CDAC MUMBAI

Concepts of Operating System

Assignment 2

Part A

What will the following commands do?

- echo "Hello, World!"
  Ans:**it is used too print the command on scripting**
- name="Productive"
  Ans; **A variable is assign which is name and value is "Productive"**
- touch file.txt
  Ans:**It is used to make a file in shell scripting**
- ls -a
  Ans: **it is used to show the file present in the particular directory**
- rm file.txt
  Ans: **it Is used to remove the file in scripting**
- cp file1.txt file2.txt
  Ans: **it copy the file1 to file 2**
- mv file.txt /path/to/directory/
  Ans: **mv file used to rename the file .**
- chmod 755 script.sh
  Ans: **It will give access to read,write and executive to the user**
- grep "pattern" file.txt
  Ans: It is ued to find the specific word or pattern from the file
- kill PID
  Ans **It will terminate the process with the given id**
- mkdir mydir && cd mydir && touch file.txt && echo "Hello, World!" > file.txt && cat file.txt
  Ans: **mkdir make a directory with name mydir**
  Cd mydir we will switch to mydir directory after file is create by the command touch and display the output with echo "Hello World" and cat command display all the content present in the file.
- ls -l | grep ".txt"
  Ans It will list the all the file or filter with the file name .txt
- cat file1.txt file2.txt | sort | uniq

PART B

Identify True or False:

1. **ls** is used to list files and directories in a directory. **YES**
2. **mv** is used to move files and directories. **NO**
3. **cd** is used to copy files and directories. **NO**
4. **pwd** stands for "print working directory" and displays the current directory.**YES**
5. **grep** is used to search for patterns in files. **YES**

6. **chmod 755 file.txt** gives read, write, and execute permissions to the owner, and read and execute permissions to group and others.**YES**
7. **mkdir -p directory1/directory2** creates nested directories, creating directory2 inside directory1 if directory1 does not exist. **YES**
8. **rm -rf file.txt** deletes a file forcefully without confirmation. **YES**

Identify the Incorrect Commands:

1. **chmodx** is used to change file permissions INCORRECT.
2. **cpy** is used to copy files and directories.INCORRECT
3. **mkfile** is used to create a new file.INCORRECT
4. **catx** is used to concatenate files.INCORRECT
5. **rn** is used to rename files.INCORRECT

Part C

Question 1: Write a shell script that prints "Hello, World!" to the terminal.
Ans: echo "hello world!"

Question 2: Declare a variable named "name" and assign the value "CDAC Mumbai" to it. Print the value of the variable.
Ans:name='CDAC Mumbai'
echo $name

Question 3: Write a shell script that takes a number as input from the user and prints it.
Ans: echo user please enter your number
read num
echo you have entered the number $num

Question 4: Write a shell script that performs addition of two numbers (e.g., 5 and 3) and prints the result
Ans: echo Enter Number 1
read num1
echo Enter Number 2
read num2
sum=$((num1+num2))
echo $sum
.

Question 5: Write a shell script that takes a number as input and prints "Even" if it is even, otherwise prints "Odd".
Ans:echo Enter any Number
read num2
if [$((num2%2)) -eq 0]

then
    echo $num2 "Number is positive"
else

```
    echo $num2 "Number is negative"
fi
```

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

Ans:for i in 1 2 3 4 5

do

echo $i

done

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

Ans:i=1

while [$i -le 5]

do

echo $i

i=$((i+1))

done

Question 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".

Ans: if [-f file.txt]
then
echo "file does exit"
else
echo "file does not exit"
fi

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

Ans:echo Enter the number

read num3

if [$num3 -le 10]

then

echo $num3 "Number is less than 10"

else

echo $num3 "number is greater is than 10"

fi

Question 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.
Ans: echo Enter Your Number For Multiplication
read num4
for k in 1 2 3 4 5
do
echo "$num4 * $k = $((num2 * k))"
done

Question 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.

Ans:echo "Enter a NUmber "

read i

while true

do

if [$i -lt 0]

then

echo "you have enter -ve number"

break

fi

echo "$i=$((i*i))"

echo another number

read i

done

echo "Done!"

