CSE 2005

OPERATING SYSTEMS

Assessment – 1

L7+L8 | PLBG17

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by

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Q.a. Basic Linux Commands.

Command	Function
pwd	pwd command is used to find out the path of the current working directory (folder). The command will return an absolute (full) path, which is basically a path of all the directories that starts with a forward slash (/)
cd	cd is used to navigate through the Linux files and directories. cd (directoryName) to move down the immediate directory cd .. to move one directory up cd to go straight to the home folder cd- to move to your previous directory
ls	The ls command is used to view the contents of a directory. By default, this command will display the contents of your current working directory. ls -l will list all the files and directory in the directory along with their modification permissions. ls -R will list all the files in the sub-directories as well. ls -a will show the hidden files. ls -al will list the files and directories with detailed information like the permissions, size, owner, etc.
cat	It is used to list the contents of a file on the standard output (sdout). To run this command, type cat followed by the file's name and its extension. For instance: cat file.txt.
vi	vi command is to create new files and open and edit existing files.
mkdir	mkdir command to make a new directory
rmdir	rmdir command is used to delete a directory. However, rmdir only allows you to delete empty directories.
grep	grep lets us search through all the text in a given file.
sudo	Short for "SuperUser Do", this command enables you to perform tasks that require administrative or root permissions.
chmod	chmod is used to change the read, write, and execute permissions of files and directories.
ping	ping command is used to check our connectivity status to a server.
man	Shows a documentation on another linux commands for us to learn how to use those commands
echo	This command is used to move some data into a file.
rm	The rm command is used to delete directories and the contents within them. If you only want to delete the directory — as an alternative to rmdir — use rm -r

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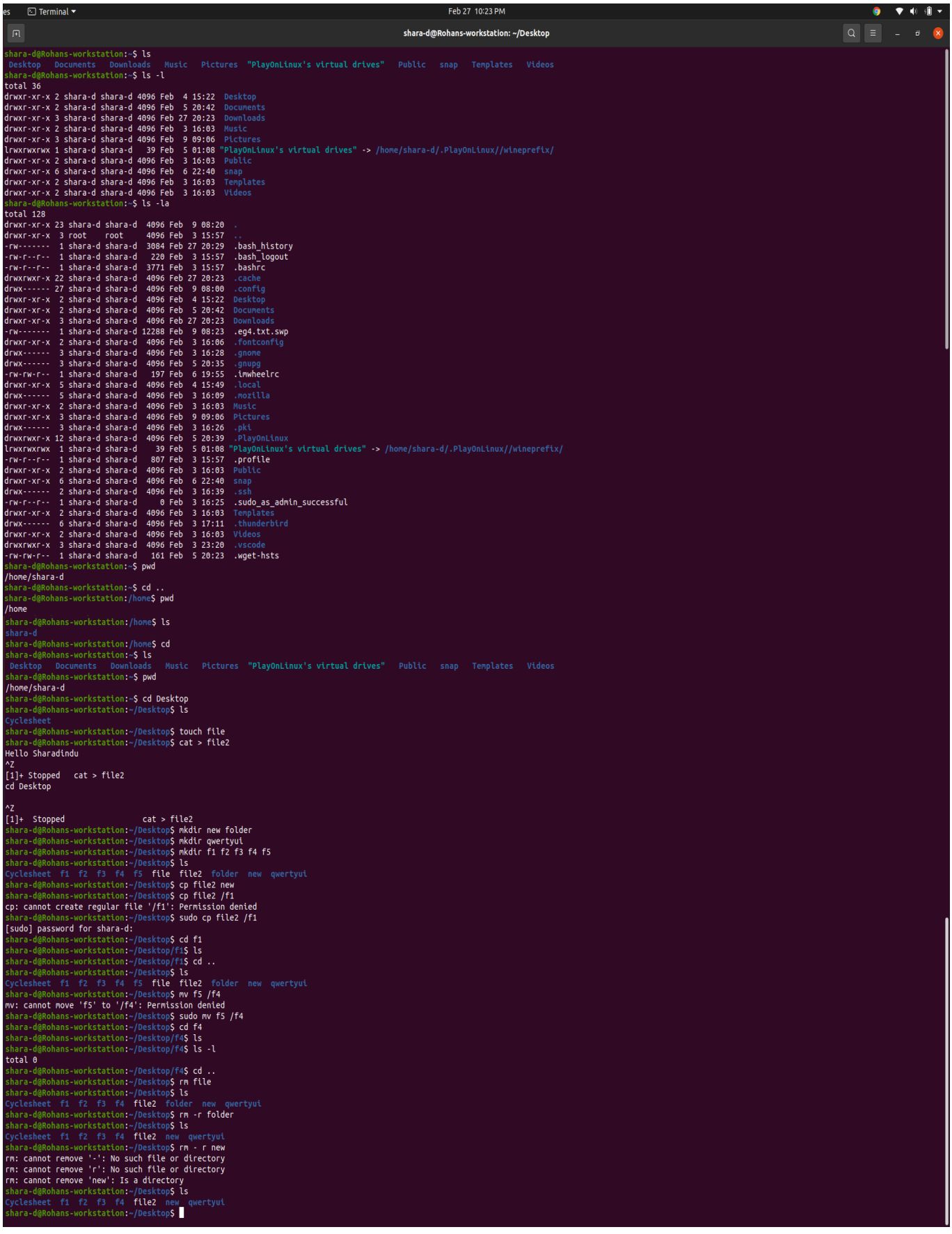


