Department of Computer Science

Subject:

OPERATING SYSTEM

Submitted by:

ABDUL REHMAN SUDAIS

Reg number:

23-NTU-CS-1123

Lab :

3 HOMETASK

Semester:

5TH

Operating Systems – COC 3071L

SE 5th A – Fall 2025

Part 1: File and Directory Operations

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

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

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.
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:

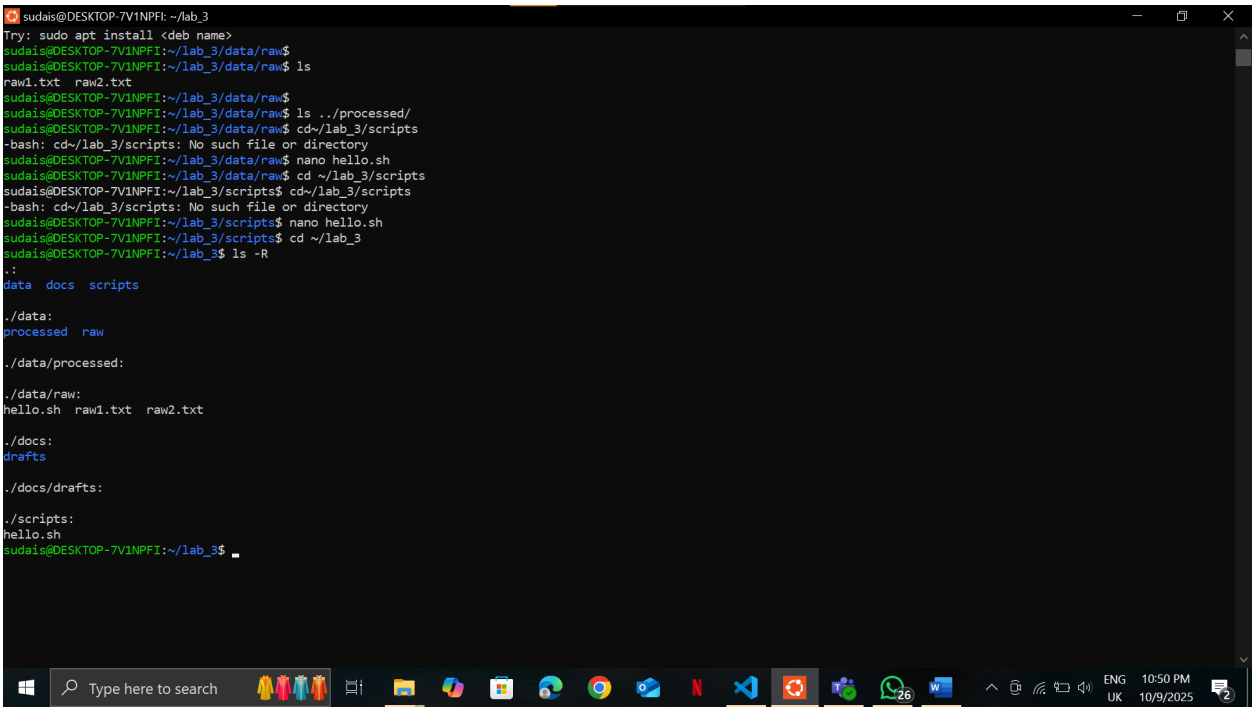
```
mv source destination
```

4. Inside `scripts/`:
   - Create a script named `hello.sh` with the following content:

```
echo "Hello World"
pwd
ls -lh
```

   - Later, you will make it executable (in Part 3).
5. Display the directory structure recursively and take a screenshot:

```
ls -R
```

