

Concepts of Operating System

Assignment 2

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Part A

What will the commands do?

1. echo "Hello, World!"

This command prints text or string between the double quotes on to the terminal.
Output → Hello, World!

2. name="Productive"

This assigns the value "Productive" to a variable named name.

3. touch file.txt

It creates an empty file named file.txt.

4. ls -a

Lists all files and directories in the current directory, including hidden files

5. rm file.txt

It deletes or removes the file named file.txt permanently.

6. cp file1.txt file2.txt

It copies the contents of file1.txt into a file called file2.txt.

7. mv file.txt /path/to/directory/

It moves file.txt to the mentioned directory.

8. chmod 755 script.sh

It changes the permissions of script.sh such as follow

Owner → read (r), write (w), and execute (7)

Group → read (r) and execute (5)

Others → read (r) and execute (5)

9. grep "pattern" file.txt

It searches for lines containing "pattern" inside file.txt.

10. kill PID

It terminates the process with the given Process ID (PID).

11. mkdir mydir && cd mydir && touch file.txt && echo "Hello, World!" > file.txt && cat file.txt

&& is operator, It does next command will only execute if the previous one is successful.

A) mkdir → Create mydir directory.

B) cd mydir → Change to mydir

C) touch file.txt → Create an empty file of name file.txt

D) echo "Hello, World!" → Write text to the file.

E) cat file.txt → Display file content.

12. ls -l | grep ".txt"

A) ls -l → Lists files in the current directory with detailed information.

B) | → (Pipe) Passes the output of ls -l as input to grep.

C) grep ".txt" → It filters and displays only lines that contain .txt

13. `cat file1.txt file2.txt | sort | uniq`

- A) `cat file1.txt cat file2.txt` → Displays the contents of file1.txt and file2.txt together.
- B) `|` → (Pipe) Passes the output of cat as input to the next command.
- C) `sort` → Sorts the combined output alphabetically.
- D) `uniq` → Removes duplicate lines.

14. `ls -l | grep "^d"`

- A) `ls -l` → Lists files and directories in long (detail) format.
- B) `|` → (Pipe) Passes the output of `ls -l` to `grep`.
- C) `Grep "^d"` → Filters only directories by checking if the line starts (^) with d (it shows directory)
- D) `/path/to/directory/` → The directory where the search begins.

15. `grep -r "pattern" /path/to/directory/`

- A) `grep` → Searches for text inside files.
- B) `-r` → (Recursive) Searches inside all files and subdirectories within `/path/to/directory/`.
- C) `"pattern"` → The text or pattern you want to find.
- D) `/path/to/directory/` → The directory where the search begins.

16. `cat file1.txt file2.txt | sort | uniq -d`

- A) `cat file1.txt file2.txt` → Displays the contents of file1.txt and file2.txt. together.
- B) `|` → (Pipe) Passes the combined output to the next sort command.
- C) `sort` → Sorts the combined content
- D) `uniq -d` → Displays only the duplicate lines that appear in both files.

17. `chmod 644 file.txt`

It changes the permissions of file.txt such as follow

- Owner → read (r), write (w) (6)
- Group → read (r) (4)
- Others → read (r) (4)

18. `cp -r source_directory destination_directory`

- A) `cp` → It is used to copy files and directories.
- B) `-r` → (Recursive) tells cp to copy directories and their contents, including subdirectories and files.
- C) `source_directory` → It is the folder you want to copy.
- D) `destination_directory` → It is where you want to copy it.

19. `find /path/to/search -name "*.txt"`

- A) `find` → Searches for files and directories.
- B) `/path/to/search` → The directory where the search starts (e.g., `/home/user/`).
- C) `-name "*.txt"` → It looks for files with the .txt extension.

20. `chmod u+x file.txt`

- A) `chmod` → Changes file permissions.
- B) `u+x` → Grants execute (x) permission to the owner (u) of file.txt.
- C) `file.txt` → The file whose permissions are being modified.

21. `echo $PATH`

- A) `echo` → Displays text or variable values in the terminal.
- B) `$PATH` → Prints the system's PATH environment variable, which contains directories where executable programs are stored.