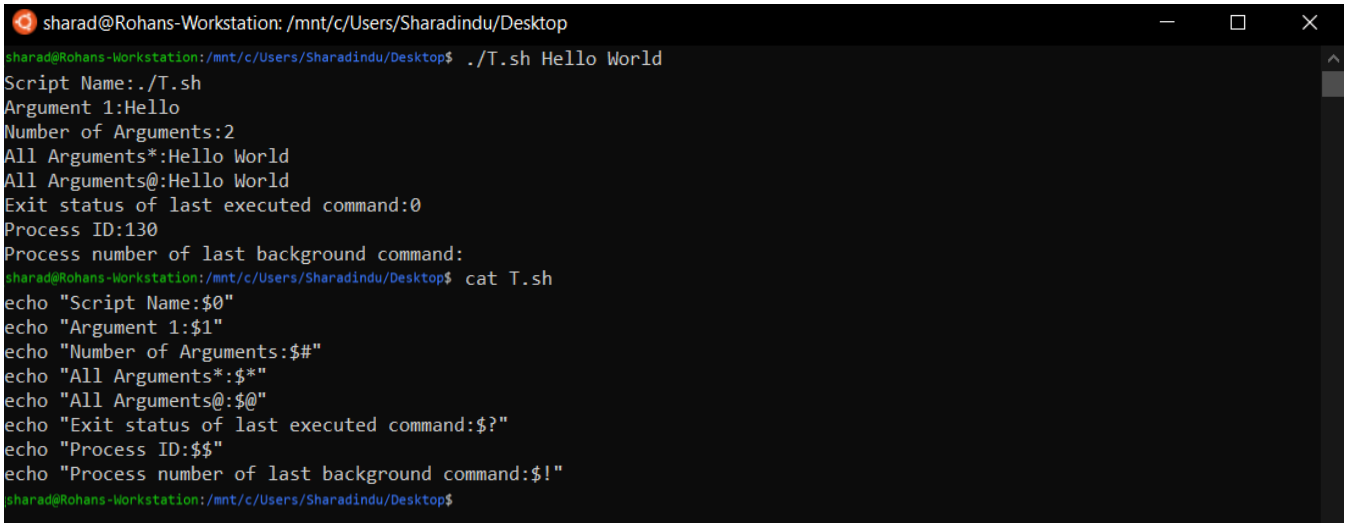
Q.b.