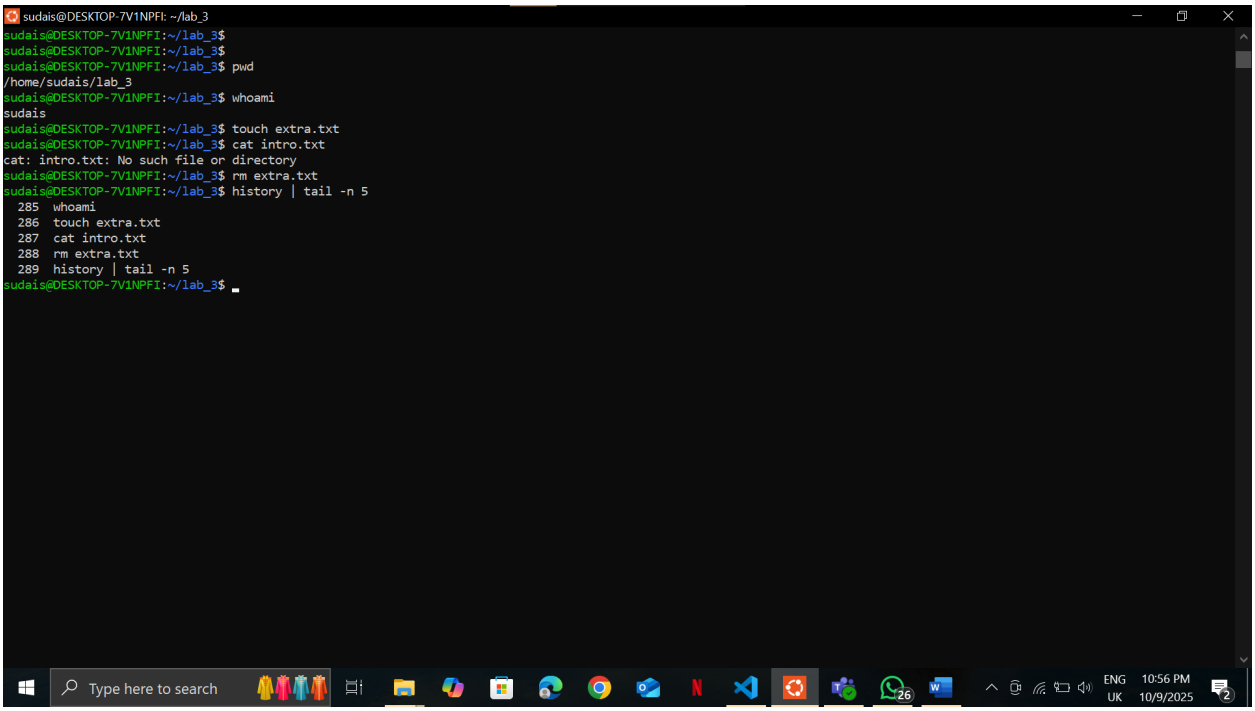


Part 2: Practice with Basic Linux Commands

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.



Part 3: File Permissions and Ownership

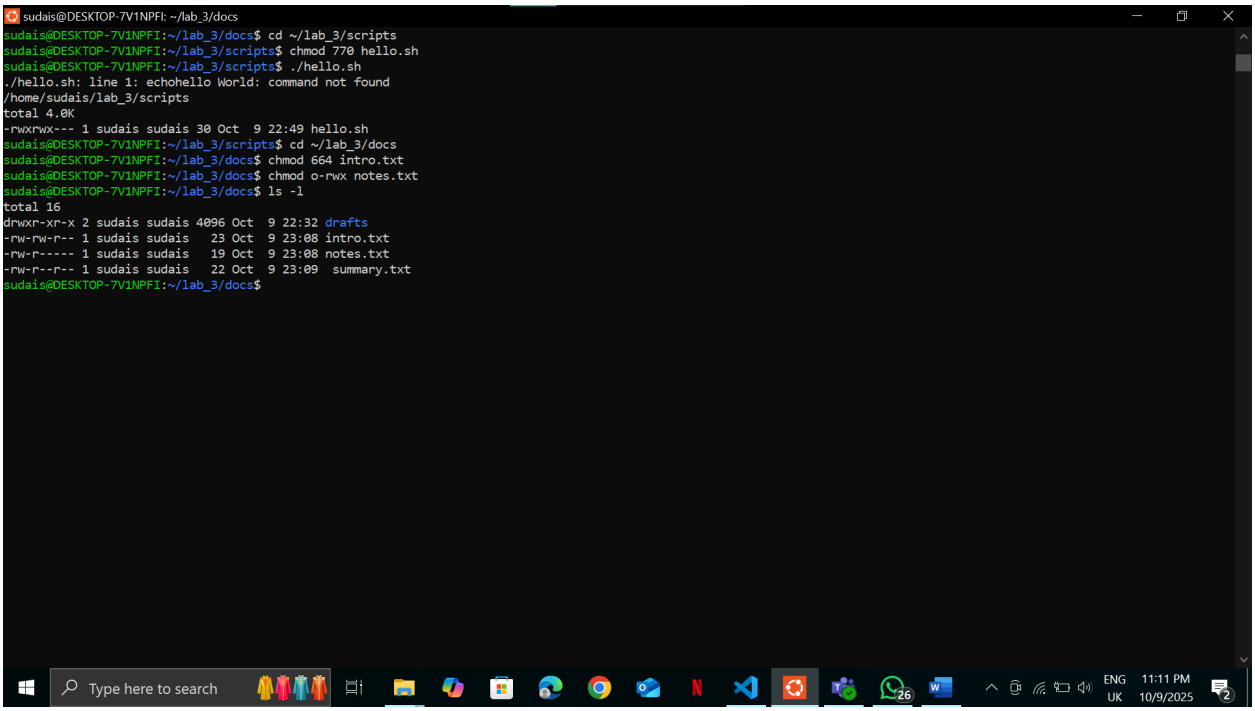
1. Change the permissions of `hello.sh` so that:
   - Owner → Read, Write & Execute
   - Group → Read, Write & Execute
   - Others → No permissions
   - Run the script using:

     ```
     ./hello.sh
     ```

     Take a screenshot of its output.
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
   ```

   Take a screenshot of the output.



WC

Part 4: Reading & Searching Files

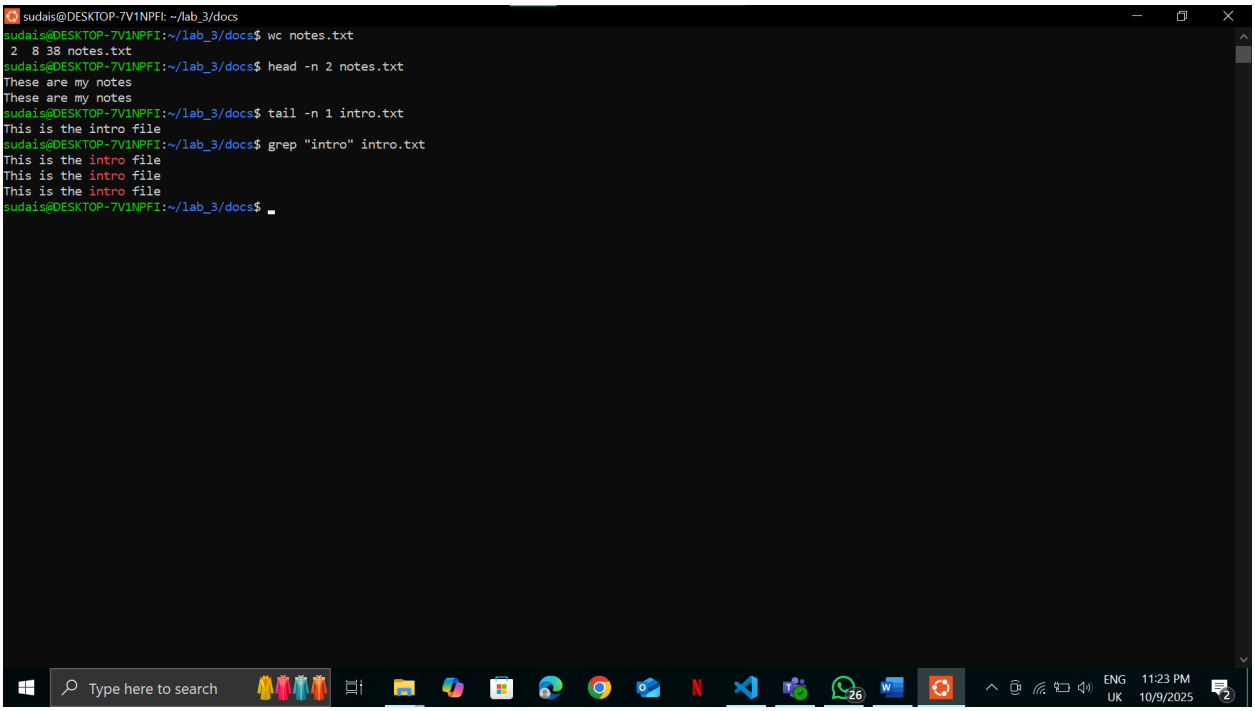
Inside `docs/`:

1. Count the number of lines, words, and characters in `notes.txt` using `wc`.
2. Show only the **first 2 lines** of `summary.txt` using `head -n 2`.

---

3. Show the **last line** of `summary.txt` using `tail -n 1`.
4. Search for a keyword (of your choice) in `intro.txt` using `grep`.

Take screenshots.



Part 5: Linux Process Commands

1. **Exploring Processes**
   - Use `ps -ef` and identify **3 processes** running on your system. Note their **PID, PPID, and command**.
   - Run `top` for 20–30 seconds. Write down:
     - Which process is consuming the most CPU.
     - Which process is consuming the most memory.
2. **Practice with Infinite Process**
   - Start:

     ```
     yes > /dev/null &
     ```

   - Locate its PID using `ps -ef | grep yes`.
   - Kill it using `kill <PID>` and verify using `ps`.
3. **Foreground & Background Jobs**
   - Run `sleep 60` in **foreground** and terminate it with **Ctrl + C**.
   - Run `sleep 60 &` in **background**, bring it to foreground with `fg`, stop with **Ctrl + Z**, then resume in background using `bg`.

Select sudais@DESKTOP-7V1NPFI: ~/lab_3/docs