Part B

Identify True or False:

1. ls is used to list files and directories in a directory. → True
2. mv is used to move files and directories. → True
3. cd is used to copy files and directories. → False (Used to change directories)
4. pwd stands for "print working directory" and displays the current directory. → True
5. grep is used to search for patterns in files. → True
6. chmod 755 file.txt gives read, write, and execute permissions to the owner, and read and execute permissions to group and others. → True
7. mkdir -p directory1/directory2 creates nested directories, creating directory2 inside directory1 if directory1 does not exist. → True
8. rm -rf file.txt deletes a file forcefully without confirmation. → False (rm -f file.txt → this command deletes a file forcefully without confirmation.)

Identify the Incorrect Commands:

1. chmodx is used to change file permissions. → chmod (chmod 755 file.txt)
2. cpy is used to copy files and directories. → cp (cp file1.txt file2.txt)
3. mkfile is used to create a new file. → touch (touch file.txt)
4. catx is used to concatenate files. → cat (cat file.txt)
5. rn is used to rename files. → mv

Part C

1: Write a shell script that prints "Hello, World!" to the terminal.

```
cdac@Satyajeet: ~/Assignment2$ pwd
/home/cdac
cdac@Satyajeet:~/Assignment2$ ls
Assignment2  LinuxAssignment  Problem2  docs.zip
cdac@Satyajeet:~/Assignment2$ cd Assignment2
cdac@Satyajeet:~/Assignment2$ ls
Addition.txt  PartC  Subtr.txt
cdac@Satyajeet:~/Assignment2$ cd PartC
cdac@Satyajeet:~/Assignment2/PartC$ touch Hello.txt
cdac@Satyajeet:~/Assignment2/PartC$ nano Hello.txt
cdac@Satyajeet:~/Assignment2/PartC$ cat Hello.txt
echo "Hello, World!"
cdac@Satyajeet:~/Assignment2/PartC$ bash Hello.txt
Hello, World!
cdac@Satyajeet:~/Assignment2/PartC$ |
```

2: Declare a variable named "name" and assign the value "CDAC Mumbai" to it. Print the value of the variable.

```
cdac@Satyajeet:~/Assignment2/PartC$ name="CDAC Mumbai"
cdac@Satyajeet:~/Assignment2/PartC$ echo $name
CDAC Mumbai
cdac@Satyajeet:~/Assignment2/PartC$ |
```

3: Write a shell script that takes a number as input from the user and prints it.

```
cdac@Satyajeet:~/Assignment2/PartC$ touch Num.txt
cdac@Satyajeet:~/Assignment2/PartC$ nano Num.txt
cdac@Satyajeet:~/Assignment2/PartC$ cat Num.txt
echo "Enter a number"
read a
echo Your number is $a
cdac@Satyajeet:~/Assignment2/PartC$ bash Num.txt
Enter a number
21
Your number is 21
cdac@Satyajeet:~/Assignment2/PartC$ |
```

4: Write a shell script that performs addition of two numbers (e.g., 5 and 3) and prints the result.

```
cdac@Satyajeet:~/Assignment2/PartC$ ls
Add.txt  Hello.txt  Num.txt
cdac@Satyajeet:~/Assignment2/PartC$ nano Add.txt
cdac@Satyajeet:~/Assignment2/PartC$ cat Add.txt
echo "Enter first number"
read a
echo "Enter second number"
read b
sum=$((a+b))
echo sum of $a and $b is $sum
cdac@Satyajeet:~/Assignment2/PartC$ bash Add.txt
Enter first number
5
Enter second number
3
sum of 5 and 3 is 8
cdac@Satyajeet:~/Assignment2/PartC$ |
```