(b) Shell Programming

- Handling the command line arguments
- String reversal
- If-Else, Nested If Else,Switch cases in shell

b.1. Handling command line arguments

S. No.	Parameter	Description
1	$0	Returns filename of the script
2	$n	n is positive integer. Returns the nth argument given to the script when the script was invoked
3	$#	Returns the number of arguments given to the script when it was invoked
4	$*	Returns all arguments given to the script when it was invoked
5	$@	Returns all arguments given to the script when it was invoked
6	$?	Returns the exit status of last command executed
7	$$	Returns process number of the current shell i.e. process id under which the script is executing
8	$!	The process number of last background command



b.2. String reversal

```
String="$1"
len=${#String}
for ((i = $len-1; i >= 0; i--))
do
                reverse="$reverse${String:$i:1}"
done
echo $reverse
```

```
sharad@Rohans-Workstation: /mnt/c/Users/Sharadindu/Desktop
sharad@Rohans-Workstation:~$ cd /mnt/c/Users/Sharadindu/Desktop
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ sed -i 's/\r//' reverse
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ cat reverse
String="$1"
len=${#String}
for ((i = $len-1; i >= 0; i--))
do
        reverse="$reverse${String:$i:1}"
done
echo $reverse
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ ./reverse Yahallo!
!ollahaY
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$
```

b.3. If-Else, Nested If Else, Switch cases in shell

```
echo "IF ELSE STATEMENT"
if (( $1 == $2 ))
then
        echo "$1 is Equal to $2"
else
        echo "$1 is NOT Equal to $2"
fi
echo "NESTED IF ELSE STATEMENT"
if (( $1 >= 0 ))
then
                echo "$1 is Non Negative Integer"
                if (( $1 == 0 ))
                then
                        echo "$1 is Equal to Zero"
                else
                        echo "$1 is NOT Equal to Zero"
                fi
else
                echo "$1 is Negative Integer"
fi
echo "SWITCH CASE STATEMENT"
case $3 in
        1) echo "Case 1 invoked";;
        2) echo "Case 2 invoked";;
        3) echo "Case 3 invoked";;
Esac
```

```
sharad@Rohans-Workstation: /mnt/c/Users/Sharadindu/Desktop
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ sed -i 's/\r//' if.txt
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ cat if.txt
if (( $1 == $2 ))
then
       echo "$1 is Equal to $2"
else
       echo "$1 is NOT Equal to $2"
fi
echo "NESTED IF ELSE STATEMENT"
if (( $1 >= 0 ))
then
               echo "$1 is Non Negative Integer"
               if (( $1 == 0 ))
               then
                       echo "$1 is Equal to Zero"
               else
                       echo "$1 is NOT Equal to Zero"
               fi
else
               echo "$1 is Negative Integer"
fi
echo "SWITCH CASE STATEMENT"
case $3 in
       1) echo "Case 1 invoked";;
       2) echo "Case 2 invoked";;
       3) echo "Case 3 invoked";;
esac
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ ./if.txt 2 1 05
2 is NOT Equal to 1
NESTED IF ELSE STATEMENT
2 is Non Negative Integer
2 is NOT Equal to Zero
SWITCH CASE STATEMENT
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$
```