```
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ ps -ef
UID          PID    PPID  C STIME TTY          TIME CMD
root           1       0  0 22:22 ?        00:00:01 /sbin/init
root           2       1  0 22:22 ?        00:00:00 /init
root           7       2  0 22:22 ?        00:00:00 plan9 --control-socket 7 --log-level 4 --server-fd 8 --pipe-fd 10 --root          43       1  0 22:22 ?        00:00:00
/usr/lib/systemd/systemd-journald
root          96       1  0 22:22 ?        00:00:00 /usr/lib/systemd/systemd-udevd
systemd+     111       1  0 22:22 ?        00:00:00 /usr/lib/systemd/systemd-resolved
systemd+     112       1  0 22:22 ?        00:00:00 /usr/lib/systemd/systemd-timesyncd
root         159       1  0 22:22 ?        00:00:00 /usr/sbin/cron -f -P
message+     160       1  0 22:22 ?        00:00:00 @dbus-daemon --system --address=systemd: --nofork --nopidfile --systroot         167       1  0 22:22 ?        00:00:00
/usr/lib/systemd/systemd-logind
root         169       1  0 22:22 ?        00:00:00 /usr/libexec/wsl-pro-service -vv
root         171       1  0 22:22 hvc0     00:00:00 /sbin/agetty -o -p -- \u --noclear --keep-baud - 115200,38400,9600 vsyslog       173       1  0 22:22 ?        00:00:00
/usr/sbin/rsyslogd -n -iNONE
root         176       1  0 22:22 tty1     00:00:00 /sbin/agetty -o -p -- \u --noclear - linux
root         187       1  0 22:22 ?        00:00:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-sroot         292       2  0 22:22 pts/1    00:00:00
/bin/login -f
sudais       339       1  0 22:22 ?        00:00:00 /usr/lib/systemd/systemd --user
sudais       340     339  0 22:22 ?        00:00:00 (sd-pam)
sudais       364     292  0 22:22 pts/1    00:00:00 -bash
root         458       1  0 22:22 ?        00:00:00 /init
root        1032       2  0 22:25 ?        00:00:00 /init
root        1033    1032  0 22:25 ?        00:00:00 /init
sudais      1034    1033  0 22:25 pts/0    00:00:00 sh -c "$VSCODE_WSL_EXT_LOCATION/scripts/wslServer.sh" 385651c938df8asudais      1035    1034  0 22:25 pts/0    00:00:00
sh /mnt/c/Users/Bablu/.vscode/extensions/ms-vscode-remote.remote-wslsudais      1041    1035  0 22:25 pts/0    00:00:00 sh /home/sudais/.vscode-server/bin/385651c938df8a906
869babee516bffd0sudais      1045    1041  0 22:25 pts/0    00:00:06 /home/sudais/.vscode-server/bin/385651c938df8a906869babee516bffd0ddbroot        1056       2  0 22:25 ?
       00:00:00 /init
root        1057    1056  0 22:25 ?        00:00:00 /init
sudais      1058    1057  0 22:25 pts/2    00:00:00 /home/sudais/.vscode-server/bin/385651c938df8a906869babee516bffd0ddbroot        1074       2  0 22:25 ?        00:00:00
/init
root        1075    1074  0 22:25 ?        00:00:00 /init
sudais      1080    1075  0 22:25 pts/3    00:00:00 /home/sudais/.vscode-server/bin/385651c938df8a906869babee516bffd0ddbsudais      1096    1045  2 22:25 pts/0    00:01:15
/home/sudais/.vscode-server/bin/385651c938df8a906869babee516bffd0ddbroot        1115       2  0 22:25 ?        00:00:00 /init
root        1117    1115  0 22:25 ?        00:00:00 /init
sudais      1122    1117  0 22:25 pts/5    00:00:00 /bin/sh -c cd '/' && /bin/sh
sudais      1123    1122  0 22:25 pts/5    00:00:00 /bin/sh
sudais      1134    1123  0 22:25 pts/5    00:00:00 /home/sudais/.vscode-server/bin/385651c938df8a906869babee516bffd0ddbsudais      1157    1134  0 22:26 pts/5    00:00:00
/bin/sh
root        9829       2  0 23:14 ?        00:00:00 /init
root        9831    9829  0 23:14 ?        00:00:00 /init
```

Type here to search

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Select sudais@DESKTOP-7V1NPFI: ~/lab_3/docs

