `ps -ef` and identify 3 processes running on your system. Note their PID, PPID, and command.

```
root@DESKTOP-GFUS3VG:/# ps -ef
UID          PID    PPID  C  TIME TTY          TIME CMD
root         1        0  0  0:45 ?        00:00:07 /sbin/init
root         2        1  0  0:45 ?        00:00:00 /init
root         8        2  0  0:45 ?        00:00:02 plan9 --control-socket 7 --log-root 186 1 0 10:48 ? 00:00:24 /usr/lib/systemd/systemd-journaro
ot          233      1  0  0:48 ?        00:00:00 /usr/lib/systemd/systemd-udev
systemd+    289      1  0  0:48 ?        00:00:00 /usr/lib/systemd/systemd-resolvsystemd+ 290 1 0 10:48 ? 00:00:01 /usr/lib/systemd/systemd-timesyro
ot          299      1  0  0:48 ?        00:00:00 /usr/sbin/cron -f -P
message+    300      1  0  0:48 ?        00:00:03 @dbus-daemon --system --addressroot 310 1 0 10:48 ? 00:00:01 /usr/lib/systemd/systemd-logindro
ot          314      1  0  0:48 ?        00:00:00 /usr/libexec/wsl-pro-service -vroot 317 1 0 10:48 hvc0 00:00:00 /sbin/agetty -o -p -- \u --noclsysl
og          323      1  0  0:48 ?        00:00:00 /usr/sbin/rsyslogd -n -iNONE
root        326      1  0  0:48 tty1    00:00:00 /sbin/agetty -o -p -- \u --noclroot 337 1 0 10:48 ? 00:00:00 /usr/bin/python3 /usr/share/unaro
ot          442      2  0  0:48 ?        00:00:00 /init
root        444      442  0  0:48 ?        00:00:00 /init
root        445      444  0  0:48 pts/0    00:00:00 -bash
root        446      2  0  0:48 pts/1    00:00:00 /bin/login -f
root        496      1  0  0:48 ?        00:00:00 /usr/lib/systemd/systemd --userroot 497 496 0 10:48 ? 00:00:00 (sd-pam)
root        524      446  0  0:48 pts/1    00:00:00 -bash
root        2527    445  99 12:45 pts/0    00:00:00 ps -ef
root@DESKTOP-GFUS3VG:/#
```

PID:1 PPID:0 CMD: /sbin/init

PID:2 PPID:1 CMD: /init

PID:444 PPID:552 CMD: /init

2. Run `top` for 20–30 seconds. Write down: Which process is consuming the most CPU. Which process is consuming the most memory.

```
root@DESKTOP-GFUS3VG:/# top
Tasks: 23 total, 1 running, 22 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.4 us, 0.7 sy, 0.0 ni, 98.1 id, 0.7 wa, 0.0 hi, 0.2 si, 0.0 st
MiB Mem : 5881.2 total, 5061.8 free, 464.5 used, 501.4 buff/cache
MiB Swap: 2048.0 total, 2048.0 free, 0.0 used, 5416.8 avail Mem

  PID USER      PR  NI  VIRT  RES  SHR  S  %CPU  %MEM    TIME+  COMMAND
 186 root        19   -1 50364 15100 14264 S   2.3   0.3   0:26.62 systemd-journal
   1 root        20    0 21764 12400  9200 S   0.3   0.2   0:08.15 systemd
   2 root        20    0 3072 1792  S   0.0   0.0   0:00.03 init-systemd(Ub
   8 root        20    0 3388 2148 1792 S   0.0   0.0   0:02.28 init
 233 root        20    0 25272 6144 4864 S   0.0   0.1   0:00.76 systemd-udev
 289 systemd+    20    0 21456 12544 10368 S   0.0   0.2   0:00.43 systemd-resolve
 290 systemd+    20    0 91024 7424 6656 S   0.0   0.1   0:01.18 systemd-timesyn
 299 root        20    0 4236 2432 2304 S   0.0   0.0   0:00.05 cron
 300 message+    20    0 9628 4736 4352 S   0.0   0.1   0:03.60 dbus-daemon
 310 root        20    0 17960 8448 7552 S   0.0   0.1   0:01.53 systemd-logind
 314 root        20    0 1829828 13184 10624 S   0.0   0.2   0:00.88 wsl-pro-service
 317 root        20    0 3160 1920 1792 S   0.0   0.0   0:00.00 agetty
 323 syslog      20    0 222508 5504 4352 S   0.0   0.1   0:00.76 rsyslogd
 326 root        20    0 3116 1664 1664 S   0.0   0.0   0:00.01 agetty
 337 root        20    0 107028 22400 13312 S   0.0   0.4   0:00.25 unattended-upgr
 442 root        20    0 3076 896 896 S   0.0   0.0   0:00.00 SessionLeader
 444 root        20    0 3092 1152 1024 S   0.0   0.0   0:00.68 Relay(445)
 445 root        20    0 6200 4864 3328 S   0.0   0.1   0:00.71 bash
 446 root        20    0 6668 4096 3584 S   0.0   0.1   0:00.01 login
 496 root        20    0 20316 11264 9216 S   0.0   0.2   0:00.87 systemd
 497 root        20    0 21160 3380 1664 S   0.0   0.1   0:00.00 (sd-pam)
 524 root        20    0 6072 4864 3456 S   0.0   0.1   0:00.00 bash
 2665 root        20    0 9300 5504 3328 R   0.0   0.1   0:00.04 top
```