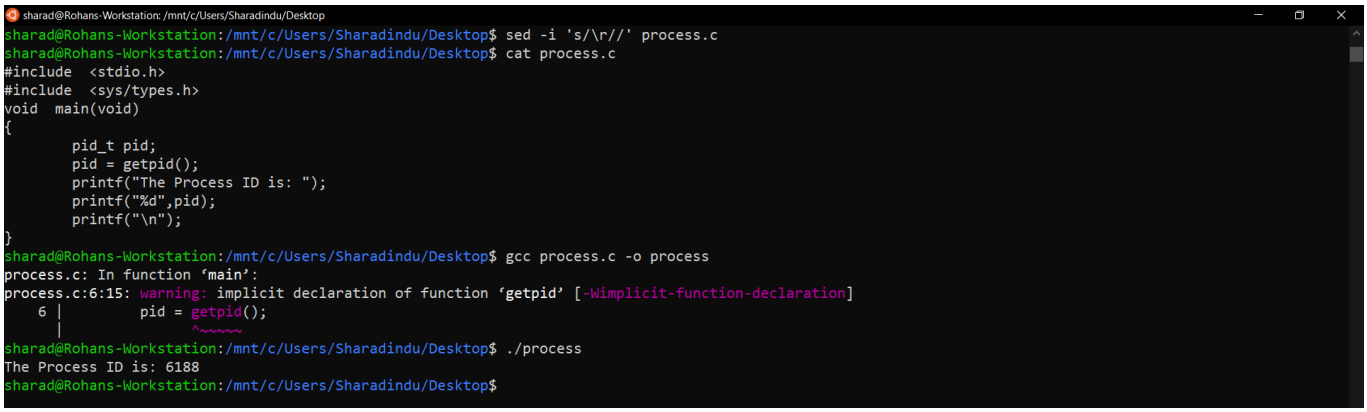
Q.c.

(c) Parent child process creation using fork( ) and exec() system call

Checking the Process Identifier
Assigning new task to child
Providing the path name and program name to exec()
Synchronizing Parent and child process using wait()

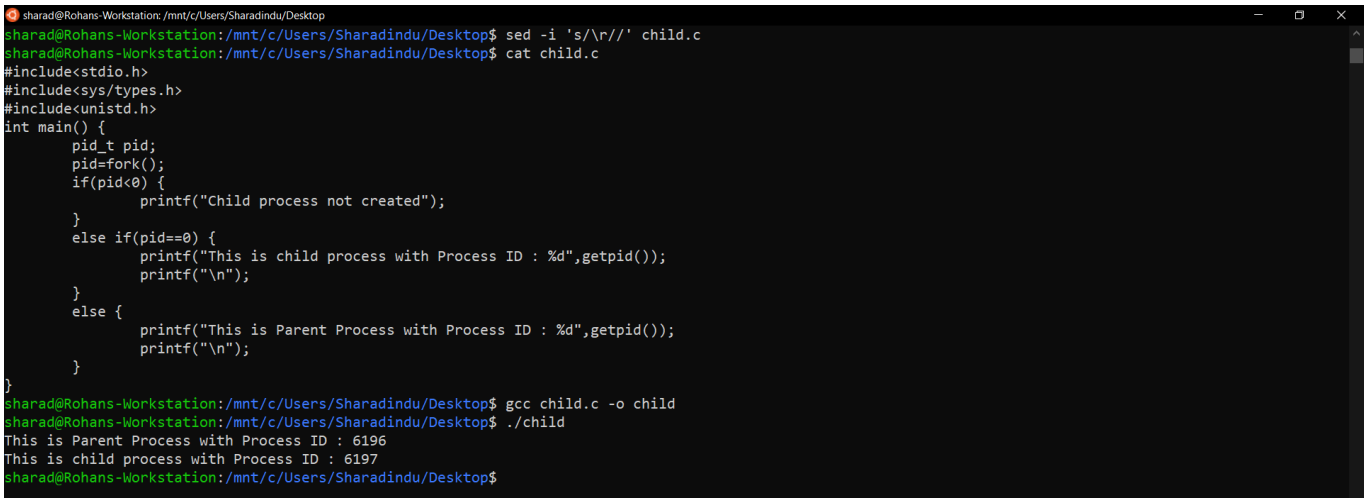
c.1. Checking the Process Identifier

```
#include  <stdio.h>
#include  <sys/types.h>
void  main(void)
{
        pid_t pid;
        pid = getpid();
        printf("The Process ID is: ");
        printf("%d",pid);
        printf("\n");
}
```