#######here is the code ############

```
  GNU nano 6.2                                                    task.sh
echo assigment  of  OS
echo " question no. 1 Write a shell script that prints Hello world  to the terminal"
echo "hello world!"

echo "============================================================================================================"
echo "question no.2 Declare a variable named name  and assign the value CDAC Mumbai  to it. Print the
value of the variable"
name='CDAC Mumbai'
echo $name
echo "============================================================================================================"
echo "question no 3 Write a shell script that takes a number as input from the user and prints it"
echo user please enter your number
read num
echo you have entered the number $num
echo "============================================================================================================"
echo "question 4 Write a shell script that performs addition of two numbers   and prints the result"
echo Enter Number 1
read num1
echo Enter Number 2
read num2
sum=$((num1+num2))
echo $sum
echo "============================================================================================================"
echo "Question 5: Write a shell script that takes a number as input and prints  even and odd "
echo Enter any Number
read num2
if [ $num2 -gt 0 ]

 then
       echo $num2 "Number is positive"
else
       echo $num2 "Number is negative"
fi
echo "============================================================================================================"
echo "question 6: Write a shell script that uses a for loop to print numbers from 1 to 5."
for i in  1 2 3 4 5
do
echo $i
done
echo "============================================================================================================"
```

```
fi
echo "=============================================================================================================="
echo "question 6: Write a shell script that uses a for loop to print numbers from 1 to 5."
for i in  1 2 3 4 5
do
echo $i
done
echo "=============================================================================================================="
echo "Question 7: Write a shell script that uses a while loop to print numbers from 1 to 5."
i=1
while [ $i -le 5 ]
do
echo $i
##this for increment purpose
i=$((i+1))
done

echo "=============================================================================================================="
echo question 8 rite a shell script that checks  a file named  file.txt exists  the current directory.

if [ -f file.txt ]
then
echo "file does  exit"
else
echo "file does not exit"
fi
echo "=============================================================================================================="
echo "Question 9  Write a shell script that uses the  statement to check  a number is greater than 10 and
prints a message accordingly"
echo Enter the number
read num3
if [ $num3 -le 10 ]
then
echo $num3 "Number is less than 10"
else
echo $num3 "number is greater is than 10"
fi
echo "=============================================================================================================="
```

```
  GNU nano 6.2                                                    task.sh
echo "Question 9  Write a shell script that uses the  statement to check  a number is greater than 10 and
prints a message accordingly"
echo Enter the number
read num3
if [ $num3 -le 10 ]
then
echo $num3 "Number is less than 10"
else
echo $num3 "number is greater is than 10"
fi
echo "=============================================================================================================="
echo "Question 10: Write a shell script that uses nested FOR loops to print a multiplication table FOR numbers
from 1 to 5. The output should be formatted nicely, with each row representing a number and each
column representing the multiplication result FOR that number. "
echo Enter Your Number For Multiplication
read num4
for k in 1 2 3 4 5
do
echo "$num4 * $k = $((num2 * k))"
done
echo "=============================================================================================================="
echo "question 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."

echo "Enter a NUmber "
read i
while true
do
if [ $i -lt 0 ]
then
echo "you have enter -ve number"
break
fi
echo "$i=$((i*i))"
echo another number
read i
done
echo "Done!"
```

Part D

Common Interview Questions (Must know)