5: Write a shell script that takes a number as input and prints "Even" if it is even, otherwise prints "Odd".

```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt Hello.txt Num.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch Even.txt
cdac@SatyaJeet:~/Assignment2/PartC$ ls
Add.txt Even.txt Hello.txt Num.txt
cdac@SatyaJeet:~/Assignment2/PartC$ nano Even.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Even.txt
echo "Enter a number"
read a
if ((a%2 == 0));
then
echo "Given number is Even!"
else
echo "Given number is Odd!"
cdac@SatyaJeet:~/Assignment2/PartC$ bash Even.txt
Enter a number
4
Even.txt: line 8: syntax error: unexpected end of file
cdac@SatyaJeet:~/Assignment2/PartC$ nano Even.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Even.txt
echo "Enter a number"
read a
if ((a%2 == 0));
then
echo "Given number is Even!"
else
echo "Given number is Odd!"
fi
cdac@SatyaJeet:~/Assignment2/PartC$ bash Even.txt
Enter a number
4
Given number is Even!
cdac@SatyaJeet:~/Assignment2/PartC$ bash Even.txt
Enter a number
5
Given number is Odd!
cdac@SatyaJeet:~/Assignment2/PartC$ |
```

6: Write a shell script that uses a for loop to print numbers from 1 to 5.

```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt Even.txt Hello.txt Num.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch Loop.txt
cdac@SatyaJeet:~/Assignment2/PartC$ nano Loop.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Loop.txt
for a in {1..5}
do
echo $a
done
cdac@SatyaJeet:~/Assignment2/PartC$ bash Loop.txt
1
2
3
4
5
cdac@SatyaJeet:~/Assignment2/PartC$ |
```

7: Write a shell script that uses a while loop to print numbers from 1 to 5.

```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt Even.txt Hello.txt Loop.txt Num.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch while.txt
cdac@SatyaJeet:~/Assignment2/PartC$ mv while.txt While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ ls
Add.txt Even.txt Hello.txt Loop.txt Num.txt While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ nano While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat While.txt
a=1
while [ $a -lt 5 ]
do
echo $a
((a++))
done
cdac@SatyaJeet:~/Assignment2/PartC$ bash While.txt
1
2
3
4
cdac@SatyaJeet:~/Assignment2/PartC$ nano While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat While.txt
a=1
while [ $a -lt 6 ]
do
echo $a
((a++))
done
cdac@SatyaJeet:~/Assignment2/PartC$ bash While.txt
1
2
3
4
5
cdac@SatyaJeet:~/Assignment2/PartC$ |
```

8: Write a shell script that checks if a file named "file.txt" exists in the current directory. If it does, print "File exists", otherwise, print "File does not exist".

```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt Even.txt Hello.txt Loop.txt Num.txt While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch Que8.txt
cdac@SatyaJeet:~/Assignment2/PartC$ nano Que8.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Que8.txt
if [ -f "file.txt" ];
then
echo "File exists"
else
echo "File does not exist"
fi
cdac@SatyaJeet:~/Assignment2/PartC$ bash Que8.txt
File does not exist
cdac@SatyaJeet:~/Assignment2/PartC$ ls
Add.txt Even.txt Hello.txt Loop.txt Num.txt Que8.txt While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch file.txt
cdac@SatyaJeet:~/Assignment2/PartC$ bash Que8.txt
File exists
cdac@SatyaJeet:~/Assignment2/PartC$ ls
Add.txt Hello.txt Num.txt While.txt
Even.txt Loop.txt Que8.txt file.txt
cdac@SatyaJeet:~/Assignment2/PartC$
```

9: Write a shell script that uses the if statement to check if a number is greater than 10 and prints a message accordingly.

```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt Hello.txt Num.txt Que9.txt file.txt
Even.txt Loop.txt Que8.txt While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Que9.txt
echo "Enter a number"
read a
if [ $a -gt 10 ]
then
echo "$a is greater than 10"
else
echo "$a is equal to or less than 10"
fi
cdac@SatyaJeet:~/Assignment2/PartC$ bash Que9.txt
Enter a number
9
9 is equal to or less than 10
cdac@SatyaJeet:~/Assignment2/PartC$ bash Que9.txt
Enter a number
11
11 is greater than 10
cdac@SatyaJeet:~/Assignment2/PartC$
```

10: Write a shell script that uses nested for loops to print a multiplication table for numbers from 1 to 5. The output should be formatted nicely, with each row representing a number and each column representing the multiplication result for that number.