Highest cpu: 2.3% by 186 process: systemd journal

Highest memory: 0.3% systemd journal

2. Practice with Infinite Process Start: `yes > /dev/null &` & Locate its PID using `ps -ef | grep yes` . Kill it using `kill` and verify using `ps`.

```
root@DESKTOP-GFUS3VG:/# yes > /dev/null &
[1] 3142
root@DESKTOP-GFUS3VG:/# ps -ef | grep yes
root      3142      445  99 00:09 pts/0    00:00:13 yes
root      3146      445   0 00:09 pts/0    00:00:00 grep --color=auto yes
root@DESKTOP-GFUS3VG:/# kill 3142
root@DESKTOP-GFUS3VG:/# ps -ef | grep yes
root      3148      445   0 00:10 pts/0    00:00:00 grep --color=auto yes
[1]+  Terminated                  yes > /dev/null
root@DESKTOP-GFUS3VG:/# ps
      PID TTY          TIME CMD
      445 pts/0    00:00:00 bash
      3157 pts/0    00:00:00 ps
root@DESKTOP-GFUS3VG:/#
```

3. Foreground & Background Jobs Run `sleep 60` in foreground and terminate it with `Ctrl + C`

```
root@DESKTOP-GFUS3VG:/# sleep 60
^C
root@DESKTOP-GFUS3VG:/#
```

Run `sleep 60` & in background, bring it to foreground with `fg` , stop with `Ctrl + Z`, then resume in background using `bg` .

```
root@DESKTOP-GFUS3VG: /
root@DESKTOP-GFUS3VG:/# sleep 60
^C
root@DESKTOP-GFUS3VG:/# sleep 60 &
[1] 3216
root@DESKTOP-GFUS3VG:/# fg
sleep 60
^Z
[1]+  Stopped                  sleep 60
root@DESKTOP-GFUS3VG:/# bg
[1]+ sleep 60 &
root@DESKTOP-GFUS3VG:/#
```

## PART 6:

Modify the exec program so that the child runs top instead of ls -l . Run the program. In another terminal, use ps -ef | grep top (or run top ) to find the child's PID. Use the child's process ID to kill it manually.

### Terminal:

```
root@DESKTOP-GFUS3VG:/home/emanuser/lab3_homework# ps -ef | grep top
```

```
root    5568   5203  0 01:01 pts/7    00:00:00 grep --color=auto top
```

```
root@DESKTOP-GFUS3VG:/home/emanuser/lab3_homework# kill 5203
```

```
root@DESKTOP-GFUS3VG:/home/emanuser/lab3_homework#
```

### Code:

```
#include <stdio.h>

#include <unistd.h>

int main() {
    pid_t pid = fork(); // create a child process

    if (pid == 0) {
        // Child process: replace its code with the 'top' program
        execlp("top", "top", NULL);
        printf("This will not print if exec succeeds.\n");
    } else if (pid > 0) {
        // Parent process
        printf("Parent still running...\n");
    } else {
        // fork() failed
        perror("fork failed");
    }

    return 0;
}
```

## PART2:

FileEditSelectionViewGoRun...lab3\_homework [WSL: Ubuntu-24.04]

EXPLORER...LAB3\_HOMEWORK [WSL: UBUNTU-24.04]a.outexec\_topC task\_exel.cC wait.c

3#include <sys/wait.h>4int main() {5pid\_t pid = fork();6if (pid == 0) {7execvp("date", "date", NULL);8} else {9// Parent process -> wait for child to finish10waitpid(pid, NULL, 0);11printf("Child finished\n");12return 0;13}

PROBLEMSOUTPUTDEBUG CONSOLETERMINALPORTSbash - lab3\_homework + - -

root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework# ps -ef | grep top  
root 5258 5203 0 13:50 pts/7 00:00:00 grep --color=auto top  
root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework# kill 5203  
root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework# ps -ef | grep top  
root 5568 5203 0 01:01 pts/7 00:00:00 grep --color=auto top  
root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework# kill 5203  
root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework# gcc wait.c  
root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework# ./a.out  
Mon Oct 6 13:55:59 PDT 2025  
Child finished  
root@DESKTOP-GFUS3VG:/home/emanuser/lab3\_homework#

> OUTLINE