c.2. Assigning new task to child

```
#include<stdio.h>
#include<sys/types.h>
#include<unistd.h>
int main() {
        pid_t pid;
        pid=fork();
        if(pid<0) {
                printf("Child process not created");
        }
        else if(pid==0) {
                printf("This is child process with Process ID : %d",getpid());
                printf("\n");
        }
        else {
                printf("This is Parent Process with Process ID : %d",getpid());
                printf("\n");
        }
}
```



c.3. Providing the path name and program name

path 1:

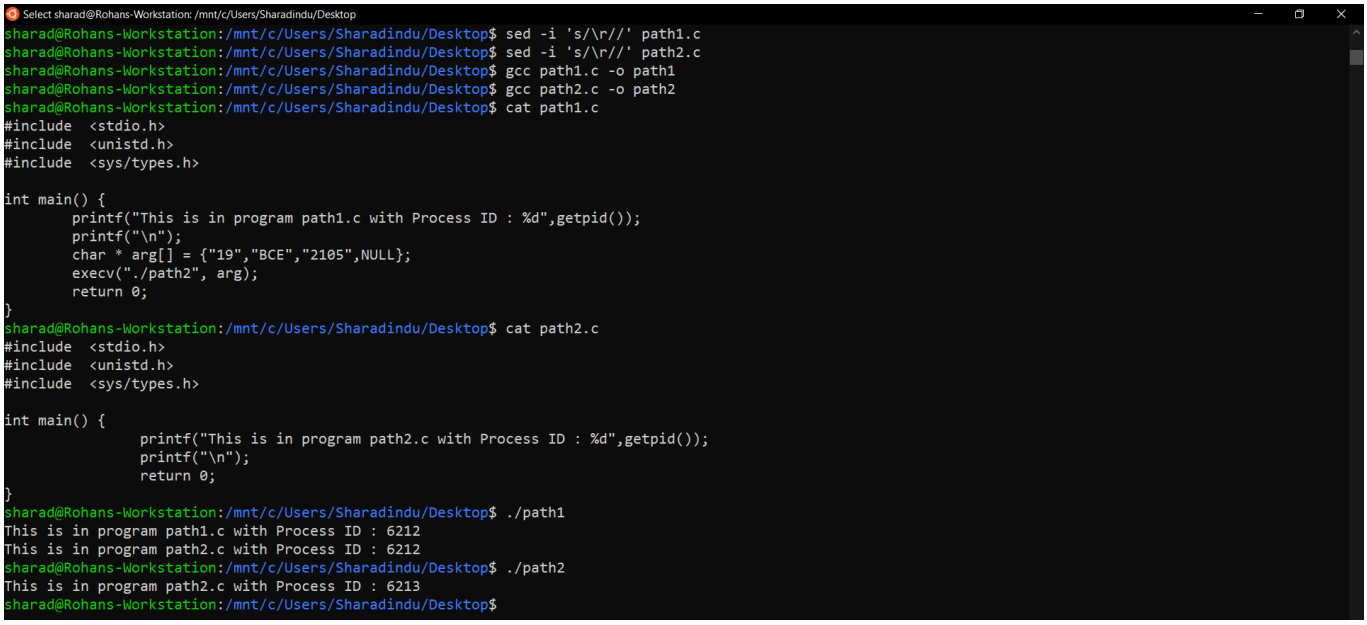
```
#include  <stdio.h>
#include  <unistd.h>
#include  <sys/types.h>

int main() {
        printf("This is in program path1.c with Process ID : %d",getpid());
        printf("\n");
        char * arg[] = {"19","BCE","2105",NULL};
        execv("./path2", arg);
        return 0;
}
```

path 2:

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

int main() {
                printf("This is in program path2.c with Process ID : %d",getpid());
                printf("\n");
                return 0;
}
```



c.4. Synchronizing parent and child process