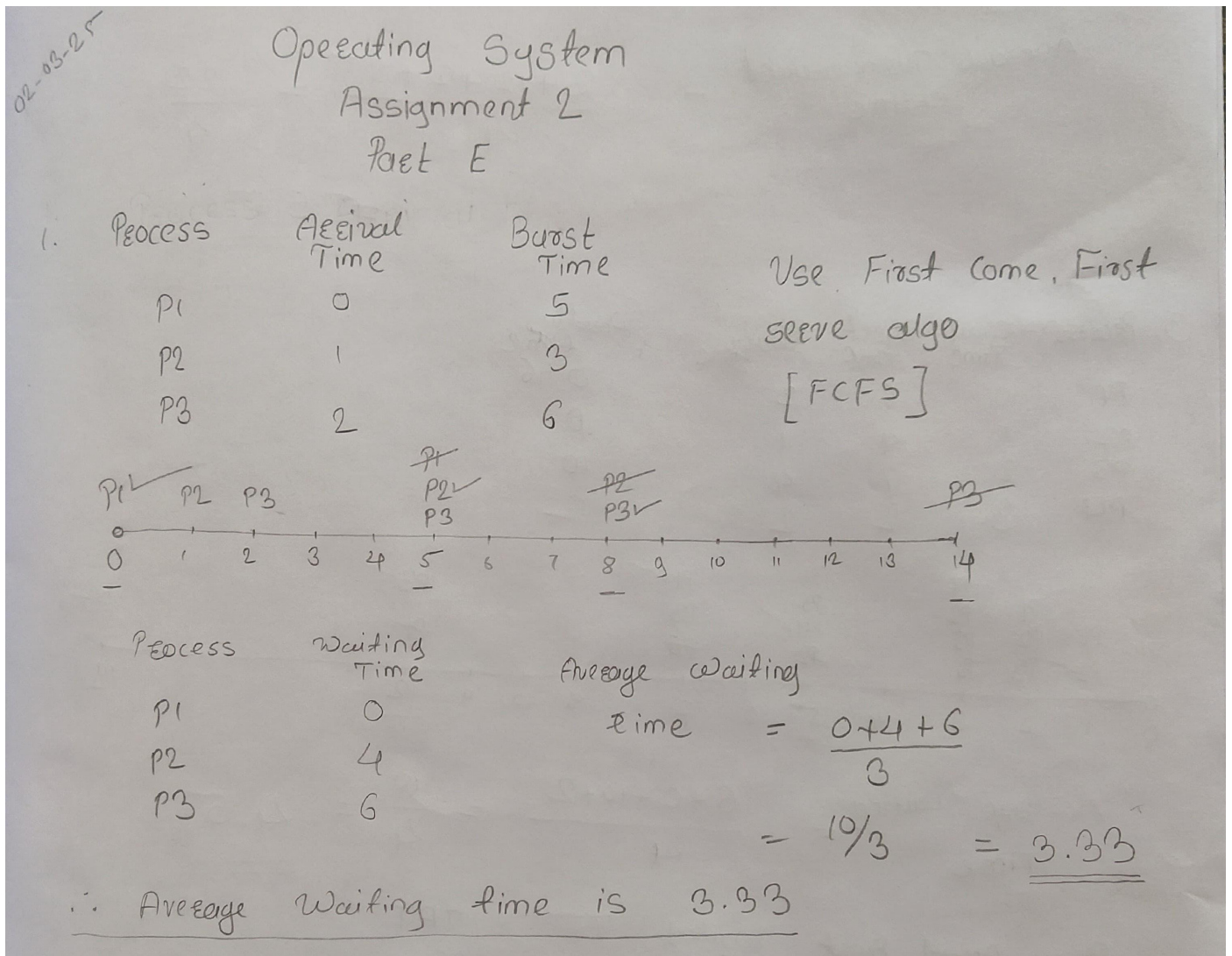
```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt Hello.txt Num.txt Que9.txt file.txt
Even.txt Loop.txt Que8.txt While.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch Que10.txt
cdac@SatyaJeet:~/Assignment2/PartC$ nano Que10.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Que10.txt
echo "Table from 1 -5"
echo "-----"
for i in {1..5}
do
    for j in {1..5}
    do
        result=`expr $i \* $j`
        echo -n "$result "
    done
    echo
done
cdac@SatyaJeet:~/Assignment2/PartC$ bash Que10.txt
Table from 1 -5
-----
1      2      3      4      5
2      4      6      8      10
3      6      9      12     15
4      8      12     16     20
5      10     15     20     25
cdac@SatyaJeet:~/Assignment2/PartC$
```