```
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ top
top - 23:25:41 up  1:03,  1 user,  load average: 0.02, 0.04, 0.00
Tasks:  43 total,   1 running,  42 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.2 us,  0.2 sy,  0.0 ni, 99.4 id,  0.0 wa,  0.0 hi,  0.1 si,  0.0 st
MiB Mem :   3843.2 total,   3126.2 free,    645.3 used,    208.1 buff/cache
MiB Swap:   1024.0 total,   1024.0 free,      0.0 used.   3197.9 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   1096 sudais    20   0   31.9g 130892  51968 S   1.3   3.3   1:16.78 node
   1058 sudais    20   0 1017244  57272  42496 S   0.3   1.5   0:00.59 node
      1 root      20   0   21652  12528   9328 S   0.0   0.3   0:01.19 systemd
      2 root      20   0    3072   1792   1792 S   0.0   0.0   0:00.02 init-systemd(Ub
      7 root      20   0    3072   1792   1792 S   0.0   0.0   0:00.00 init
     43 root      19  -1   66824  15404  14508 S   0.0   0.4   0:00.78 systemd-journal
     96 root      20   0   25140   6144   4864 S   0.0   0.2   0:00.37 systemd-udevd
    111 systemd+  20   0   21456  12544  10368 S   0.0   0.3   0:00.18 systemd-resolve
    112 systemd+  20   0   91024   7552   6784 S   0.0   0.2   0:00.21 systemd-timesyn
    159 root      20   0    4236   2432   2304 S   0.0   0.1   0:00.01 cron
    160 message+  20   0    9624   4608   4224 S   0.0   0.1   0:00.21 dbus-daemon
    167 root      20   0   17964   8192   7296 S   0.0   0.2   0:00.15 systemd-logind
    169 root      20   0 1755840  12672  10496 S   0.0   0.3   0:00.18 wsl-pro-service
    171 root      20   0    3160   1920   1792 S   0.0   0.0   0:00.01 agetty
    173 syslog    20   0  222508   5504   4352 S   0.0   0.1   0:00.14 rsyslogd
    176 root      20   0    3116   1664   1664 S   0.0   0.0   0:00.00 agetty