```
#include<stdio.h>
#include<sys/types.h>
#include<unistd.h>
int main() {
        pid_t pid;
        pid=fork();
        if(pid<0) {
                printf("Child process not created");
        }
        else if(pid==0) {
                printf("This is child process with Process ID : %d",getpid());
                printf("\nAdding Two Numbers: \n");
                int a, b;
                scanf("%d %d",&a,&b);
                printf("Sum is: %d",a+b);
        }
        else {
                wait();
                printf("\nThis is Parent Process with Process ID : %d",getpid());
                printf("\n");
        }
}
```

```
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ sed -i 's/\r//' parent.c
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ gcc parent.c -o parent
parent.c: In function ‘main’:
parent.c:18:17: warning: implicit declaration of function ‘wait’ [-Wimplicit-function-declaration]
   18 |                 wait();
      |                 ^~~~
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ cat parent.c
#include<stdio.h>
#include<sys/types.h>
#include<unistd.h>
int main() {
        pid_t pid;
        pid=fork();
        if(pid<0) {
                printf("Child process not created");
        }
        else if(pid==0) {
                printf("This is child process with Process ID : %d",getpid());
                printf("\nAdding Two Numbers: \n");
                int a, b;
                scanf("%d %d",&a,&b);
                printf("Sum is: %d",a+b);
        }
        else {
                wait();
                printf("\nThis is Parent Process with Process ID : %d",getpid());
                printf("\n");
        }
}
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ ./parent
This is child process with Process ID : 6247
Adding Two Numbers:
1 39
Sum is: 40
This is Parent Process with Process ID : 6246
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$
```

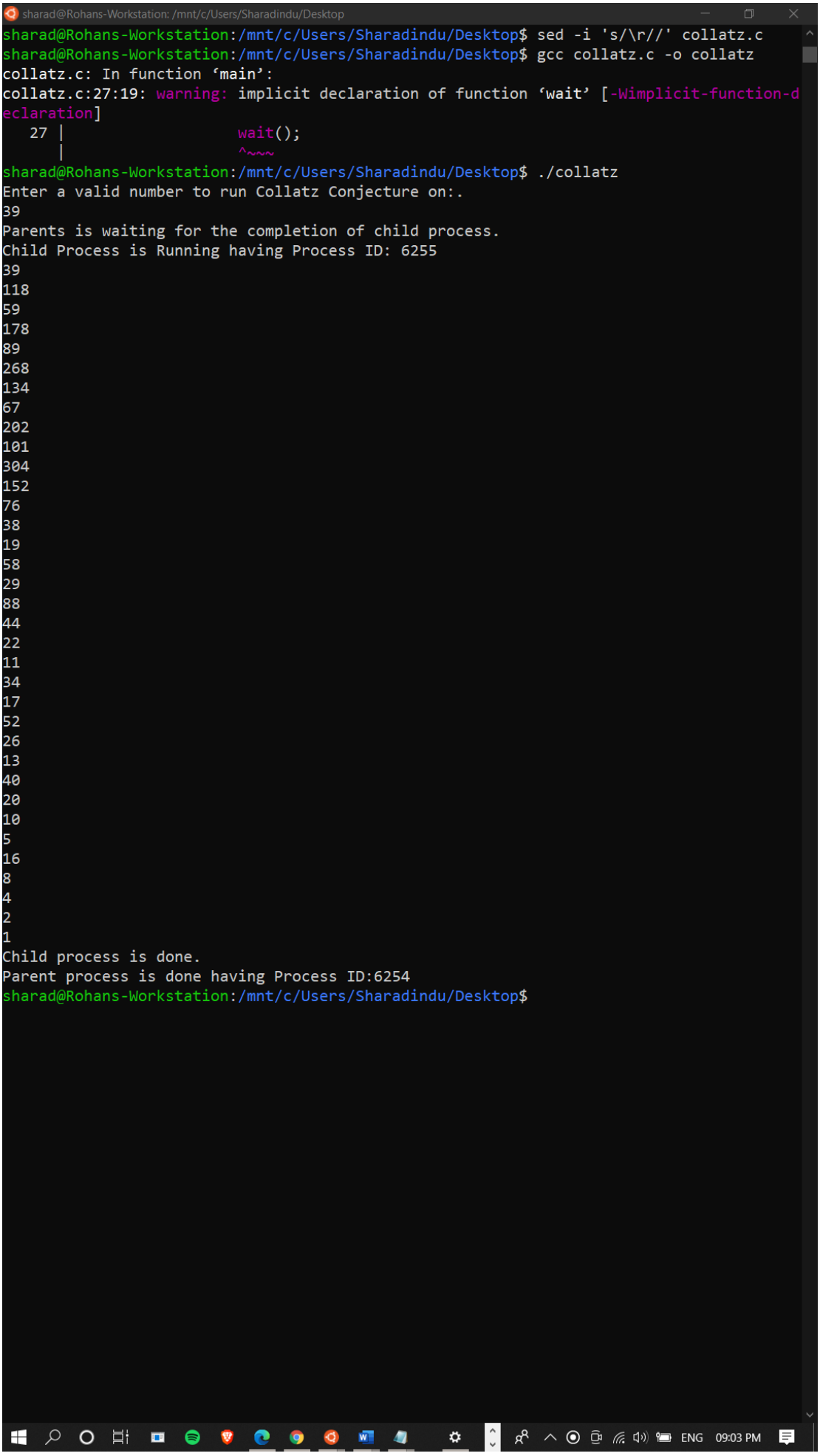
Q.d.

(d) The Collatz conjecture concerns what happens when we take any positive integer n and apply the following algorithm:

$$n = n/2, \text{ if } n \text{ is even } n = 3 \times n + 1, \text{ if } n \text{ is odd}$$

The conjecture states that when this algorithm is continually applied, all positive integers will eventually reach 1. For example, if n = 35, the sequence is 35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1.Write a C program using the fork () system call that generates this sequence in the child process. The starting number will be provided from the command line. For example, if 8 is passed as a parameter on the Command line, the child process will output 8, 4, 2, 1. Because the parent and child processes have their own copies of the data, it will be necessary for the child to output the sequence. Have the parent invoke the wait () call to wait for the child process to complete before exiting the program