11: Write a shell script that uses a while loop to read numbers from the user until the user enters a negative number. For each positive number entered, print its square. Use the break statement to exit the loop when a negative number is entered.

```
cdac@SatyaJeet: ~/Assignment2/PartC$ ls
Add.txt  Hello.txt  Num.txt  Que8.txt  While.txt
Even.txt Loop.txt  Que10.txt Que9.txt  file.txt
cdac@SatyaJeet:~/Assignment2/PartC$ touch Que11.txt
cdac@SatyaJeet:~/Assignment2/PartC$ nano Que11.txt
cdac@SatyaJeet:~/Assignment2/PartC$ cat Que11.txt
while [ true ]
do
    echo "Enter a number"
    read a
    if [ $a -lt 0 ]
    then
        break
    fi
done
echo Program terminated because you entered negative value.
cdac@SatyaJeet:~/Assignment2/PartC$ bash Que11.txt
Enter a number
1
Enter a number
5
Enter a number
6
Enter a number
9
Enter a number
26463146
Enter a number
41346
Enter a number
000
Enter a number
-1
Program terminated because you entered negative value.
cdac@SatyaJeet:~/Assignment2/PartC$ |
```

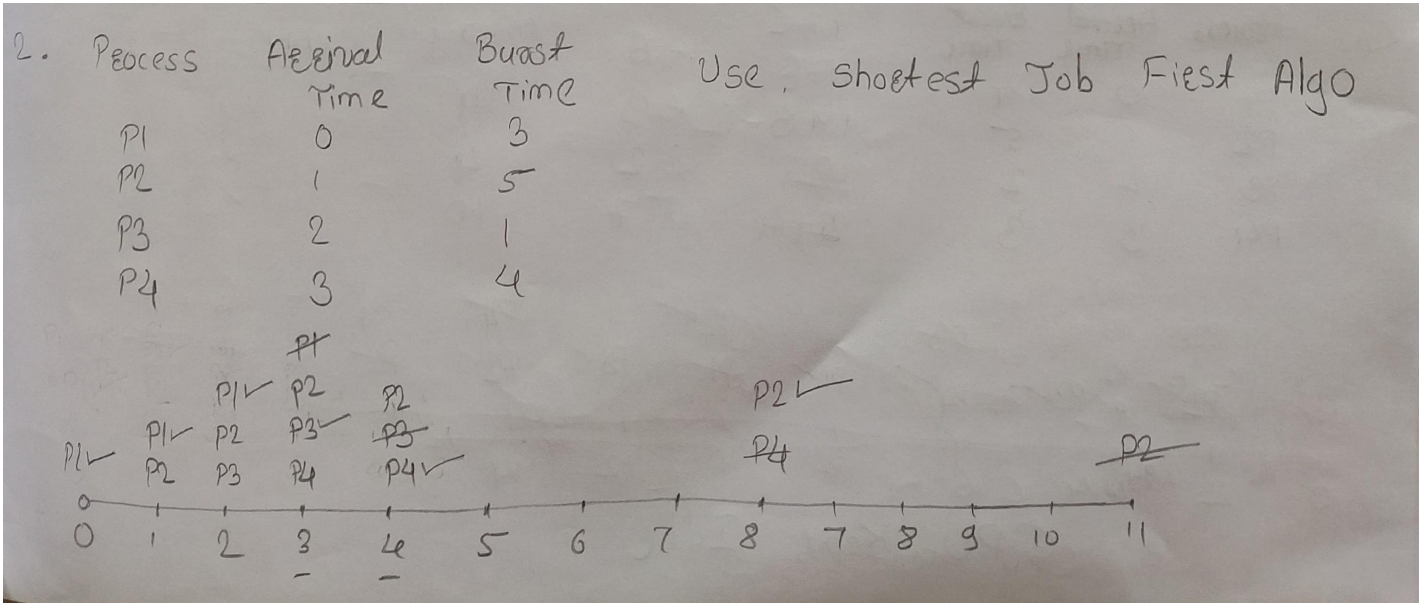

Part E

1.