    187 root      20   0  107012  22528  13312 S   0.0   0.6   0:00.19 unattended-upgr
    292 root      20   0    6824   4352   3712 S   0.0   0.1   0:00.02 login
    339 sudais    20   0   20312  10880   8960 S   0.0   0.3   0:00.15 systemd
    340 sudais    20   0   21152   3520   1792 S   0.0   0.1   0:00.00 (sd-pam)
    364 sudais    20   0    6072   5120   3584 S   0.0   0.1   0:00.03 bash
    458 root      20   0    3088   1164   1024 S   0.0   0.0   0:00.02 Relay(459)
   1032 root      20   0    3088   1028    896 S   0.0   0.0   0:00.00 SessionLeader
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
```

Type here to search

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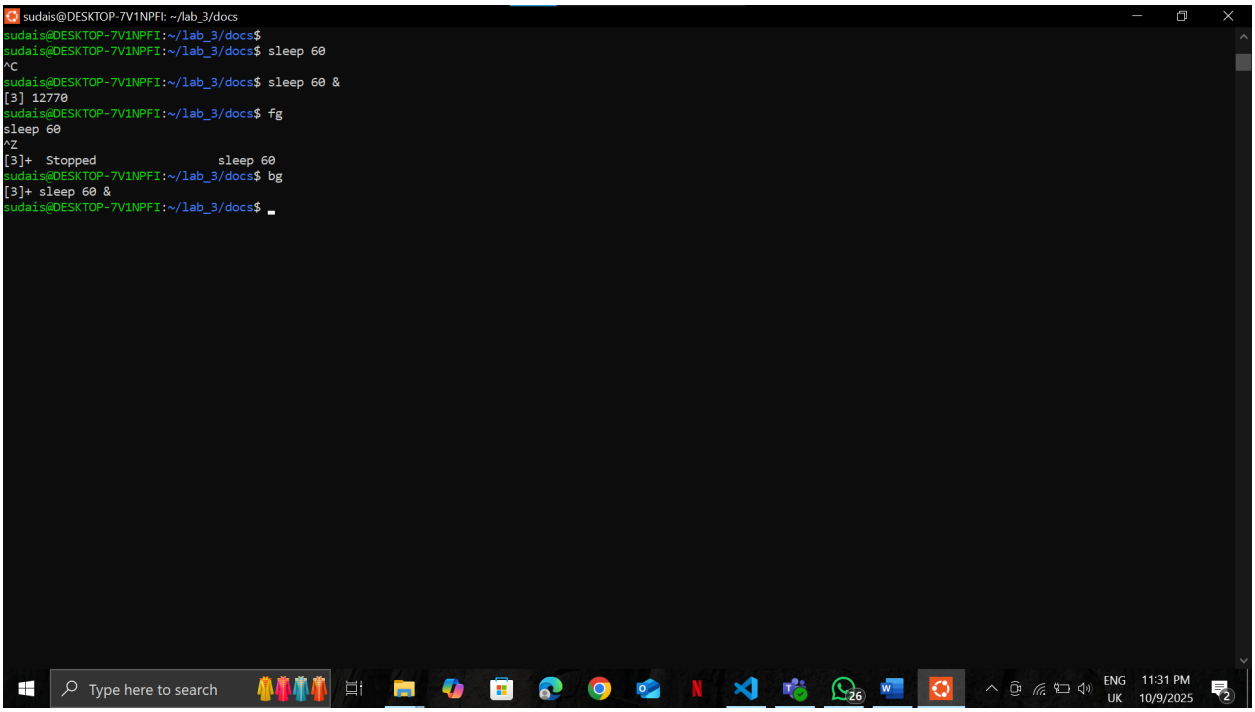
```
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ yes > /dev/null &
[1] 12153
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ ps -ef | grep yes
sudais     12153    9837 99 23:27 pts/6    00:00:16 yes
sudais     12203    9837  0 23:28 pts/6    00:00:00 grep --color=auto yes
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ kill <PID>
-bash: syntax error near unexpected token `newline'
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ ps -ef | grep yes
sudais     12153    9837 99 23:27 pts/6    00:00:46 yes
sudais     12295    9837  0 23:28 pts/6    00:00:00 grep --color=auto yes
sudais@DESKTOP-7V1NPFI:~/lab_3/docs$ ps
    PID TTY          TIME CMD
   9837 pts/6    00:00:00 bash
  12153 pts/6    00:01:05 yes
  12350 pts/6    00:00:00 ps
```



Part 6: C Programs on Processes

Program 1 – Exec with `top`

- 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.

Program 2 – Incomplete Program

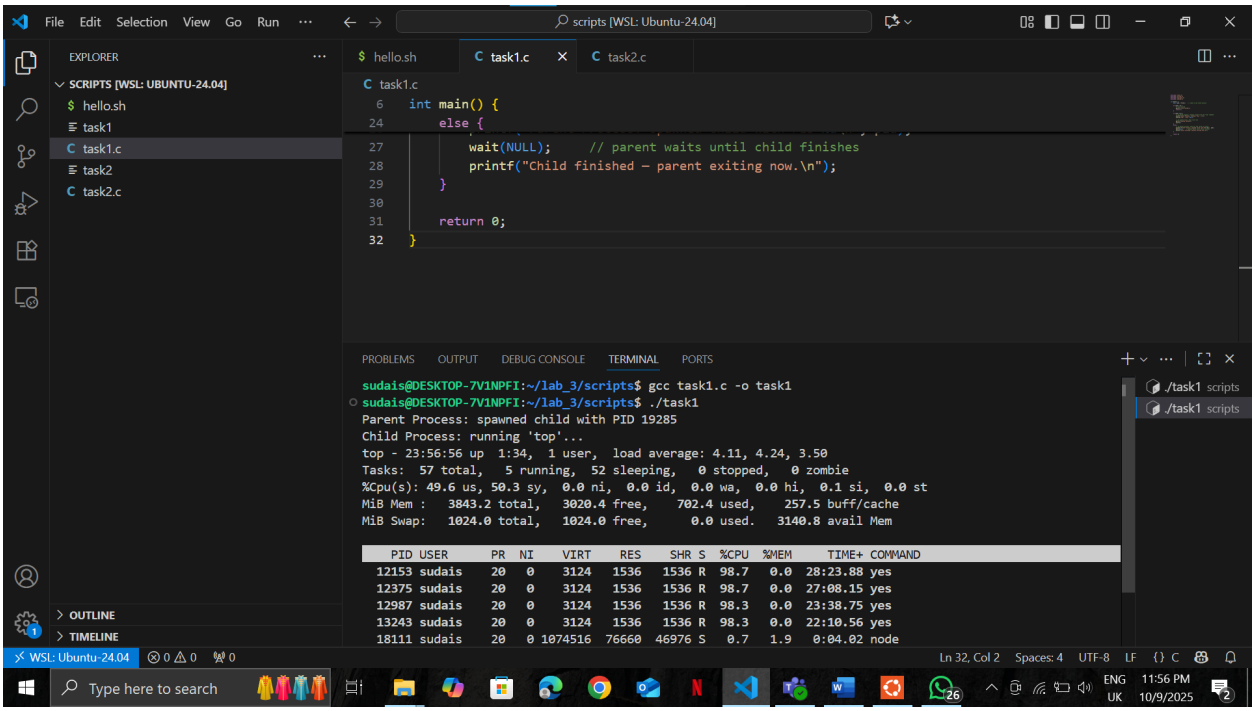
```
#include <stdio.h>
#include <unistd.h>
#include <sys/wait.h>