1. What is an operating system, and what are its primary functions?

   Ans:It is an application which interact with user and hardware for performing task according to instructions .Its primary functions are File Management,Memory Management,CPU Scheduling,Security,Process Synchronization
2. Explain the difference between process and thread
   Ans:the program need to executive in main memory know as process where as thread is sub part of process .process is heavy weight thread is lightweight,Context switching is slow in process in thread it is fast
3. What is virtual memory, and how does it work?
   Ans:Virtual Memory is present in the secondary part of the system which can store the large file when the main memory wants to program. It provides the specific code of chunks to the main memory for the process rather than a full program to process.
4. Describe the difference between multiprogramming, multitasking, and multiprocessing.
5. What is a file system, and what are its components?
6. What is a deadlock, and how can it be prevented?
   Ans:When many process hold the resources and request for the other process without leaving holding process is know as deadLock it can we prevent by(Mutual Exclusion,hold and wait,No preemption curricular wait) if one of this conditions fails than it can be prevented ,DeadLock Ignorance,Resource Allocation graph
7. Explain the difference between a kernel and a shell.
   Ans;kernel Interact core part OS interacts with the hardware and manages resources like CPU, memory, and devices. while the shell is scripting language in linux
8. What is CPU scheduling, and why is it important?
   Ans : Which process is needed to be executive next after the process is now as CPU Scheduling.It is important because the processes waiting in the ready queue need to be executive if not system failure can occur.
9. How does a system call work?
   Ans:A system call is a mechanism that allows a user-mode application to request services or resources from the operating system's kernel. When a user-mode program needs to perform operations like input/output (I/O), file management, or process control, it makes a system call
10. What is the purpose of device drivers in an operating system?
    Ans:It used to interact between operating system applications and the hardware.
11. Explain the role of the page table in virtual memory management.
    Ans: The page table is a crucial data structure used in virtual memory management. It maps virtual addresses generated by a program to physical addresses in the computer's memory. Each entry in the page table contains the physical address of the corresponding page in memory or information about where the page is stored if it's not currently in physical memory (such as on disk)
    .
12. What is thrashing, and how can it be avoided?
    Ans:It occur when system spend more time on swapping rather than performing usually task .It can avoid by Replace program ,increase the size of ram,decrease the number of application on the system
13. Describe the concept of a semaphore and its use in synchronization.
    Ans:It only allow to perform read operation more than two process if any process want to write other process have to leave by the synchronization to reduce by race conditions
14. How does an operating system handle process synchronization?
    Ans It allow only one process at time to shared the data in the critical sections to avoid race

conditions

15. What is the purpose of an interrupt in operating systems?
    Ans:The interrupt is a signal emitted by hardware or software when a process or an event needs immediate attention. It alerts the processor to a high-priority process requiring interruption of the current working process.
16. Explain the concept of a file descriptor.
17. How does a system recover from a system crash?
18. Describe the difference between a monolithic kernel and a microkernel.
    In microkernels, the user services and kernel services are implemented in different address spaces. The user services are kept in the user address space, and kernel services are kept under the kernel address space.
    ->In a Monolithic kernel, the entire operating system runs as a single program in kernel mode. The user services and kernel services are implemented in the same address space.
19. What is the difference between internal and external fragmentation?
    Ans:Internal fragmentation where the size of memory is fixed
    external fragmentation where the size of memory is Variable
20. How does an operating system manage I/O operations?
21. Explain the difference between preemptive and non-preemptive scheduling.
    Ans:Preemitive scheduling CPU remove the process forcefully but in non preemptive process executive until it not complete
22. What is round-robin scheduling, and how does it work?
23. Describe the priority scheduling algorithm. How is priority assigned to processes?
24. What is the shortest job next (SJN) scheduling algorithm, and when is it used?
25. Explain the concept of multilevel queue scheduling.
    Ans:the Process divided into different class in the ready queue and each class has own cpu scheduling
26. What is a process control block (PCB), and what information does it contain?
27. Describe the process state diagram and the transitions between different process states.
28. How does a process communicate with another process in an operating system?
    Ans:Process Communicate each other and share informations each other by the inter process Communications
29. What is process synchronization, and why is it important?
    Ans:It is process where one by one process shared the resources in the critical sections to avoid race conditions
30. Explain the concept of a zombie process and how it is created
    Ans;when one process is terminated but its entry remains in the main memory .
31. Describe the difference between internal fragmentation and external fragmentation.
32. What is demand paging, and how does it improve memory management efficiency?
    Ans:the pages which is needed or required by the cpu from the secondary memory .Only specific page is shown after requesting from the user
33. Explain the role of the page table in virtual memory management
    Ans:Page Table is a data structure used by the virtual memory system to store the mapping between logical addresses and physical addresses.
34. How does a memory management unit (MMU) work?
    Ans:it convert logical address into physical address
35. What is thrashing, and how can it be avoided in virtual memory systems?
36. What is a system call, and how does it facilitate communication between user programs and the operating system?
37. Describe the difference between a monolithic kernel and a microkernel.
38. How does an operating system handle I/O operations?
39. Explain the concept of a race condition and how it can be prevented.