Answer = the average waiting time using First-Come, First-Served (FCFS) scheduling is 3.33

2.

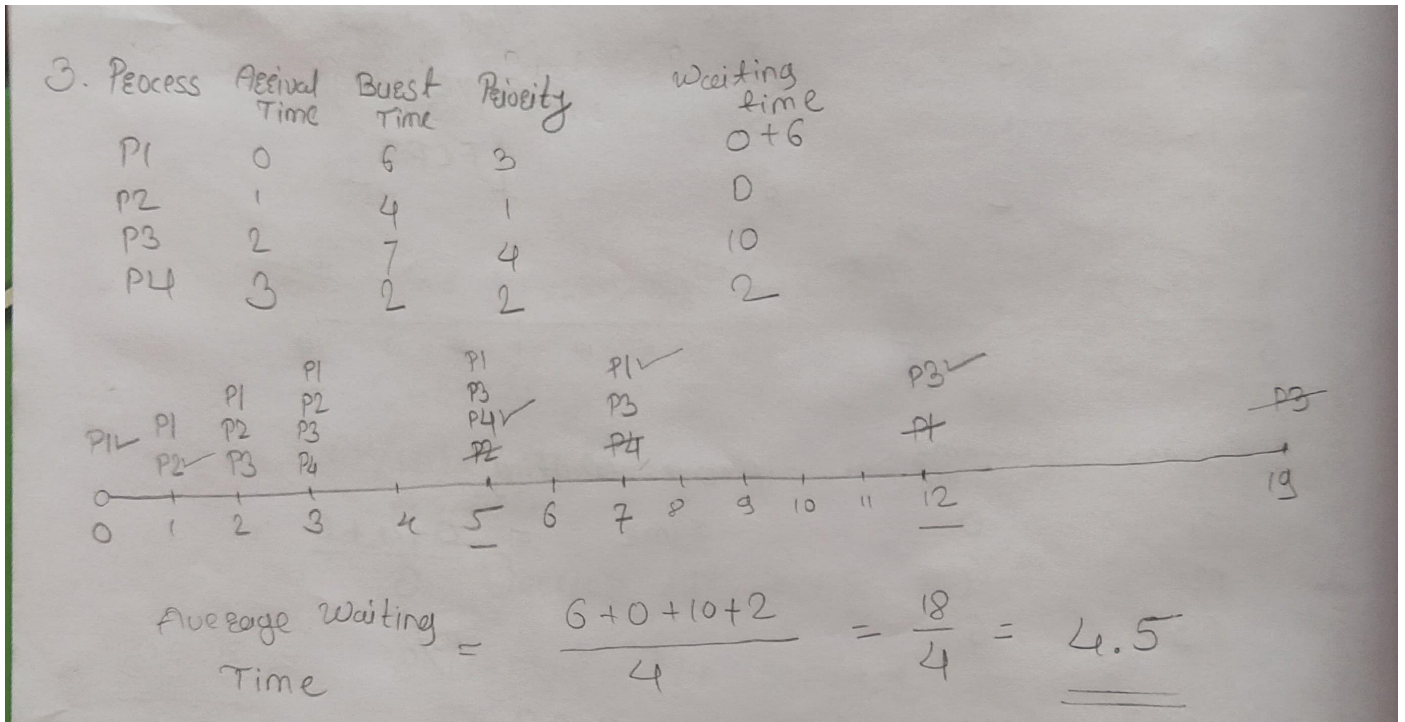


Process	Arrival Time	Burst Time	Waiting Time	Turn-around Time
P1	0	3	0	3
P2	1	5	7	12
P3	2	1	1	2
P4	3	4	1	5

$$\text{Average Turn-around Time} = \frac{3 + 12 + 2 + 5}{4} = \frac{22}{4} = 5.5$$