```
#include<stdio.h>
#include<sys/types.h>
#include<unistd.h>
int main() {
        pid_t pid;
        pid=fork();
        if(pid<0) {
                printf("Child process not created");
        }
        else if(pid==0) {
                printf("This is child process with Process ID : %d",getpid());
                printf("\nAdding Two Numbers: \n");
                int a, b;
                scanf("%d %d",&a,&b);
                printf("Sum is: %d",a+b);
        }
        else {
                wait();
                printf("\nThis is Parent Process with Process ID : %d",getpid());
                printf("\n");
        }
}
```


sharad@Rohans-Workstation: /mnt/c/Users/Sharadindu/Desktop
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ sed -i 's/\r//' collatz.c
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ gcc collatz.c -o collatz
collatz.c: In function ‘main’:
collatz.c:27:19: warning: implicit declaration of function ‘wait’ [-Wimplicit-function-declaration]
27 | wait();
| ^~~~
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$ ./collatz
Enter a valid number to run Collatz Conjecture on:.
39
Parents is waiting for the completion of child process.
Child Process is Running having Process ID: 6255
39
118
59
178
89
268
134
67
202
101
304
152
76
38
19
58
29
88
44
22
11
34
17
52
26
13
40
20
10
5
16
8
4
2
1
Child process is done.
Parent process is done having Process ID:6254
sharad@Rohans-Workstation:/mnt/c/Users/Sharadindu/Desktop$
ENG
09:03 PM