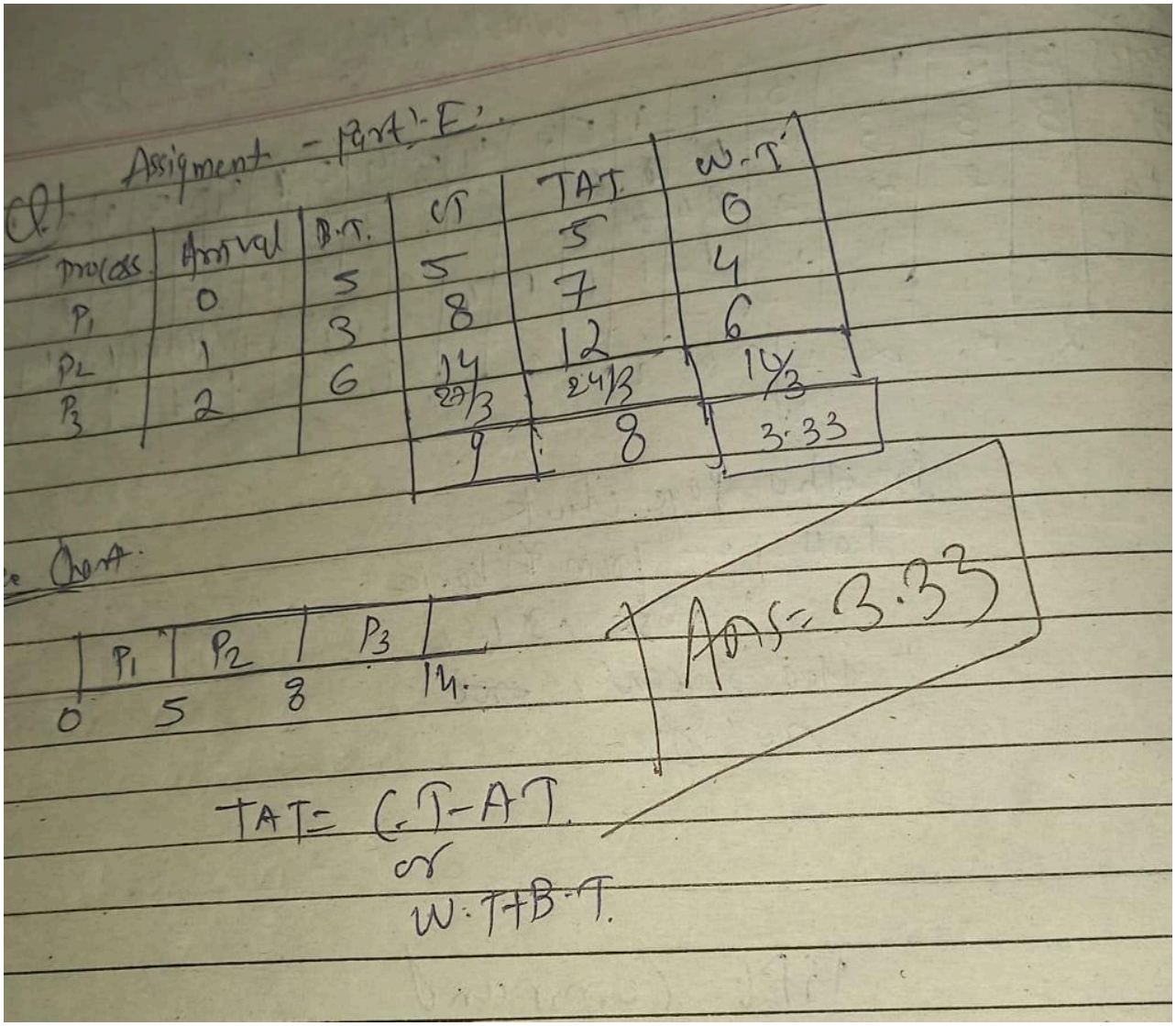
40. Describe the role of device drivers in an operating system.
41. What is a zombie process, and how does it occur? How can a zombie process be prevented?
42. Explain the concept of an orphan process. How does an operating system handle orphan processes?
    Ans:the process which is formed when a child dies while continuing the process continuously The operating system identifies the orphan process and reassigns it to the `init` process (usually with PID 1 on Unix-like systems). The `init` process becomes the new parent of the orphan process.
43. What is the relationship between a parent process and a child process in the context of process management?
44. How does the fork() system call work in creating a new process in Unix-like operating systems?
45. Describe how a parent process can wait for a child process to finish execution.
46. What is the significance of the exit status of a child process in the wait() system call?
47. How can a parent process terminate a child process in Unix-like operating systems?
48. Explain the difference between a process group and a session in Unix-like operating systems.
49. Describe how the exec() family of functions is used to replace the current process image with a new one.
50. What is the purpose of the waitpid() system call in process management? How does it differ from wait()?
51. How does process termination occur in Unix-like operating systems?
52. What is the role of the long-term scheduler in the process scheduling hierarchy? How does it influence the degree of multiprogramming in an operating system?
53. How does the short-term scheduler differ from the long-term and medium-term schedulers in terms of frequency of execution and the scope of its decisions?
54. Describe a scenario where the medium-term scheduler would be invoked and explain how it helps manage system resources more efficiently.