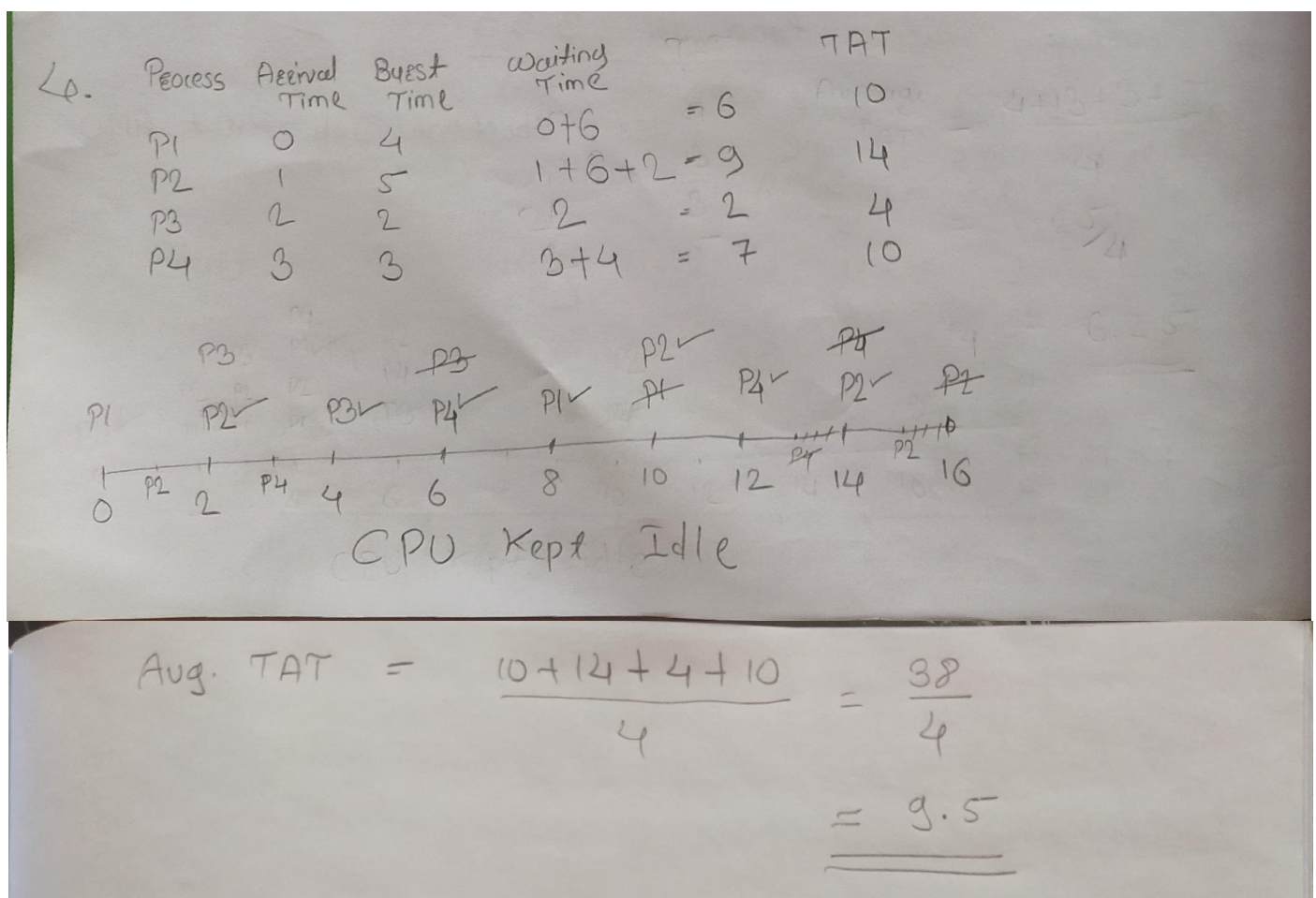
Answer = The average turnaround time using Shortest Job First (SJF) scheduling 5.5

3.



Answer = The average waiting time using Priority Scheduling is 4.5

4.



Answer = The average turnaround time using Round Robin scheduling is 9.5

5.

When a program uses the `fork()` system call, it creates a new child process that is a copy of the parent process.

If the parent process starts with $x = 5$, after forking, both the parent and child have their own copies of $x = 5$. When both increment x by 1, the parent process updates x to 6, and the child process also updates x to 6.