int main() {
    pid_t pid = fork();

    if (pid == 0) {
        // TODO: Replace this child process with the "date" command using
execlp
        // Hint: execlp("date", "date", NULL);
    } else {
        // TODO: Make parent wait for child before printing "Child finished"
    }

    return 0;
}
```

Task: Complete the missing parts, run the program, and take a screenshot of the output.


File Edit Selection View Go Run
scripts [WSL: Ubuntu-24.04]
EXPLORER
SCRIPTS [WSL: UBUNTU-24.04]
hello.sh
task1
task1.c
task2
task2.c
hello.sh
task1.c
task2.c
C task1.c
6 int main() {
24 else {
27 wait(NULL); // parent waits until child finishes
28 printf("Child finished — parent exiting now.\n");
29 }
30
31 return 0;
32 }
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
sudais@DESKTOP-7V1NPFI:~/lab_3/scripts$ gcc task1.c -o task1
sudais@DESKTOP-7V1NPFI:~/lab_3/scripts$ ./task1
Parent Process: spawned child with PID 19285
Child Process: running 'top'...
top - 23:56:56 up 1:34, 1 user, load average: 4.11, 4.24, 3.50
Tasks: 57 total, 5 running, 52 sleeping, 0 stopped, 0 zombie
%Cpu(s): 49.6 us, 50.3 sy, 0.0 ni, 0.0 id, 0.0 wa, 0.0 hi, 0.1 si, 0.0 st
MiB Mem : 3843.2 total, 3020.4 free, 702.4 used, 257.5 buff/cache
MiB Swap: 1024.0 total, 1024.0 free, 0.0 used. 3140.8 avail Mem
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