Part E

1. Consider the following processes with arrival times and burst times:

Process	Arrival Time	Burst Time
P1	0	5
P2	1	3
P3	2	6

Calculate the average waiting time using First-Come, First-Served (FCFS) scheduling.



2. Consider the following processes with arrival times and burst times:

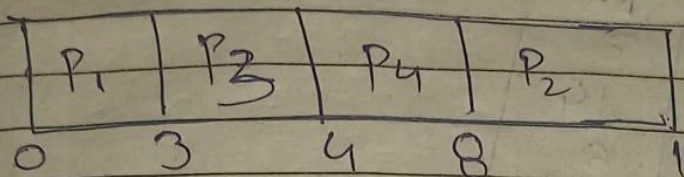
Process	Arrival Time	Burst Time
P1	0	3
P2	1	5
P3	2	1
P4	3	4

Calculate the average turnaround time using Shortest Job First (SJF) scheduling

Q.2

Process	Arrival	Burst Time	CT	TAT
P_1	0	3	3	3
P_2	1	5	13	12
P_3	2	1	4	2
P_4	3	4	8	5
				23/4
				5.75

Date: / / Page no:



TAT = C.T − A.T

or

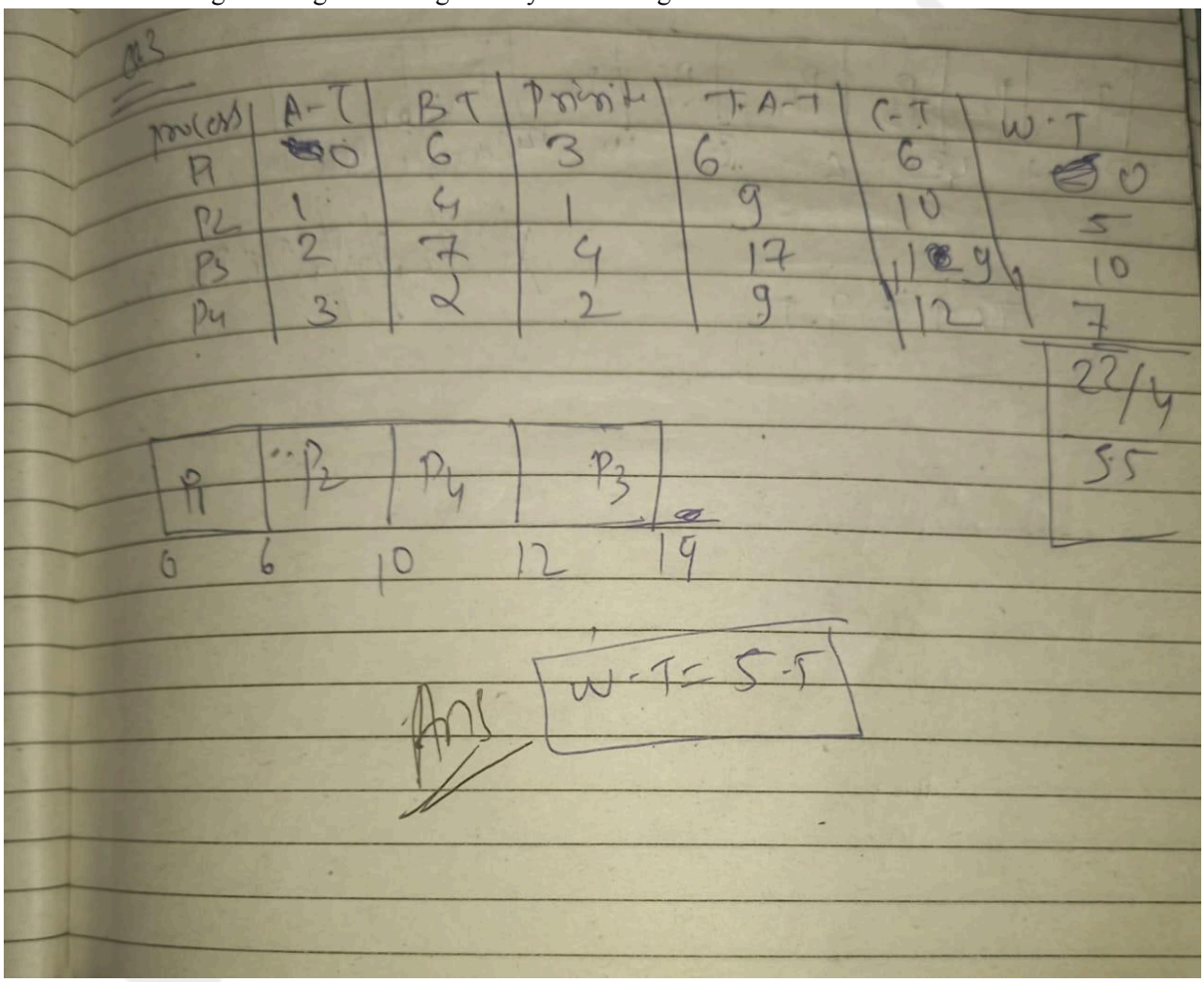
B.T + W.T

Ans = 5.5

3. Consider the following processes with arrival times, burst times, and priorities (lower number indicates higher priority):