12153 sudais 20 0 3124 1536 1536 R 98.7 0.0 28:23.88 yes
12375 sudais 20 0 3124 1536 1536 R 98.7 0.0 27:08.15 yes
12987 sudais 20 0 3124 1536 1536 R 98.3 0.0 23:38.75 yes
13243 sudais 20 0 3124 1536 1536 R 98.3 0.0 22:10.56 yes
18111 sudais 20 0 1074516 76660 46976 S 0.7 1.9 0:04.02 node
./task1 scripts
./task1 scripts
OUTLINE
TIMELINE
WSL: Ubuntu-24.04
Ln 32, Col 2 Spaces: 4 UTF-8 LF C
Type here to search
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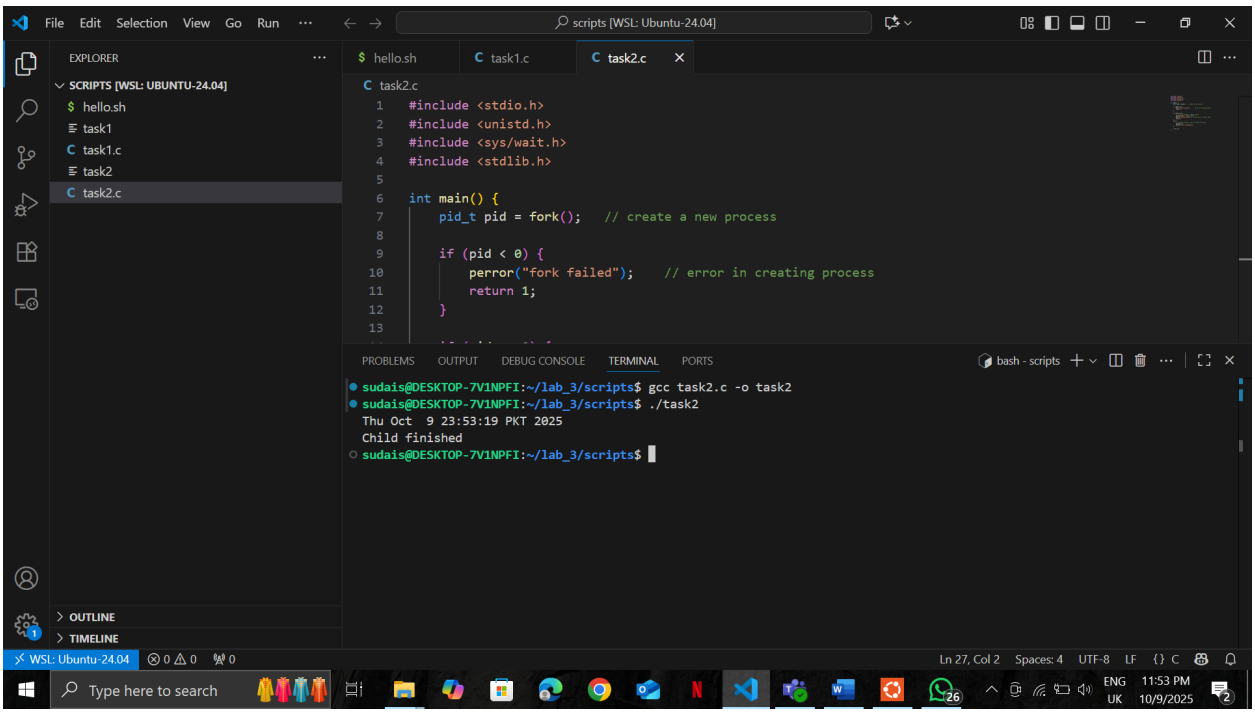
File Edit Selection View Go Run
scripts [WSL: Ubuntu-24.04]
EXPLORER
SCRIPTS [WSL: UBUNTU-24.04]
hello.sh
task1
task1.c
task2
task2.c
hello.sh
task1.c
task2.c
C task2.c
1 #include <stdio.h>
2 #include <unistd.h>
3 #include <sys/wait.h>
4 #include <stdlib.h>
5
6 int main() {
7 pid_t pid = fork(); // create a new process
8
9 if (pid < 0) {
10 perror("fork failed"); // error in creating process
11 return 1;
12 }
13
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
bash - scripts
sudais@DESKTOP-7V1NPFI:~/lab_3/scripts$ gcc task2.c -o task2
sudais@DESKTOP-7V1NPFI:~/lab_3/scripts$ ./task2
Thu Oct 9 23:53:19 PKT 2025
Child finished
sudais@DESKTOP-7V1NPFI:~/lab_3/scripts$
OUTLINE
TIMELINE
WSL: Ubuntu-24.04
Ln 27, Col 2 Spaces: 4 UTF-8 LF C
Type here to search
ENG UK 11:53 PM 10/9/2025