Process	Arrival Time	Burst Time	Priority
P1	0	6	3
P2	1	4	1
P3	2	7	4
P4	3	2	2

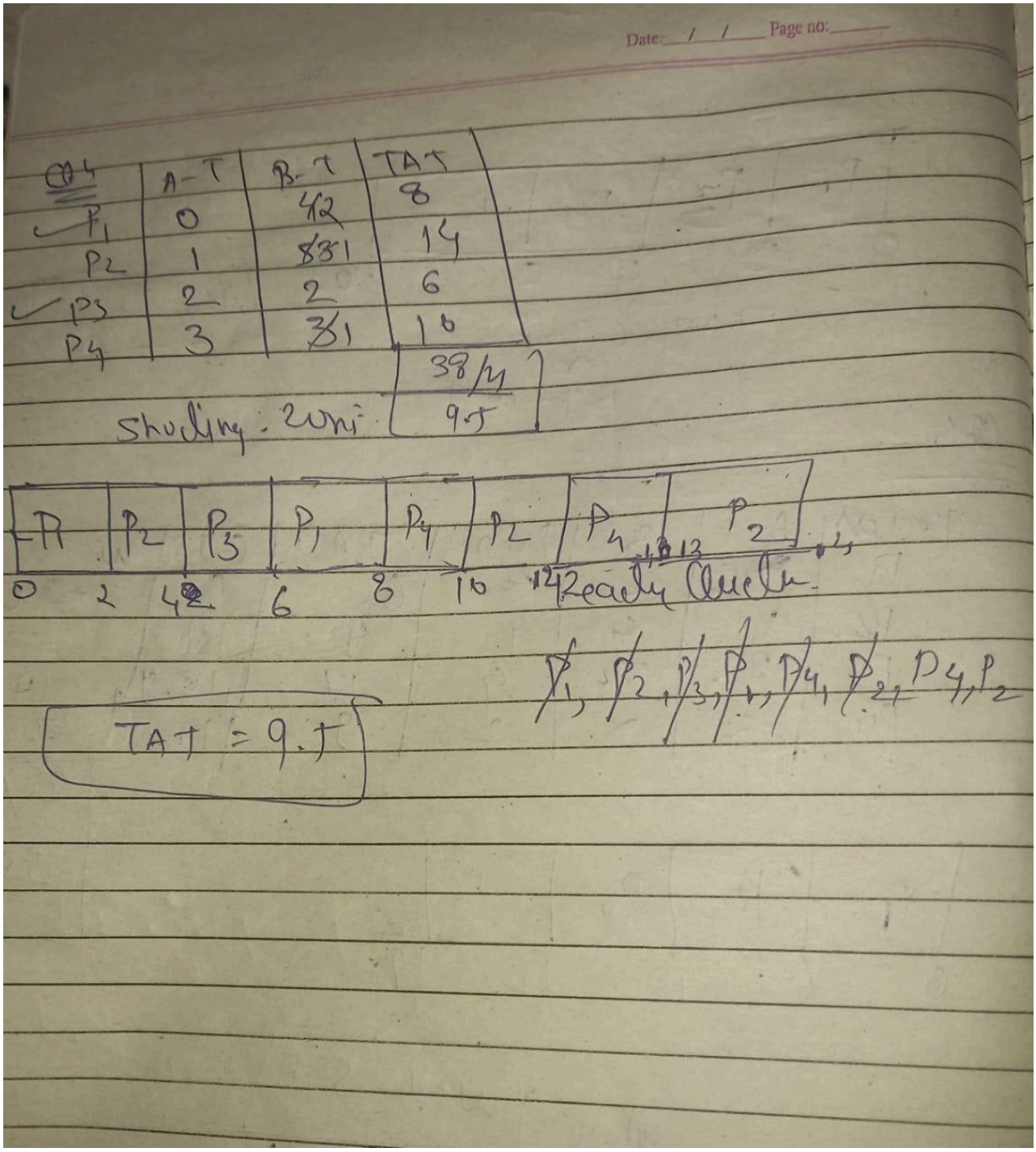
Calculate the average waiting time using Priority Scheduling.



4. Consider the following processes with arrival times and burst times, and the time quantum for Round Robin scheduling is 2 units:

Process	Arrival Time	Burst Time
P1	0	4
P2	1	5
P3	2	2
P4	3	3

Calculate the average turnaround time using Round Robin scheduling.



5. Consider a program that uses the **fork()** system call to create a child process. Initially, the parent process has a variable **x** with a value of 5. After forking, both the parent and child processes increment the value of **x** by 1.
   What will be the final values of **x** in the parent and child processes after the **fork()** call?
   Ans:#include <stdio.h>

```
void main() {

    int x = 5;
    fork();
```

```
        x = x+1;
        printf("x = %d\n",x);
}
```

Submission Guidelines:

- Document each step of your solution and any challenges faced.
- Upload it on your GitHub repository

Additional Tips:

- Experiment with different options and parameters of each command to explore their functionalities.
- This assignment is tailored to align with interview expectations, CCEE standards, and industry demands.
- If you complete this then your preparation will be skyrocketed.